

**Alcohol-Related Image Priming and Aggression in Adolescents Aged 11-14.**

(accepted by Addictive Behaviors, March 2010)

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Acknowledgement: This research was funded by grant no. SG 08/09 120 from the Alcohol Education Research Council, UK.

In adults, alcohol-related stimuli prime aggressive responding without ingestion or belief of ingestion. This represents either experiential or socially-and culturally-mediated learning. Using a laboratory-based competitive aggression paradigm, we replicated adult findings in 103 11-14 year old adolescents below the legal UK drinking age. Using a two independent groups design, priming with alcohol-related imagery led participants to deliver louder noise punishments in a competition task than priming with beverage-related images. This effect was stronger in participants scoring low on an internalization measure. Priming effects in relatively alcohol naïve participants could constitute evidence of socio-cultural transmission of scripts linking alcohol use and aggression. The enhanced effect in lower internalization scorers suggests that alcohol priming might undermine behavioral inhibition processes in otherwise stable adolescents.

Keywords: Alcohol; Aggression; adolescents; priming.

Interpersonal violence is a primary cause of morbidity and mortality in young people (Potenza, Hoyt, Coimbra, et al, 2004). Geographical (Gruenewald & Remer, 2006), temporal (Nelson, Bromley & Thomas, 2001) and observational (Graham, Bernards, Osgood, Wells, 2006) evidence shows links between alcohol and violence. Causal links are demonstrated by placebo-controlled experimental studies (Bushman, 1993). Findings from placebo conditions, where participants have not ingested alcohol, show non-pharmacological mediation (Bushman, 1993).

The mere visual presentation of alcohol-related stimuli, without belief of ingestion, increases the likelihood of indirect aggression and hostile attributions (Bartholow & Heinz, 2006; Friedman, McCarthy, Bartholow & Hicks, 2007). It is not known whether this extends to physical aggression. Huesmann (1988) uses the term social script to describe individuals' mental representations of common and acceptable social behaviour. Scripts specify contextually appropriate responses and reward contingencies for specific social situations, and are partly culturally transmitted. A UK example is 'lad' (and 'ladette') sub-culture, which ties alcohol and aggression together within a rubric of powerful values emphasising status, virility and power (Benson & Archer, 2002). Scripts are maintained and strengthened by personal and vicarious experience, modeling and representations within media, peer and family systems (Bushman & Huesmann, 2006).

Young people are important targets for prevention, as scripts are often not fully formed and vulnerable to challenge (Bushman & Huesmann, 2006). Priming studies use presentations of alcohol-related stimuli to elicit aggressive responding, but have used adults where socio-cultural learning of scripts is difficult to disentangle from experiential learning. Naïve drinkers are less likely to have personal or vicarious experience of alcohol-related aggression. Thus, work with

this population allows researchers to make more substantive inferences about possible socio-cultural origins of individuals' script representations. This study represents the first examination of how alcohol priming affects physical aggression in adolescents. Using a two-independent groups design, we examined priming effects of visual alcohol stimuli on a laboratory aggression task in 11-14 year olds. We expected greater priming effects for alcohol-related images, compared to non-alcoholic beverage images.

Script influences may to interact with other factors to cause aggression (Quigley, & Leonard, 2006). Behavioral disturbance is a well-known risk factor for adolescent alcohol misuse and aggression (Prinstein & La Greca, 2004; Rose & Swenson, 2009). Internalization, refers to behavioral withdrawal, and externalization, involving inappropriate or delinquent behaviors, are associated with enhanced sensitivity to physical and social cues: higher internalization scorers tend to be more sensitive to social influences toward substance use and aggression (Cohen & Prinstein, 2006), whilst high externalization scorers are characterized by impulsive responses to external stimuli, **involving elements of anti-social behaviour, and both relational and direct aggression** (Benning, Patrick, Blonigen, Hicks & Iacono, 2005). Thus, cues pertaining to prominent social scripts should be more powerful for both higher internalization and externalization scorers. We predicted facilitation of any observed alcohol priming effects in participants scoring highly on internalising and externalising behaviors.

### METHOD

Participants: Participants were 103 young people (35 males and 66 females) aged between 11-14 years (**Mean=13.37, SD=0.72**), recruited from two high schools in North West

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England. There were no exclusion criteria, except self or parental exclusion. Few were frequent drinkers; 28 had never drunk alcohol, 19 only drank once or twice a year, 16 drank monthly, 20 two to four times per month, ten 2-5 times per week and one drank six or more times per week.

### Materials and Procedure

Participants completed questionnaires, followed a week later with a laboratory session involving priming and the physical aggression paradigm.

Questionnaires: Participants completed questionnaires including demographic items and externalizing and internalizing behavior (Child Behavior Checklist-Youth Self-Report, Achenbach, 1991). Internalizing behaviour was measured with thirteen items (e.g., “I feel lonely”) and externalizing behaviour with nine (“I destroy things belonging to others”).

Responses are 1 (not true), 2 (somewhat true) and 3 (often true). Higher scores represent greater externalizing or internalizing behaviour. **Internalizing range was 13-35 and Cronbach alpha.75.**

**Externalizing range was 8-25 and alpha .59. To assess personal alcohol use, we added the AUDIT (Connigraue, Saunders & Reznik, 1995) items for frequency and quantity of drinking. Participants were also asked to estimate parental drinking.**

One week after completing questionnaires, participants were brought into a lab room in groups of six, requested not to communicate, and seated with a 17-inch PC. **They were told that the study was about how images affect reaction speed. Debriefing confirmed acceptance of this story.**

Priming: Priming was administered after instruction and practice trials, but before the experimental trials. Participants were presented with either alcohol or beverage-related images, consisting of a series of ten high resolution colour slides mounted on a full-screen ‘powerpoint’ presentation. Each image was presented for 3 seconds, with the total presentation lasting 30

seconds. Each group of six participants was observed by two researchers to ensure that they attended to the primes. A Google image search was made to locate drinks, glass sizes and types and brands commonly used in the UK (e.g., pint glass of beer, wine in glasses, 'alcopops', shots, vodka bottle, beer bottles). Non-alcoholic images consisted of pictures of non-alcoholic beverages (e.g., water, milk, orange juice, soda). Based on the image pairings used by Thrush et al. (2008), we presented alcohol and control images on white backgrounds, matched to be as close as possible in object size, color and drink quantity.

Physical Aggression Measure: The Competitive Reaction Time Task (CRT - Taylor, 1967) is associated with self-reported aggression and a similar pattern of correlates as observed aggressive behaviour in 'real world' contexts (e.g., Anderson & Bushman, 1997; Giancola & Zeichner, 1995). In each of 25 trials, participants believe that they are competing against an opponent to be the first to respond to a stimulus. The loser of each trial supposedly receives a blast of noise through headphones. The outcome of each trial is pre-set by the computer, and participants "win" on about half. Before each trial, participants are required to set a level of noise (from 0 to 105 decibels) and duration (from 0 to 5 seconds) that their opponent will be blasted with should the participant lose the trial. On winning a trial, the participant is shown the loudness of the blast of noise they would have received upon losing. The nature of the task was explained and participants told that they would be playing against another player. To provide this impression, testing was conducted in groups of six, which were randomly assigned a condition. Before the experimental trials, participants were instructed in the task and allowed to complete practice trials.

The mean noise intensity and duration across each of the 25 trials was calculated. Nine participants (four female, five male) gave both the most intense and longest possible duration for

every trial, indicating that they may have become suspicious of the purpose of the study and were either not taking the task sufficiently seriously or trying to confound the results. Accordingly, their scores were omitted from the analysis.

Statistical checks: Checks were performed to ensure that conditions did not differ on age, gender, personal drinking, parental drinking and internalization and externalization scores. A logistic regression showed no multivariate prediction of condition,  $\chi^2(6)=7.91, p=.245$ , and there were no univariate predictors. We also examined the possibility that these might moderate the prediction of intensity and duration by condition, but found no evidence of this.

### RESULTS

One-tailed  $t$ -tests were conducted to assess the effect of priming on intensity (means: Alcohol prime=7.38, SD=1.69; Beverage prime=6.71, SSD=2.05) and duration (means: Alcohol prime=6.54, SD=2.06; Beverage prime=6.22, SSD=2.21). The alcohol prime mean was higher for intensity,  $t(101)=1.82, p<.05$ ), but no difference existed for duration,  $t(101)=0.77, p=.324$ .

We used two hierarchical regression analyses to examine interactive effects of the experimental condition and internalizing and externalizing scores on noise intensity and duration respectively. Two and three-way interactions between condition (coded; alcohol=1, beverage=2) and internalizing and externalizing behaviors were modeled by centering internalizing and externalizing scores and computing products. Independent predictors were identified by a significant standardized  $\beta$  (Aiken & West, 1991).

Although correlated with each other,  $r(91)=.265, p<.05$ , neither internalizing nor externalizing were associated with intensity, internalizing  $r=.04, p=.713$ ; externalizing  $r=.12,$

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$p=.235$ , or duration,  $r=.10$ ,  $p=.326$ ;  $r=.07$ ,  $p=.510$ . The regression significantly predicted noise intensity,  $R^2(7,92)=.185$ ,  $p<.05$ , with a significant condition/internalizing interaction (see Table). **Condition was a significant independent predictor at all steps. Males administered more intense noise.** There were no main or interaction effects for externalizing behaviors and no three-way interaction. **Males and younger participants delivered longer blasts**, but there were no main or interactive effects of internalizing, externalizing or condition.

Simple slopes analysis (Aiken & West, 1991) was used to probe the two way interaction. Noise intensity was regressed onto internalizing behavior scores within each condition. The regression equation was significant for the beverage ( $\hat{Y}=0.135x+3.75$ ,  $p<.05$ ) but not the alcohol prime ( $\hat{Y}=-0.051x+8.37$ ,  $p=.290$ ). Slopes (see Figure) show that the alcohol prime increased the level of noise delivered by lower scoring internalizers, but not higher scorers.

## DISCUSSION

Research with adults suggests that people respond aggressively when primed with visual alcohol-related stimuli (Bartholow & Heinz, 2006; Friedman, et al., 2007). Priming with alcohol-related images increased adolescents' aggressive responding in a laboratory task. Alcohol primes moderated the positive relationship between internalization and aggression by increasing aggressive responding in low internalizers.

Links between alcohol priming and aggression in a young and largely alcohol-naïve population are important for two reasons. First, it suggests that relationships between mental representations of alcohol and aggression exist before extensive personal experience with alcohol use. Rather than learning being mediated by behavioral modeling or personal experience of the

pharmacological effect of alcohol, participants may have responded to socially or culturally-transmitted representations of common or appropriate responses to alcohol. This conclusion is tentative until the form of representations and their transmission is established.

Second, our findings suggest that links between alcohol and aggression are learned early and that prevention activities could be focused on early drinkers and pre-drinkers. Programs might profitably focus on common cultural beliefs about alcohol and aggressive behavior. Further contribution of this work lies in the finding that, in addition to hostile attributions and indirect aggression, alcohol primes physical aggression (Bartholow & Heinz, 2006; Friedman, et al., 2007).

Alcohol priming did not interact with higher internalizing and externalizing scores to predict greater aggression. Rather, the alcohol prime may have undermined the inhibiting effect of low internalization on aggression. This could be important because it implies that alcohol/aggression scripts cause aggression in those who would not normally be aggressive. Pharmacological disinhibition is well understood, and disinhibition has also been noted in placebo studies in experienced drinkers (Fillmore, 2003). Thus, inhibition could be reduced by mere exposure to alcohol-related stimuli. This could be investigated by testing alcohol priming effects on responses to standard inhibition paradigms (Fillmore & Vogel-Sprott, 2000).

Externalizing had no main effect or interaction with priming in predicting aggression. One possibility is that the aggressive component of externalizing behavior evolves before regular alcohol use in early adolescents (Lillehoj, Trudeau, Spoth & Madon, 2005). Thus, alcohol triggers for aggression may not yet exist, explaining why externalizing participants did not respond differentially to alcohol cues.

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Further research could seek to identify the nature of inexperienced drinkers' representations of alcohol use and the acceptability of alcohol/related aggression, and how they may moderate or facilitate aggressive responding. Research could also examine the media by which these representations are transmitted.

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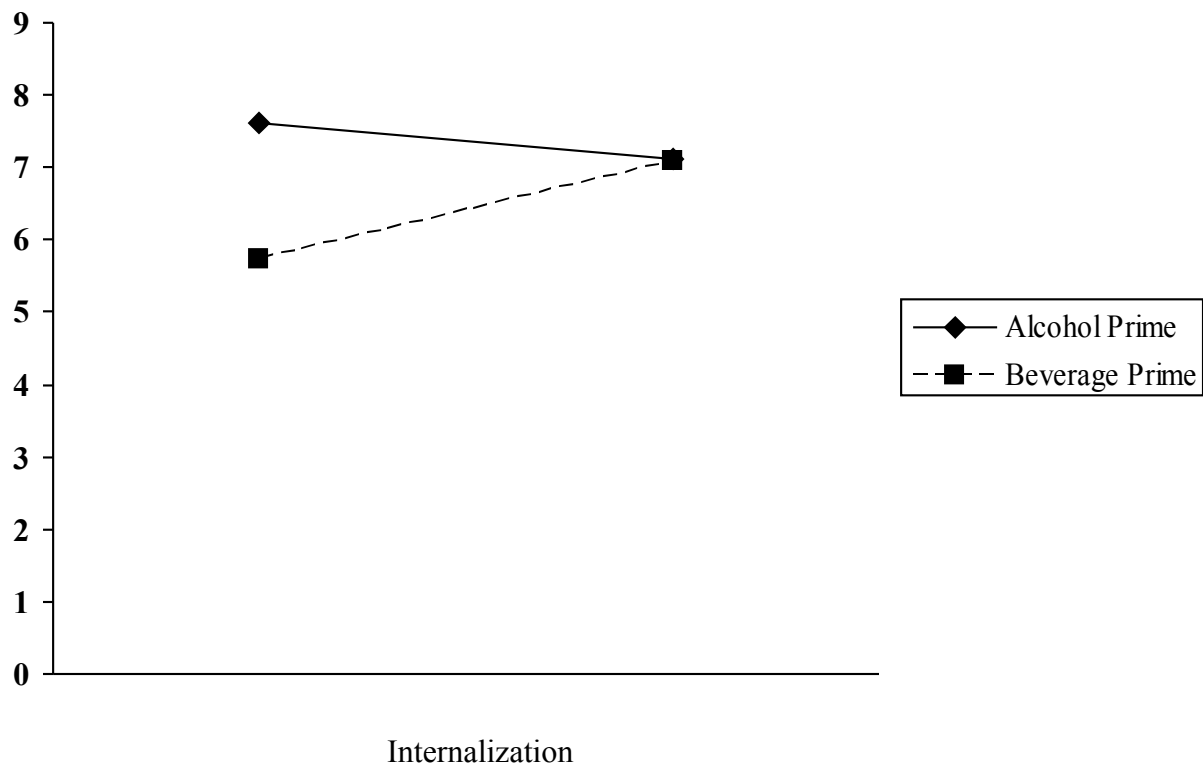
Table. Main and Interaction Effects of Hierarchical Regression of Noise Intensity and Duration on Experimental Condition and Internalizing and Externalizing Scores (unless denoted  $\Delta R^2$ , figures are standardized  $\beta$ s)..

	Intensity	Duration	
	Mean=7.08, SD=7.95	Mean=6.40, SD=2.13	
Gender	-.22*	-.35**	
Age (Mean=13.37, SD=0.72)	-.17	-.26*	
Personal Drinking (Mean=5.14, SD=2.69)	-.09	-.07	
Parent Drinking (Mean=12.68, SD=8.62)	.03	.02	
$\Delta R^2$	.122**		.226**
Condition (1=control, 2=alcohol)	.29*	.14	
$\Delta R^2$	.044*		.001
Internalizing (Mean=19.67, SD=4.98)	.89**	.59	
Externalizing (Mean=12.15, SD=3.46)	.07	.13	
$\Delta R^2$	.045		.042
Cond X Int	-.96*	-.60	
Cond X Ext	.41	.18	
Int X Ext	-.11	-.03	
$\Delta R^2$	.098*		.023
Cond X Int X Ext	-.20	-.07	
$\Delta R^2$	.007		.001

\* $p < .05$ , \*\* $p < .01$ .

Figure: Interaction of Experimental Condition and Internalization in Predicting Noise Intensity.

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Note: The end points on the graph lines represent  $\pm 1$  z-score from the internalization mean.