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Implicit Alcohol-Aggression Scripts and Alcohol-Related Aggression on a Laboratory Task in 11-14 Year-Old Adolescents

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Scripts are socially-acquired representations of behavior, represented as long term memory associations in individuals. In adults, implicit associations between alcohol and aggression have been noted, but this cannot be solely attributed to social acquisition because learning based on personal experience cannot be eliminated. We used a lexical decision task to examine implicit links between alcohol and aggression in alcohol naïve adolescents who have less experience of alcohol-related aggression. One hundred and four 11-14 year old adolescents made lexical decisions on aggressive or non-aggressive words preceded by 40ms alcohol or non-alcohol word primes. We did not find that alcohol word primes caused faster response times for aggression words than non-aggression words, or that alcohol primes led to faster responses to aggression words than non-alcohol primes. However, controlling current self-reported drinking and externalizing behavior, faster recognition times predicted aggression on a competitive laboratory task preceded by a visual presentation of alcoholic, but not non-alcoholic beverage, images. We concluded that alcohol-related aggression scripts are not strongly developed in this age group, but individual differences in script strength are linked to alcohol-related aggressive responding. These may play a role in later alcohol-related aggression.

Keywords: alcohol; aggression; social scripts; implicit measures.

Interpersonal violence is one of the primary causes of morbidity and mortality in young people (Potenza, Hoyt, Coimbra, et al, 2004). Much violent crime in young people is related to alcohol misuse (Graham, Bernards, Osgood, Wells, 2006; Navis, Brown & Heim, 2008). Causal links are suggested by placebo-controlled studies showing that alcohol ingestion leads to aggression in laboratory tasks (Bushman, 1993). Further, the mere presentation of alcohol-related stimuli causes laboratory aggression (Bartholow & Heinz, 2006; Friedman, McCarthy, Bartholow & Hicks, 2007), emphasizing the role of personal beliefs about alcohol and its effects.

One commonly cited reason for alcohol-related violence is that both are closely tied into normative representations of what is considered to be expected and acceptable behavior (Huesmann, 1988). The notion of a social script may be helpful in understanding how social representations are held and transmitted. A social script is a commonly shared social or cultural representation that specifies a temporal series of events in specific social settings, describing appropriate responses and personal and social rewards for those responses (Huesmann, 1988). A script may represent fighting as a sought after and socially rewarded activity during a night out drinking (Benson & Archer, 2002). At the individual level, scripts provide accessible action plans that guide behavior in prescribed situations (Bushman & Huesmann, 2006).

Little attention has been paid to the ways in which alcohol/aggression scripts are learned and their developmental sequences. However, we do have some insight into the development of aggression scripts. Using a social learning perspective, Anderson and Bushman (2002) suggest that aggression scripts are socially learned and reinforced by the presentation and reward of aggressive responses to social cues such as conflict or provocation. Studies show links between media violence and aggressive behavior in both laboratory and field environments (Bushman & Anderson, 2001). This appears to be mediated by the development and strengthening of aggression scripts. Bushman and Huesmann's (2006) meta-analysis of links between media

content and aggression shows a developmental trajectory, where cumulative exposure to aggressive media content strengthens accessibility of aggressive thoughts and behavior over time.

Demonstrating that alcohol/aggression scripts are socially or culturally transmitted requires that the influence of competing learning mechanisms, such as direct and vicarious experience, is minimized. Brown, Coyne, Barlow and Qualter (2010) primed a laboratory aggression task with alcohol-related images, which led to more aggressive responses in 11-14 year old adolescents than priming with non-alcoholic beverage images. Given limited participant experience with alcohol and statistical control of self-reported drinking and externalizing behavior, this finding suggests that links between alcohol and aggression might be socially and culturally transmitted.

Script Automation

Similar to much social behavior (Bargh & Charterand, 1999), decisions to engage in aggression appear to be automated, in the sense that they are reflexively responsive to context and require little introspection or effortful thought (Anderson & Bushman, 2002; Huesmann, 1988). The principle of spreading activation is often used to explain the automation of social thought and behavior (Bargh & Charterand, 1999). Knowledge is stored in discrete semantically-linked modules in long-term memory, forming the basis of a script. For example, several studies have shown links between the semantic closeness of aggression and reward concepts and aggressive behavior (Richetin & Richardson, 2008). Activation of one module will activate linked modules, proportional to the strength of semantic links between them. Automation involves the strengthening of these semantic links by practice or observation, such that activating one construct (e.g., alcohol) makes linked constructs more easily accessible (e.g., aggressive thoughts).

Given the appropriate environmental cues, automated scripts appear to increase the likelihood of behavior consistent with their content, particularly under conditions of diminished executive control such as cognitive load, stress or intoxication (Thrush, Reinout, Ames, et al., 2008). Implicit measures provide insight into memory structures that underlie scripts by assessing the extent to which presentation of alcohol-related stimuli makes aggressive thoughts more readily available. Subliminal presentation of alcohol-related stimuli has been shown to elicit aggressive thoughts in adults (Bartholow & Heinz, 2006; Friedman et al., 2007).

Links between alcohol cues and aggression are usually attributed to alcohol outcome expectancies; specific internalized beliefs about the reward contingencies of behavior acquired through direct and vicarious learning (e.g., Brown, Goldman & Christiansen, 1985; Moss & Albery, 2009). Both expectancies and scripts contain implicit and explicit representations of behavior and consequences, appear to be represented in long-term memory in similar ways, and can be elicited by environmental cues. Scripts differ from expectancies in that they represent commonly-held perceptions of normative behavior – and are located in the individual's environment and acquired through indirect learning. Expectancies, on the other hand, pertain to a narrower domain of individuals' perceptions of reward and punishment contingencies.

Current Study

The eventual goal of our research program is to understand how socially transmitted information can shape personal alcohol/aggression scripts. Memory associations between alcohol and aggression in pre-drinking age adolescents, and links with alcohol-related aggression, would constitute evidence of social learning. We used an implicit association task to examine semantic links between alcohol and aggression concepts. We wanted to evaluate two propositions; 1) that semantic linkages between alcohol and aggression exist in relatively alcohol-naïve adolescent

participants, and 2) that individual differences in the strength of these linkages predict participant responses on a laboratory aggression task.

A rigorous test of automation involves the near subliminal presentation of alcohol-related stimuli (Friedman et al., 2007). Using a lexical decision task, we measured response times (RTs) to aggression or non-aggression words after near subliminal (40 millisecond) priming with alcohol or control words. Consistent with adult studies, shorter response times were expected in the aggression word/alcohol prime condition than in either non-aggression word/alcohol prime or aggression words/non-alcohol beverage prime conditions (Hypothesis 1). We also used individuals' response times to alcohol primed aggression words in the lexical decision task to predict aggression (Bushman, 1995; Taylor, 1967). Before participating in a laboratory aggression task, participants were presented with either images of alcoholic or non-alcoholic beverages. It was expected that shorter response times to aggression words with alcohol primes would predict greater aggression. To show that this effect is specific to alcohol-related aggression, rather than a general aggression effect, prediction of aggression by response times to alcohol-primed aggression words should be stronger in participants presented with the alcoholic beverage images immediately before the aggression task (Hypothesis 2).

METHOD

Participants

The same sample was used as that reported by Brown et al. (2010). 110 participants originally undertook data collection, but six were eliminated because they did not generate sufficient correct trials on the response time task (see equipment and procedure). The final sample consisted of 104 young people recruited from two high schools in England. Participation was open to all students in the target age range in each school. There were 39 males and 65 females

aged between 11-14 years with a mean age of 13.42 (*SD*=0.75). English was their main language and that used for instruction in the school.

Few participants were frequent drinkers; 33 had never drunk alcohol, 20 only drank once or twice a year, 18 drank monthly, 21 drank two to four times per month, ten 2-5 times per week, one drank six or more times per week and another participant failed to provide data. Parental drinking may also affect expectancies. From the sample of 104 participants, ten estimated that their parents had never drunk alcohol, eleven estimated once or twice a year, 19 estimated monthly, 26 estimates two to four times per month, 20 estimates 2-5 times per week and eight estimates six or more times per week. 10 participants did not provide estimates.

Design

Hypothesis 1: All participants provided four sets of lexical decision RT data in a 2 x 2 repeated measures design (alcohol or beverage prime words, aggression or non-aggression target words). Hypothesis 2: On a different day, participants performed the aggression task after being allocated to one of two conditions; exposure to either alcohol or non-alcohol beverage related images. Individuals' RTs to the alcohol prime/aggression target words in the lexical decision task were used to predict aggression. Aggression was measured by participants' choices of intensity and duration of punishments on the aggression task. Age, gender, drinking behavior and pre-existing behavioral disturbance were controlled.

Equipment and Procedure

RT task: The RT task was run using an E-Prime application mounted on laptop computers. Primes of five alcohol-related words (cider, beer, lager, whisky, vodka) were chosen to represent familiar drinks. These or five beverage-related words (water, coffee, juice, cola, soda) were presented in the center of the screen for 40ms, with backward and forward masks (XXXXXX)

presented for 1 second. The 40ms presentation time was chosen as it is the lowest exposure duration that has yielded reliable results (Friedman, et al., 2007), and provides a stringent test of automation.

The primes were followed by the target words, which fell into three categories, i) aggression (fight, hit, assault, bash, attack), ii) neutral words (bank, watch, spread, balance, reach) and iii) non-words (fark, bazt, hig, aggnop, annilt). Neutral words were chosen to match aggression words on the basis of natural language frequency, number of syllables and physical appearance. The English Lexicon Project's lexical norms (Balota, Yap, Cortese, Hutchison, Kessler, et al., 2007) were used for frequency matching. The target remained on the screen until the participant made a lexical decision (whether it is a real English word or not) by pressing a 'yes' or 'no' computer key which extinguished the word. The non-word condition was added simply to ensure that participants had to make a discrete decision on each task.

Participants were told that the task measured speed of language comprehension and were instructed to be as fast as possible whilst ensuring accuracy. Debriefing confirmed that this cover story was accepted. Participants initially completed five practice trials, in this case the prime was a series of the same letter, i.e. aaaaaa, followed by a neutral target word (desk, aspect, next, printer) or non-word (dasg, trashk, beeg, prantee). Participants needed to be correct on three of these trials to move onto the task. If not, a further practice trial was run. Two participants needed this further practice run, but were able to engage in the task trials. 100 task trials were run in total. Fixed prime/target pairs were randomly presented to each participant. Fifty trials had an alcohol-related word prime, and 50 a non-alcoholic beverage word prime. Thirty trials used aggressive words, 30 neutral, and 40 non-words.

Accuracy and RTs were recorded for each pairing of words. Following standard practice in RT studies (Neely, O'Connor & Calabrese, 2010), six participants who were correct on less than

80% of the trials were removed from the analyses. From each of the remaining participants, six mean RTs were calculated, one for each condition (alcohol/beverage primes and aggression/non-aggression/non-word target words). Only RTs within 2*SD* of each participant's mean RT within each condition were used to calculate means. This eliminates abnormally high or low RTs (e.g., Peresa & Carreiras, 2003). All participants generated sufficient RTs (80% or over) to calculate mean RTs for each of the six combinations of prime and target word.

Aggression Task

Immediately after the RT task, participants completed the Competitive Response Time Task (CRT, Taylor, 1967). The CRT involves 25 trials. In each trial, participants believe that they are competing against an opponent 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 (from 0 to 105 decibels) and duration (from 0 to 5 seconds) of noise that their opponent will be blasted with should the participant lose the trial. In winning a trial, the participant is shown the loudness of the blast of noise they would have received upon losing. These were preset to occur in random sequences. To provide a sense of realism, participants were told that they would be playing the game against another player in the room (Taylor, 1967). Testing was conducted in groups of six, which were randomly assigned to a condition. Task validity is established by studies showing outcomes to be 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). Before the experimental trials, participants were instructed in the task and allowed to complete practice trials.

Between practice trials and experimental trials, participants were presented with either alcohol or beverage-related images, consisting of high resolution color slides mounted on a full-screen

'powerpoint' presentation. Each image was presented on screen for 3 seconds, with the total presentation lasting 30 seconds. Participants were observed to ensure that they attended to the primes. Alcoholic drinks and brands were representative of those commonly consumed in the UK (e.g., pint of beer, wine in glasses, 'alcopops', shots, vodka bottle, beer bottles). Non-alcoholic images consisted of pictures of non-alcoholic beverages commonly consumed in the UK (e.g., water, milk, orange juice, soda). Similar to Thrush et al. (2008), alcohol and control images were presented on white backgrounds, matched to be as close as possible in object size, color and drink quantity. Immediately, after viewing the primes, participants completed the competitive response time task. Mean noise intensity and duration across each of the 25 trials was calculated for each participant.

Questionnaires

Participants completed questionnaires assessing demographic items (i.e. gender, age, drinking frequency), and behavioral disturbance. To assess personal alcohol use, we used the product of the AUDIT (Connigrave, Saunders & Reznik, 1995) items for frequency and quantity of drinking. Participants were asked to estimate parental drinking using the frequency measure only. Behavioral disturbance is a risk factor for both adolescent alcohol misuse and aggression (Prinstein & La Greca, 2004; Rose & Swenson, 2009). The Child Behavior Checklist-Youth Self-Report (Achenbach, 1991) internalization and externalization scales were used. Internalization refers to behavioral withdrawal (Cohen & Prinstein, 2006), and externalization, inappropriate or delinquent behaviors (Benning, Patrick, Blonigen, Hicks & Iacono, 2005). Internalizing behavior is measured with thirteen items (e.g., "I feel lonely") and externalizing behavior 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

behavior. Internalizing range was 13-35 and Cronbach alpha .75. Externalizing range was 8-25 and alpha .59.

RESULTS

Hypothesis 1

Average response times (in milliseconds) for each participant on prime/target word pairs are presented in Table 1. These are generally similar to those obtained in comparable semantic recognition studies, as are the longer RTs for non-words (e.g., Harley, 2008). Non words were not included in analyses.

The hypothesis that alcohol primes would elicit lower RTs to aggression than non-aggression words was tested by examining the interaction between prime and target words. A 2x2x3x2 (prime x target x grade level x gender) mixed ANOVA showed no direct or interaction effects for grade level or gender. A main effect was observed for prime, where RTs were slower after alcohol primes, $F(1,103)=15.49$, $p<.01$, $\eta_{partial}^2=.13$, but not target, $F(1,103)=3.35$, $p=.070$, $\eta_{partial}^2=.03$. No interaction between prime and target was observed, $F(1,103)=0.37$, $p=.546$, $\eta_{partial}^2=.01$. This does not provide any support for Hypothesis 1.

Hypothesis 2

We calculated two variables to represent the comparisons between alcohol-primed aggression and non aggression words and between aggression words primed by alcohol or beverage words. RT Target Difference is the difference between the response times to aggressive and non-aggressive target words when primed by alcohol word stimuli. It is calculated by subtracting the mean RT to the non-aggressive words from that of the aggressive. Negative differences

represent comparatively faster RTs to aggressive words. RT Prime Difference is the difference between the response times to aggressive words primed by alcohol and beverage words, calculated by subtracting the mean RT for the non-alcohol prime from the alcohol prime. Negative differences represent comparatively faster RTs following alcohol primes.

Means, SDs and correlations between study variables, within the full sample and each condition, are presented in table 2. We used moderated multiple regression (Aiken & West, 1991) to test interactions between RT measures from the lexical decision task and image condition of the aggression task in predicting noise intensity and duration. These interactions test the differential capacity of the predictor variables to predict aggression in the alcohol versus non-alcohol image conditions. Interaction terms were created by centring RT and the two difference scores and computing the product of these and CRT condition (coded as 1=beverage images, 2=alcohol images). Age, gender, participant drinking and externalizing and internalizing scores were added to the equation as control variables. The predictive equations contained control variables, condition, RT variables and RT*condition interactions. Unique prediction by the latter demonstrates a significant interaction whereby the RT variables differentially predict aggression preceded by either alcohol or beverage images.

Table 3 shows the regression outcomes. Male gender and Externalizing behavior predicted both intensity and duration of punishment noise. None of the lexical decision RT main or interaction effects predicted noise intensity. RT Target Difference - the RT difference between alcohol primed aggressive and non-aggressive target words - interacted with condition to predict noise duration and a main effect on duration was noted for RT Target Difference.

Simple slopes analysis (Aiken & West, 1991) was used to probe the interaction between RT Target Difference and condition in predicting aggression. Two slopes were calculated, representing the regression of RT Target Difference onto Noise Duration within each alcohol

and beverage image conditions. Slopes are presented in Figure 1, and show the interaction. Noise duration was predicted by proportionally faster RTs to aggressive than non aggressive words after alcohol priming when the aggression task is preceded by alcohol. A non-significant trend was noted in the opposite direction for non-alcohol images.

As RT Target Difference is a composite variable, we conducted the above analysis using main effects and product terms for both components - RT for aggression and non aggression words with alcohol word primes. A significant main effect was observed for lexical decision RTs for alcohol-primed aggression words, standardized β=-0.99 p<.05. An interaction effect was also noted between condition and lexical decision RTs for alcohol-primed aggression words; standardized β=-1.79 p<.05. There were no main or interaction effects for non-aggression words; main effect - standardized β=-0.94 p=.070, interaction - standardized β=1.73 p=.053. These analyses suggest that lexical decision RT for alcohol primed aggression words does not, by itself, predict alcohol-related aggression, but does so when RTs to alcohol primed non-aggression words are controlled.

DISCUSSION

Using a primed lexical decision task in relatively alcohol-naïve adolescents, we examined semantic associations between alcohol and aggression words to identify 1) the strength of semantic long-term memory links between alcohol and aggression concepts, and 2) whether individual differences in the strength of these associations can predict laboratory aggression after presentation of visual alcohol cues. We did not find faster RTs to aggression words after alcohol primes, compared to either aggression words after non-alcohol primes or non-aggression words after alcohol primes. This suggests that semantic links between alcohol and aggression concepts are not prominent. However, we did find that faster lexical decision RTs to alcohol-

primed aggression than non-aggression target words predicted greater noise punishment durations on the aggression task. This occurred after visual priming of the aggression task by alcohol-related but not non-alcohol-related beverage images.

We note an apparent contradiction, where hypothesis one was not supported, suggesting that that semantic links between alcohol and aggression words are no stronger than those between beverage and aggression or alcohol and non-aggression words, yet support for hypothesis two suggests that these links predict alcohol-related aggression. This probably occurs because such semantic links exist in a minority of participants [1].

The failure to support hypothesis 1 contrasts with findings from older-aged samples, where implicit measures show semantic links between alcohol and aggression words or concepts (Bartholow & Heinz, 2006; Friedman et al., 2007). This could mean that automation of alcohol aggression scripts is not prominent in this age group, although it may become so over time. At an individual level, we found evidence that semantic associations between aggression and alcohol words are associated with aggressive behavior. This finding is strengthened by the specificity of the effect to the presentation of alcohol images, but not beverage images, before the aggression task. This eliminates an alternative interpretation - that the effect is linked to the aggression component of the RT task only. Importantly, this effect does not appear to be confounded by demographic, drinking or behavioral disturbance variables, which were statistically controlled. This provides empirical support for the idea that the automation of alcohol/aggression scripts is linked to alcohol-related aggression. We do, however, caution that

[1] Concerned about the possibility that this effect was generated by outliers, we examined scatttergrams of relationships between noise duration and alcohol/aggression RTs and RT looking for ouitliers or non-linear correlation. We did not find any evidence of either.

this paradigm has not yet been linked to actual alcohol-related aggression, and that care must be taken when generalizing to a 'real world' context.

Nonetheless, we have identified a mechanism that explains a tendency toward alcohol-related aggression that exists at least four years before young people start legally drinking. As yet unidentified social influences influence the development of semantic links between alcohol and aggression, which predispose to aggressive responding. From a prevention viewpoint, these findings seem promising because, although the strength of semantic associations between alcohol and aggression content in long-term memory can cause aggressive responding, these associations do not appear to be as strong as they are in older samples (Bartholow & Heinz, 2006; Friedman et al., 2007). Finding ways to prevent the automation of alcohol/aggression scripts may help to prevent alcohol-related aggression. Of course, the development of effective preventive strategies is dependent on documenting the developmental trajectory of scripts and understanding the factors that drive this development, which is an important research priority.

As the sample is relatively alcohol-naïve, and personal and parental alcohol consumption were statistically controlled, we suggest that scripts are socially or culturally mediated. We do not have direct evidence that this is so for alcohol/aggression scripts, but Bushman and Huesmann (2006) show that social and cultural influences (specifically aggression in the media) are sufficient to strengthen and widen aggression scripts. It is important to understand if and how both local and wider cultural and media social environments may affect script acquisition and development. Future studies could use prospective designs to examine both the trajectory of script development and associations with differing social influences and personal experience. Research could also examine in how semantic links between alcohol and aggression acquired before personal experience might affect the ways in which later personal experiences are interpreted. One possibility is that future drinkers will interpret their first personal experiences

of alcohol and aggression in ways that are consistent with schema content. For example, they may over-emphasize the typicality or social acceptability of any alcohol-related aggression that they encounter.

We have linked implicit script measures to alcohol-related aggression, but the strength of semantic associations in long term memory reveals little about their meaning. The behavioral effects of aggression scripts may depend upon their evaluative content. For example, positive reward expectancies ought to facilitate script effects (Huesmann & Guerra, 1997; Quigley, Corbett & Tedeschi, 2002). Implicit associations between alcohol and positive reward expectancies have been noted (Thrush, et al., 2008), but associations between alcohol-related aggression and implicit representations of social rewards have never been examined.

In the lexical decision task, the main effect of prime on RT, where alcohol primes caused slower RTs to all target words, is interesting. As alcohol and beverage terms were not matched for lexical frequency, this may merely be a function of either set of terms being more familiar to participants. Another possibility is that alcohol-related words were more emotionally salient or meaningful than beverage words, prompting resource-demanding elaborative processing (Graf & Mandler, 1984). As this effect does not differ between aggression and non-aggression target words, it does not appear to influence interpretation of the interaction between prime and condition.

These findings ought to be viewed within limits of the methodology used. First, the extent to which our underage sample is naïve to personal experience with alcohol is not clear. Thirty per cent of the sample reported drinking at least twice per month and others made high estimates of parental drinking. Although we controlled personal and parental alcohol use in the analysis, we do not know if any participants had direct experiences with alcohol. Another limitation involves the external validity of the aggression task in terms of generalizing from the laboratory to the

field. In regard to this, we found, like Anderson and Bushman (1997) and Giancola and Zeichner (1995), that demographic correlates of the task aggression (male gender and externalizing behavior) are similar to those of aggression in field studies. This provides some evidence of external validity.

In summary, these findings provide evidence that stronger semantic associations between alcohol and aggression concepts in long-term memory are linked to the exhibition of alcohol-related aggressive behavior in naïve drinkers. The development of effective interventions is dependent on identifying the qualitative nature of these links and how they develop over time and understanding how differing forms of social influence drive this development.

REFERENCES

Achenbach, T. (1991). *Manual for the Child Behavior Checklist/4 - 18 and 1991 Profile*. Burlington, VT: University of Vermont Department of Psychiatry.

Aiken, L.S., & West, S.G. (1991). *Multiple Regression: Testing and Interpreting Interactions*. Sage: Newbury Park, CA.

Anderson, C. A., & Bushman, B. J. (1997). External validity of "trivial" experiments: The case of laboratory aggression. *General Psychology Review, 1,* 19–41.

Anderson. C. A. & Bushman. B. J. (2002). Human aggression. *Annual Review of Psychology*, *53*, 27–51.

Balota, D.A., Yap, M.J., Cortese, M.J., Hutchison, K.A., Kessler, B., Loftis, B., Neely, J.H., Nelson, D.L., Simpson, G.B., & Treiman, R. (2007). The English Lexicon Project. *Behavior Research Methods, 39*, 445-459.

Bargh, J.A. & Charterand, T.L. (1999). The unbearable automaticity of being. *American Psychologist, 54,* 462-479.

Bartholow, B.D. & Heinz, A. (2006). Alcohol and aggression without consumption. *Psychological Science, 17*, 30-37.

Benning, S.D., Patrick, C.J., Blonigen, D.M., Hicks, B.M. & Iacono, W.G (2005). Estimating facets of psychopathology from normal personality traits: A step toward community epidemiological investigations. *Assessment, 12*, 3-18.

Benson, D. & Archer, J. (2002). An ethnographic study of sources of conflict between young men in the context of the night out. *Psychology, Evolution and Gender, 4*, 3-30.

Bushman, B. J. (1993). Human aggression while under the influence of alcohol and other drugs: An integrative research review. *Current Directions in Psychological Science, 2*, 148-152.

Bushman, B. J. (1995). Moderating role of trait aggressiveness in the effects of violent media on aggression. *Journal of Personality and Social Psychology, 69,* 950–960.

Bushman, B.J. & Anderson, C.A. (2001). Media violence and the American public: Scientific facts verasus media misinformation. *American Psychologist, 56,* 477-489.

Bushman, B.J. & Huesmann, L.R. (2006). Short-term and long-term effects of violent media on aggression in children and adults. *Archives of Pediatrics & Adolescent Medicine, 160*, 48-52.

Brown, S. A., Goldman, M.S. and Christiansen, B.A. (1985). Do alcohol expectancies mediate drinking patterns of adults? *Journal of Consulting and Clinical Psychology, 53*, 512-519.

Brown, S.L., Coyne, S.M., Barlow, A. & Qualter, P. (2010). Alcohol-related image priming and aggression in adolescents aged 11-14. *Addictive Behaviors, 35*, 791-794.

Cohen, G.L. & Prinstein, M.J. (2006). Peer contagion of aggression and health risk behavior among adolescent males: An experimental investigation on effects on public conduct and private attitudes. *Child Development, 4*, 967-983.

Connigrave, K.M., Saunders, J.B., & Reznik, R.B. (1995). Predictive capacity of the AUDIT for alcohol-related harm. *Addiction, 90*, 1479-1485.

Friedman, R.S., McCarthy, D.M., Bartholow, B.D. & Hicks,J. (2007). Interactive effects of alcohol outcome expectancies and alcohol cues on non-consumptive behavior. *Experimental and Clinical Psychopharmacology, 15*, 102-114

Giancola, P.R., & Zeichner, A. (1995). Construct validity of a competitive reaction-time aggression paradigm. *Aggressive Behavior, 21,* 199–204.

Graf, P. & Mandler, G. (1984). Activation makes words more accessible, but not necessarily more retrievable. *Journal of Verbal Learning and Verbal Behavior, 23*, 553-568.

Graham K, Bernards S, Osgood DW, Wells S. 2006. Bad nights or bad bars? Multi-level analysis of environmental predictors of aggression in late-night large-capacity bars and clubs. *Addiction 101*, 1569–1580.

Huesmann, L. R. (1988). An information processing model for the development of aggression. *Aggressive Behavior, 14,* 13-24.

Huesmann, L. R. & Guerra, N. G. (1997). Normative beliefs and the development of aggressive behavior. *Journal of Personality and Social Psychology, 72*, 1-12.

Huesmann, L. R., Moise, J., Podolski, C., & Eron, L. (2003). Longitudinal relations between children's exposure to television violence and their later aggressive and violent behavior in young adulthood: 1977–1992. *Developmental Psychology, 39*, 201–221.

Moss, A.C. & Albery, I.P. (2009). A dual-process model of the alcohol-behavior link for social drinking. Psychological Bulletin, 135, 516-530.

Navis C, Brown S L and Heim D (2008) Predictors of injurious assault committed during or after drinking alcohol: a case-control study of young offenders. Aggressive Behaviour, 34, 167-74

Potenza, B.M., Hoyt, D.B., Coimbra, R., Fortlage, D., Holbrook, T. & Hollingsworth-Fridlund, P. (2004). The epidemiology of serious and fatal injury in San Diego County over an 11-year period. *Journal of Trauma, 56,* 68-75.

Neely, J.H., O'Connor, PA. & Calabrese, G. (2010). Fast trial pacing in a lexical decision task reveals a decay of automatic semantic activation. *Acta Psychologica, 133,* 127-136.

Perea, M. & Carreiras, M. (2003). Sequential effects in the lexical decision task: The role of item frequency of the previous trial. *The Quarterly Journal of Experimental Psychology, 56,* 385-401.

Prinstein, M.J. & La Greca, A.M. (2004). Childhood peer rejection and aggression as predictors of adolescent girls' externalizing behaviour: A 6-year longitudinal study. *Journal of Clinical and Consulting Psychology, 72*, 103-112.

Quigley, B. M., Corbett, A. B., & Tedeschi, J. T. (2002). Desired image of power, alcohol expectancies, and alcohol related aggression. *Psychology of Addictive Behaviors, 16*, 318-324.

Rose, A.J. & Swenson, L.P. (2009). Do perceived popular adolescents who aggress against others experience emotional adjustment problems themselves? *Developmental Psychology, 45*, 868-872.

Taylor, S. P. (1967). Aggressive behavior and physiological arousal as a function of provocation and the tendency to inhibit aggression. *Journal of Personality, 35,* 297–310.

Thrush, C., Reinout, W.W., Ames, S.L., Grenard, J.L., Sussman, S. & Stacy, A.W. (2008). Interactions between implicit and explicit cognition and working memory capacity in the prediction of alcohol use in at-risk adolescents. *Drug and Alcohol Dependence, 94*, 116-124.

Table 1. Response Times (with *SE*) in Milliseconds to Aggression and Non-Aggression Related words and Non-Words Using Alcohol or Beverage Primes.

	Target Word		
	Aggression	Non-Aggression Word	Non word
Alcohol Prime	757.66 (17.16)	731.27 (14.77)	856.77 (20.75)
Beverage Prime	748.79 (15.33)	714.56 (13.15)	843.47 (19.86)

Table 2. Means, SDs and correlations between study variables, within the full sample and each condition

	Mean	SD	Duration	Response Time (RT)	RT Target Difference	RT Prime Difference
Full Sample						
Noise Intensity	7.31	1.97	.85**	.04	-.01	.04
Noise Duration	6.68	2.24		-.04	-.14	-.05
Response time RT	757.56	175.09			.45**	.37**
RT Target Difference	32.88	179.36				.53**
RT Prime Difference	8.80	172.46				
CRT Non-Alcohol Images						
Noise Intensity	6.92	2.21	.95**	.05	.15	.05
Noise Duration	6.48	2.39		.07	.20	.06
RT	775.75	201.74			.60**	.63**
RT Target Difference	43.60	109.45				.67**
RT Prime Difference	19.38	102.93				
CRT Alcohol Images						
Noise Intensity	7.52	1.80	.74**	.07	-.07	.05
Noise Duration	6.76	2.20		-.16	-30*	-.10
RT	742.48	149.81			.44*	.30*
RT Target Difference	24.04	122.52				.51**
RT Prime Difference	0.09	114.91				

Table 3. Regression Analyses predicting Noise Intensity and Duration

	Intensity	Duration
Gender	-.28**	-.34**
Age	-.11	-.14
Drinking	-.12	-.15
Parent Drinking	-.08	-.14
Externalizing	.27*	.26*
Internalizing	-.11	-.08
Condition	.14	.08
RT Target Difference	-.33	-.81*
RT Prime Difference	.49	.36
RT Target Diff*Condition	-.45	-.85*
RT Prime Diff*Condition	.32	.29
R^2	.175	.257**

*p<.05, **p<.01

Figure 1. Regression Slopes Showing Prediction of Noise Duration by RT Target Difference after Presentation of Alcohol and Non-Alcohol Images.