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Exploring the alcohol-behaviour link: Myopic self-enhancement in the absence of alcohol consumption as a function of past alcohol use



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ABSTRACT

Dual process accounts of the alcohol-behaviour link hypothesise that differences in drinking patterns will moderate the effects of exposure to alcohol-related cues on behaviour, such as when a placebo is administered. We test this hypothesis by adapting a paradigm used in alcohol myopia research to examine the effects of alcohol-related priming on self-enhancement behaviour amongst social drinkers. Participants were asked to engage in a computerised self-rating task prior to being exposed to alcohol related and/or motivational primes. A staged computer error then occurred, and participants were then asked to complete their self ratings again – this method allowed for an immediate assessment of the impact of alcohol and motivational primes on self enhancement. As predicted by alcohol myopia theory, the overall effect of priming with alcohol-related cues was not significant irrespective of response-conflict manipulations. However, drinker type moderated this effect such that heavier drinkers self-enhanced more after exposure to alcohol-related cues, but only in high-conflict conditions. This suggests that the efficacy of a placebo may be significantly moderated by individual differences in reactions to alcohol-related stimuli, and that dual process accounts of the effects of alcohol on behaviour better explains this variation than alcohol myopia theory.

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Alcohol is necessary for a man so that he can have a good opinion of himself, undisturbed by the facts.

[Finley Peter Dunne, Humorist and Writer, 1867–1936]

An association between alcohol consumption and behavioural change is perhaps self-evident. Not only do we intuitively know that the consumption of alcohol leads to changes in individuals' behaviour, but there is a significant body of evidence which supports this assumption. For example, administration of alcohol in laboratory settings has been shown to increase helping behaviour (Steele, Critchlow, and Liu, 1985), decrease cooperation amongst groups (Hopthrow, Abrams, Frings, and Hulbert, 2007) and is associated with increased aggression (e.g. Bushman and Cooper, 1990). However, a particular difficulty in this field of research is that these associations are neither universal, nor consistent within individuals over time. This variability in responses to alcohol, both within and between individuals, was perhaps most vividly illustrated by MacAndrew and Edgerton (1969) in their seminal anthropological work. Throughout their text, the authors systematically

presented evidence which at once confirmed and refuted a range of different drunken stereotypes – illustrating that hardly any truisms about alcohol are true all of the time. It is therefore vital that theories attempting to explain the effects of alcohol on behaviour must be able to account for this variability.

Alcohol myopia theory (Steele and Josephs, 1990) has tried to explain the alcohol-behaviour link by positing that alcohol diminishes our capacity to process information, so our attention is drawn to only the most salient behavioural cues. Myopia theory also states that behavioural change is not inevitable under conditions of alcohol consumption and is only hypothesised to occur when impelling and inhibiting behavioural cues are near-equally salient – in the language of myopia theory, when *response conflict* is high. Response conflict occurs in circumstances where individuals are faced with more or less competing behavioural response options. Myopia theory posits that it is only when there are strongly competing alternatives (i.e. high response conflict) that alcohol consumption affects behaviour. In such situations, one's limited cognitive capacity (the psychopharmacological effect of alcohol consumption) will be diverted to only one set of cues leading to extreme responses which are not moderated by other information (e.g. Steele and Southwick, 1985). The counter-intuitive prediction of myopia theory is, therefore, that when response conflict is high an individual should behave the same as, or even more prudently than, they would when sober (e.g. MacDonald, Fong, Zanna, and Martineau, 2000).

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In an attempt to provide a reconceptualisation of the alcohol–behaviour link, we (Moss and Albery, 2009, 2010) have argued that the evidence for myopia theory is persuasive to the extent that, under conditions of high response conflict, individuals have been shown to respond in a myopic fashion (see Steele and Southwick (1985), for a meta-analytic review). However, one weakness in the myopia literature is that individual expectations are not taken in to account when considering behavioural changes. Research in the alcohol expectancy literature has demonstrated that the expected effects of alcohol predict behavioural change when participants are led to believe that they have been or are currently consuming alcohol. For example, the alcohol-aggression link has been shown to be moderated by expectations that aggression will occur after drinking (Quigley and Leonard, 2006). Furthermore, the use of subliminal priming techniques has shown that expectancy effects persist when individuals are not aware that alcohol-related thoughts are active in memory (Friedman, McCarthy, Förster, and Denzler, 2005). We posit that, unlike myopia effects which are limited to conditions of actual consumption of alcohol, expectancies operate both before and after the consumption of alcohol begins (labelled the Pre-consumption and Consumption phases of drinking). Therefore, whilst myopia researchers have traditionally predicted (and indeed found) no behavioural changes under control and placebo conditions, expectancy theory makes no such prediction. On the contrary, expectancy research typically demonstrates that behaviour changes as a function of beliefs about alcohol consumption, irrespective of whether it has actually been consumed.

Given the evidence that expectancies can affect complex social behaviours, we argue that it is possible that many of the effects observed in the myopia literature may be in part driven by the activation of expectancies, rather than being wholly dependent on the effects of alcohol consumption. We argue that expectancies moderate the effects of exposure to alcohol-related cues (including but not limited to actual drinking) on behaviour and decision making. In other words, the implication of expectancy research is that alcohol-related behavioural change is not merely the result of impairments in cognitive processing as posited by myopia theory. As we (Moss and Albery, 2009) have argued, the utility of expectancy theory is that it allows for an extension of alcohol myopia theory to include behavioural change under conditions of exposure to alcohol-related stimuli irrespective of actual alcohol consumption (e.g. cues in a bar environment, or thoughts about consuming alcohol). For example, Monk and Heim (2013) demonstrated that alcohol expectancies change when measured in alcohol-related vs. non-alcohol-related contexts, suggesting that alcohol-related behavioural change is indeed not dependent upon actual consumption. However, whilst expectancy theory is useful in this regard, it is not well suited to explaining the strong effects of response conflict, accounted for by myopia theory. Rather, expectancy research typically asserts that the activation of alcohol-related expectancies will predict behavioural change, and response conflict in paradigms testing the theory is not accounted for, or directly manipulated.

We suggest here that the effects of exposure to alcohol related cues and the consumption of alcohol will be moderated by expectancies about the effects of alcohol, but only under conditions of high response conflict. As demonstrated by the myopia literature, high response conflict is necessary for behavioural change to be observed, as the absence of such conflict will, by definition, mean that there are no salient competing response options apparent to the individual. However, contrary to the suggestions of myopia theory, behavioural change in our model is not limited to conditions of actual alcohol consumption. To test these predictions, we replicated a study from the alcohol myopia literature (Banaji and Steele, 1989) which had previously shown behavioural change only under conditions of alcohol consumption (and not in a placebo condition) and high response conflict, to examine whether the activation of alcohol-related representations could lead to the same kind of behavioural change when no alcohol had been administered. That is, we predicted that seemingly myopic responding could occur under conditions of sobriety.

1. The current study

In myopia research, it is common to use placebo groups to control for the belief that alcohol is being or has been consumed. However, based on expectancy models of alcohol-related behaviour change, this kind of experimental control would be inadequate to control for individual differences in the expected effects of consuming alcohol. In other words, placebo groups in the alcohol myopia literature are not homogeneous. Given the evidence from the expectancy literature that alcohol-related representations in memory differ widely between individuals (Rather and Goldman, 1994), it must be assumed that a placebo would affect participants in different ways based on the expectancies which they hold in relation to alcohol consumption. Specifically, heavier drinkers tend to hold more strongly active alcohol-related representations in memory (Christiansen, Goldman, & Inn, 1982) and show greater reactivity to alcohol-related cues (e.g. Rather and Goldman, 1994; Sharma, Albery, & Cook, 2001).

Following this reasoning we argue that placebos in alcohol research serve to activate alcohol-related representations, including expectancies, in memory. We also posit that the nature of the expectancies activated, and the degree to which they affect behaviour, will vary as a function of past drinking. In order to test our primary hypothesis that individual differences in drinking behaviour will moderate the effects of expectancies on behaviour, we sought to directly activate alcohol-related expectancy representations using a supraliminal priming strategy. If placebo effects are caused by the activation of expectancies, then the direct activation of such mental representations should be capable of producing a 'placebo-like' response. To achieve this we adapted one of the classic tests of alcohol myopia by Banaji and Steele (1989) which demonstrated that alcohol consumption led to self-enhancement under high response conflict. Our model suggests that similar response patterns should be shown under high response conflict conditions, in the absence of actual alcohol consumption, when participants are exposed to drinking-related cues. This effect would be stronger for heavier social drinkers because of their increased reactivity to drinking-related cues compared to lighter social drinkers.

In their original study Banaji and Steele (1989) asked participants to rate a number of trait dimensions for personal importance, and to provide both ideal and actual self ratings. During a later alcohol administration session, participants were asked to provide actual self ratings again whilst being presented with their original ideal and actual self ratings. Response conflict was considered to be high when a participant had identified a trait as being important and where there was a large self-reported discrepancy between their actual and ideal self ratings. As such, participants were faced with competing goals to (a) provide accurate and truthful responses given their previous ratings; and (b) to reduce the ideal-actual self-discrepancy for a trait they had identified as important. Low response conflict traits were those which were unimportant and had a low self-reported actual-ideal discrepancy.

Amongst those participants who were given alcohol, significant increases in actual self ratings were shown for those traits where there was a high level of response conflict (i.e. where the traits were rated as being important, and a high ideal-actual discrepancy was evident). Such self enhancement effects were not found for low conflict traits, or at all amongst the placebo and control groups. Moreover, as is the case in most myopia research, no direct analysis was conducted on the basis of drinker type differences, meaning that whilst a placebo per se did not affect responding, it is not possible to conclude from their findings that this was the case for all participants in that condition. This is a fundamental omission given the findings from the expectancy literature that exposure to alcohol-related information differentially affects different types of drinker, and the claims made in our model which suggest that such expectancy differences should be evident under conditions of high response conflict even if no alcohol has been consumed. To address this issue, in the present study we sought to partially replicate

Banaji & Steele's (1989) paradigm, to explore the effect of individual differences in drinking on responses under high and low conflict.

2. Method

2.1. Design

A mixed-factor design was used with prime condition (alcohol-related priming, motivational priming, both, neither) and drinker type score as between-participants factors and response conflict condition (low, high) as a within-participants factor. Motivational priming was included in this study as an additional control, to determine whether the novel procedure developed for this study was capable of generating self enhancement responses, independently of alcohol-related self enhancement. The dependent variables were mean self-enhancement scores for low- and high-conflict traits. All participants gave ratings for 40 traits regarding: (a) Their importance to the individual, (b) their ideal self-rating, (c) their actual self-rating prior to priming, and (d) their actual self-rating after priming. In between (c) and (d) participants were primed according to the relevant condition. Motivation and alcohol-related primes were counterbalanced for the group receiving both. Presentation of traits within each block and assignment to the four priming conditions was randomised.

2.2. Participants

Sixty undergraduate psychology students (45 females, 15 males; mean age = 24.23, SE = 0.80) participated in exchange for course credits. Although there were more females than males, the male-female ratio was equal across the priming conditions (range of 20–26% males in each condition). Non-drinking participants were excluded, but to avoid making participants aware of the alcohol-related nature of the study by directly asking about drinking patterns a general health questionnaire was administered, ostensibly for another researcher in the department. This asked ten questions about health-related behaviours (e.g. amount of exercise taken, diet, and alcohol consumption). Participants who reported that they did not drink alcohol were not required to continue. Potential problem drinkers were screened using the AUDIT questionnaire (Saunders, Aasland, Babor, de la Fuente, and Grant, 1993; $M = 7.2$, $SD = 5.2$), with scores of 21 or over suggesting potentially dependent drinking. No participants were excluded on this basis. All participants provided informed consent for participating in the study, and the research protocol was approved by the University Research Ethics Committee.

2.3. Measures

Drinker type was calculated using the first two questions of the AUDIT questionnaire, which assess quantity and frequency of drinking. For the purposes of comparing heavy and light drinkers, a median split of quantity-frequency scores was applied.

Self enhancement scores were used to assess the degree to which actual self ratings changed before and after the staged computer error. Scores were calculated using the ideal self-rating as a baseline for each individual trait, such that a positive self enhancement score represented a shift towards the ideal self ratings from the first to the second actual self ratings (i.e. more positive actual self ratings was given on the second occasion), and a negative score represented a move away from the ideal self ratings (i.e. more negative actual self ratings after the staged error).

2.4. Stimuli and apparatus

A pool of trait pairs was formed using a thesaurus to search for antonyms of 106 adjectives describing personal characteristics. Ten independent judges rated whether the first word in each pairing was a good example of the second using a 5-point Likert scale. Word pairs

which described a similar characteristic (e.g. *introvert* – *extrovert* and *quiet* – *outgoing*) were identified, and ratings for each were compared and the pair with the lowest rating was rejected. The forty traits pairs with the highest ratings were retained. The paradigm was constructed using the experiment generation software E-Prime v1.1 (Schneider, Eschman, and Zuccolotto, 2002).

In the scrambled sentence task participants were presented with five words and were asked to use four to form a sentence. Thirty scrambled sentences were created, with twenty containing a negative word (e.g. *wicked, liar*) next to a self-oriented word (I, me) to prime the motivation to self-enhance (e.g. “psychopath I evil a is”). Participants were not able to construct a grammatically correct sentence using the self-orientated word. The use of the self-orientated words was based on previous research suggesting that self-enhancement is more pronounced when individuals believe information to be personally relevant (see Geers, Handley, and McLarney, 2003). The AUDIT was administered to all participants either at the end of the experiment, or during the appropriate priming phase to prime alcohol-related representations. Importantly, the AUDIT asks questions about behaviours and consequences that would require a participant to reflect back on past drinking. Alternative priming methods were considered, such as placing bottles of alcohol in the vicinity of the participants. This and similar methods were rejected on the basis that there could be no reliable and objective assessment of whether participants had attended to the prime, and/or that they would make the aims of the study obvious to participants. The use of questionnaires as a priming tool allowed us to maintain the deception that these questionnaires were entirely unrelated to the main study.

2.5. Supraliminal priming technique

The supraliminal priming technique used involved presenting participants being presented with a scrambled sentence task, the AUDIT questionnaire, both, or neither. These were presented to participants as a seemingly unrelated task which was given to them whilst the experimenter attempted to repair a staged error which occurred during the experiment (see below). To check that participants had not associated the priming task with the main experiment, a funnelled debriefing protocol was adopted (see Bargh and Chartrand, 2000).

In an initial pilot study to assess the utility of primes, we developed and administered two scrambled sentence tasks to two groups of five participants. Each group was told that the task was designed to assess literacy skills. Of the five who received the sentences containing self-related words, none reported any suspicion that they had been misled. However, amongst the five given the task containing drinking-related words, three out of the five reported a suspicion that those sentences were somehow important to the purpose of the task. On this basis, the use of a drinking-related scrambled sentence task was rejected as participants in the main study might become consciously aware of the purpose of the priming task for alcohol. To maintain the impression that the primes being administered during the task were totally unrelated to the primary task, we opted to use the AUDIT task as it was felt that this would serve to prime alcohol-related representations in memory, but could also be administered in such a way that it would appear to be a credible separate task.

2.6. Procedure

After completing the general health questionnaire, participants were asked to complete a computerised task about self-image. The first block of this task required participants to give importance ratings for forty trait dimensions, on a scale from “extremely unimportant” to “extremely important”. Ratings for each dimension were given using a series of semantic differential scales on a computer screen. A response bar slider which could be positioned on each of the semantic differential scales was used by participants to indicate their rating for each dimension,

and was set by default to the centre of each scale. Participants then rated their ideal self for each trait dimension on the semantic differential scales by moving the response slider to the required position on screen. Participants then completed actual self ratings in the same way. Ideal self ratings were displayed alongside each actual self-scale to remind participants of their earlier responses, and to increase the salience of discrepancies. After this block, a staged error message was displayed on-screen stating that a “fatal memory error” had occurred and that the last forty responses had not been saved.

At this point the experimenter asked the participant to move to an adjacent desk, out of view of the computer screen, whilst they attempted to repair the problem. A fake telephone call was made describing the problem and asking for advice. Participants in the priming conditions were then given the appropriate questionnaires (scrambled words questionnaire and/or the AUDIT), ostensibly for another experimenter in the department, with the explanation that this would occupy them whilst the experimenter repaired the computer. Participants had been previously informed at the start of the study that they would be asked to complete one or two short questionnaires for another experimenter at the end of this study, though the nature of them was not discussed. This was to minimise any suspicions aroused by the questionnaires being introduced after the error appeared, as they were known about from the start of the study. Participants receiving no primes were simply asked to wait for 3 min whilst the repairs were made. Once the questionnaires were complete, participants were informed that the actual self-responses had been lost, so they would need to give these ratings again.

Upon completing the study, participants who had not completed the AUDIT were asked to do so. A funnelled debriefing protocol was then followed and participants were asked to report whether they thought that “the aims of the study were different from those stated at the outset”. Participants who thought that they had been misled were asked to elaborate on their suspicions. A small proportion (<10%) stated that they thought that there had been some deception in the study (e.g. the computer error seemed “suspicious”). On further questioning, it was found that these suspicions were non-specific, and no participants mentioned that they suspected the questionnaires to have been involved in the deception. Once the experimenter revealed that the questionnaires were part of the study manipulation, no participants reported that they had guessed that this might have been the case. No participants were excluded from the study on the grounds that none were aware of any relationship between the experimental variables.

3. Results

3.1. Data preparation

Responses were coded as the x-axis co-ordinate where participants positioned the response bar slider. The response range was 128–512 pixels. The response bar centrally occupied 60% of the screen width which was 640 pixels in total. Self-enhancement scores are reported in millimetres for ease of interpretation.

Most and least important traits (the upper and lower quartiles for trait importance ratings) were identified for each participant, following Banaji and Steele (1989). For each, the pre-priming discrepancy score was then calculated as follows¹:

$$|\text{Actual 1} - \text{Ideal}|$$

For the most important traits, those with the highest pre-priming discrepancy scores were retained, producing the high response conflict trait category (i.e. high importance, high discrepancy). For the least important traits, those with the lowest discrepancy scores were retained, producing the low response conflict trait category (i.e. low importance, low discrepancy). Self inflation scores were calculated by subtracting the post-priming discrepancy from the pre-priming discrepancy scores, as follows:

$$|\text{Actual 1} - \text{Ideal}| - |\text{Actual 2} - \text{Ideal}|$$

One participant's data was lost owing to a (genuine!) technical error. Prior to analysis, the data were screened for normality using the Kolmogorov-Smirnov test. Results were satisfactory for both the low- [$D(59) = 0.07, p > 0.05, n.s.$] and high-conflict [$D(59) = 0.08, p > 0.05, n.s.$] self-enhancement scores, showing that neither were significantly non-normal.

3.2. Drinking patterns data

To quantify drinker type, a quantity-frequency score was calculated by summing the first two questions of the AUDIT questionnaire (“How often do you have a drink containing alcohol?” and “How many drinks containing alcohol do you have on a typical day when you are drinking?”), using the AUDIT coding scheme. A one-way ANOVA on quantity-frequency score revealed no significant differences across priming conditions, $F(3, 59) = 1.18, p > 0.05$. Moreover, post hoc Bonferroni comparisons revealed no significant differences in quantity-frequency scores between any of the priming conditions ($ps > 0.3$). The sample comprised of non-problem social drinkers (AUDIT scores < 21; $M = 7.58, SD = 6.10$) who reported drinking on average 2–4 times a month and, on those occasions, consumed between 3 and 4 drinks.

3.3. Effects of priming on self-enhancement

To test the hypotheses that: (a) Motivation priming would lead to self-enhancement in both low- and high-conflict conditions, and (b) that alcohol-related priming would not lead to self-enhancement in either of the conflict conditions a 2×2 multivariate analysis of variance (MANOVA) was conducted on the self-enhancement scores for the low- and high-conflict conditions with motivation prime (administered or not) and alcohol-related prime (administered or not) as between-participants factors. With the use of Pillai's criterion, the combined DVs were significantly affected by motivation priming, $F(2, 54) = 5.35, p < 0.01, \eta_p^2 = 0.17$, demonstrating that motivational priming significantly increased self-enhancement scores with the combined DVs. Univariate analyses of variance (ANOVA) of the low- and high-conflict self-enhancement scores showed that motivation priming increased self-enhancement in both low- [$F(1, 55) = 4.04, p < 0.05, \eta_p^2 = 0.07$] and high-conflict [$F(1, 55) = 5.34, p < 0.05, \eta_p^2 = 0.09$] conditions. There was no significant effect of alcohol-related priming on self-enhancement for the combined DVs, $F(2, 54) = 0.18, p > 0.05, \eta_p^2 = 0.006$, and this was true for both the low- and high-conflict conditions ($Fs < 0.30, ps > 0.05$) confirming the hypothesis derived from myopia theory that exposure to alcohol-related cues would not create myopic

Table 1
Self-enhancement scores (millimetres) across priming conditions.

Prime type	N	Total		High conflict		Low conflict	
		Mean	(SD)	Mean	(SD)	Mean	(SD)
Motivation and alcohol-related	14	8.64	(14.51)	9.09	(18.83)	8.20	(10.19)
Motivation	15	8.89	(9.21)	9.94	(8.40)	7.85	(10.03)
Alcohol-related	15	3.42	(8.18)	4.69	(7.41)	2.15	(8.95)
No priming	15	2.36	(7.83)	0.62	(7.42)	4.10	(8.25)

¹ Modulus, or absolute values (indicated by the vertical lines in the formulae), were used in order to account for instances where individuals may report wanting to be lower on a scale than they perceived themselves to actually be. For example, an individual rating themselves as more intelligent than their ideal intelligence would be given a negative score for discrepancy. Clearly, any move towards the ideal is not an example of “deflation”, but self-enhancement towards a notional ideal.

responding across the sample as a whole. Table 1 presents the self-enhancement scores across priming groups.

No significant interaction between motivation priming and alcohol-related priming was detected for the combined DVs, $F(2, 54) = 0.40$, $p > 0.05$, $\eta_p^2 = 0.06$, which was again the case in both the low- and high-conflict conditions ($F_s < 0.70$, $p_s > 0.05$). This suggests that there was no additive effect of alcohol-related and motivation priming.

3.4. Moderation analysis

To test the hypothesis that drinker type (operationalised as participants' quantity-frequency scores, see Method section for details) would moderate the effects of alcohol-related priming on self-enhancement in low- and high-conflict conditions, a multivariate analysis of covariance (MANCOVA) was conducted on the high and low conflict self-enhancement scores. Specifically, to examine the independent effects of alcohol-related priming and drinker type on self-enhancement scores, these main effects were entered into the MANCOVA model first. Then, to examine the moderation effects of drinker type on alcohol-related priming for self-enhancement the two-way interaction term alcohol-related prime \times drinker type was then entered in to the model as a covariate (Baron and Kenny, 1986). Finally, to confirm whether motivation priming and alcohol-related priming produced any additive effects on self-enhancement the three-way interaction term, alcohol-related prime \times motivation prime \times drinker type, was entered into the model.

For this model, with the use of Pillai's criterion, alcohol-related priming had no significant effect on the combined DVs, $F(4, 106) = 2.20$, $p > 0.05$, $\eta_p^2 = 0.08$. This was also the case in both low- and high-conflict conditions, replicating the previous MANOVA results ($F_s < 2.9$, $p_s > 0.05$). Also with the use of Pillai's criterion, drinker type did not significantly effect the combined DVs, $F(2, 52) = 1.71$, $p > 0.05$, $\eta_p^2 = 0.06$. Again, this result was consistent across both low- and high-conflict conditions ($F_s < 3.5$, $p_s > 0.05$). The interaction term, alcohol-related prime \times drinker type did not significantly adjust the combined DVs, $F(2, 52) = 2.2$, $p > 0.05$, $\eta_p^2 = 0.08$. However, univariate analyses of covariance (ANCOVA) of this interaction on the low- and high-conflict scores showed that, in the high-conflict condition, the interaction significantly adjusted self-enhancement scores, $F(1, 53) = 4.28$, $p < 0.05$, $\eta_p^2 = 0.08$. No significant interaction was identified in the low-conflict condition, $F(1, 53) = 0.01$, $p > 0.05$, $\eta_p^2 < 0.001$. Given the absence of the main effects of drinker type and alcohol-related priming, and a significant alcohol-related prime \times drinker type interaction, this confirms the hypothesis that the effect of alcohol-related priming on self-enhancement is moderated by drinker type, such that heavier drinkers self-enhanced more in the high-conflict condition.² This moderation effect in the high-conflict condition is illustrated in the left-most panels of Fig. 1 which show that the increase in self-enhancement scores were associated with the presence of alcohol-related priming as a function of drinker type.

Finally, the 3-way interaction for alcohol-related prime \times motivation prime \times drinker type significantly adjusted the combined DVs, $F(4, 106) = 3.71$, $p < 0.01$, $\eta_p^2 = 0.12$, suggesting that motivation priming and alcohol-related priming had interactive effects on self-enhancement when drinker type was included in the model. Univariate ANCOVAs revealed that this effect was significant in the high-conflict, $F(2, 53) = 4.67$, $p < 0.05$, $\eta_p^2 = 0.15$, and not the low-conflict condition, $F(2, 53) = 2.57$, $p > 0.05$, $\eta_p^2 = 0.09$. Fig. 1 illustrates the relationship between drinker type and high-conflict self-enhancement across the priming conditions. The nature of the 3-way interaction reported here

is clearly seen in the left hand panels, whereby a greater effect of priming as a function of drinker type was seen in the bottom left panel when both priming techniques were applied, in contrast to alcohol-related priming alone, illustrated in the top-left panel.

4. Discussion

In accordance with the predictions of alcohol myopia theory, when social drinkers were exposed to an alcohol-related prime, we found no myopic effect on their self-enhancement behaviour. Consistent with our hypothesis, the effect of alcohol-related priming on responding was significantly moderated by drinker type. That is, heavier drinkers demonstrated myopic responding, under conditions of high response conflict in the absence of any actual alcohol consumption. These results suggest that future work examining the impact of placebo and actual alcohol administration on human performance should explicitly consider the moderating effects of drinker type or drinker status for understanding the relationship between exposure to and consumption of alcohol.

Importantly, based on a direct manipulation of exposure to alcohol-related information, our study suggests a pattern of behavioural responses whilst not under the influence of alcohol, which resemble those previously only found under conditions of alcohol consumption (e.g. Banaji and Steele, 1989). Such effects when under conditions of alcohol administration have previously been accounted for according to the principles of alcohol myopia theory. Importantly, these findings suggest that myopic-type responding may not be entirely due to the impairing effects of alcohol per se, but in certain individuals, responses may also be tied to previously held expectations associated with encountered alcohol-related cues. As a relatively small pilot study, utilising a novel methodology, our findings would benefit from further testing to determine the strength of this effect. A further limitation of this study is the use of a student sample, with an age range suggestive of a relatively inexperienced group of drinkers. Further work exploring the current findings might take in to account drinking experience, which has a direct impact on alcohol expectancies (e.g. Rather and Goldman, 1994), as well as considering levels of exposure to alcohol-related cues, given evidence suggesting differences in attentional processing related to alcohol amongst individuals who work in alcohol-related environments (Albery, Sharma, Noyce, Frings, and Moss, 2015).

As highlighted in our dual process model (Moss and Albery, 2009), a complete account of the alcohol-behaviour link can be more meaningfully derived from an account based upon both the myopia and expectancy perspectives. On the one hand, the body of evidence supporting myopia theory is problematic for the expectancy perspective which says nothing about the psychophysiological impairments associated with actual alcohol consumption. On the other hand the evidence presented in this paper demonstrates that expectancies might play a role in the production of myopic-type responding under conditions where no alcohol has been consumed. If one considers drinking behaviour as a biphasic process, as suggested in our dual process model, then the findings from previous research and this present study are complementary and provide a more complete account of the psychological and pharmacological predictors of alcohol-related behaviour under conditions of alcohol consumption and non-alcohol consumption.

Whilst in our discussion of the implications of this work we have provided a preferred account of the relationship between exposure to relevant cues and behavioural responding, it remains the case that an important proportion of variance in behaviour remains unexplained by the measure of drinker type used here. We urge that in future studies exploring the effect we have identified, more sensitive measures of expectancy or "drinker-type" be developed. For example, developing measures which correspond directly to the dependent variable of interest is likely to result in a greater proportion of variance being accounted for (Fishbein and Ajzen, 1975). For instance, researchers interested in the effects of alcohol consumption on intentions to use condoms may perhaps consider assessing participants' attitudes towards condoms per

² In order to establish that this effect was not simply the result of individuals with higher AUDIT scores being primed with more negative information (i.e. responding affirmatively to more questions relating to negative consequences of drinking in the alcohol prime conditions), these analyses were conducted again with AUDIT, rather than drinker type scores, as the moderator variable. No significant main effects or interactions involving AUDIT scores were obtained, suggesting that higher AUDIT scores per se were not related to increased self-enhancement.

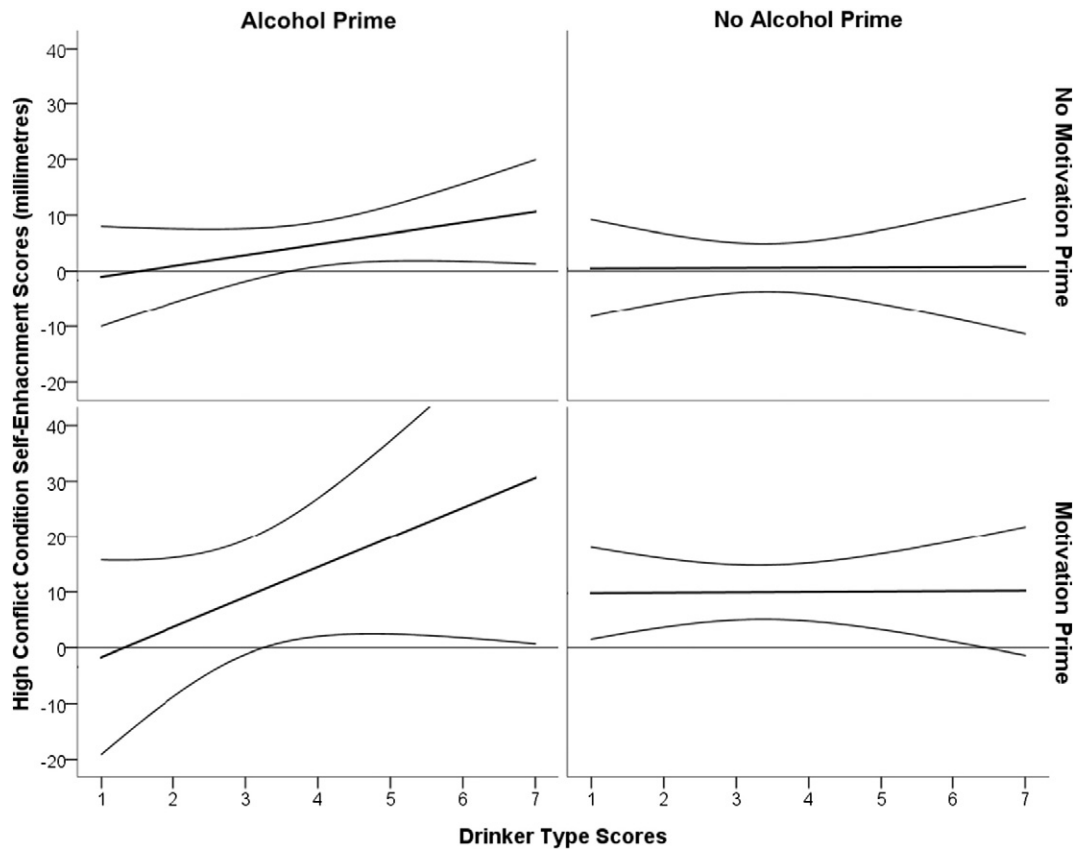


Fig. 1. Self-enhancement scores in the high-conflict condition as a function of drinker type across priming conditions (95% confidence limits shown).

se, and their beliefs about the effects that alcohol might have on sexual risk-taking, to identify whether this moderates the effects of a placebo. Further to this point, the choice of prime in studies such as this may be equally important in determining the responses of participants – the use of the AUDIT as a prime in this study clearly had an effect on participants' responses, but it remains to be seen whether other drinking-related primes (e.g. a bar or pub environment, or being exposed to others consuming alcohol) might elicit similar responses.

In addition, we have yet to show whether expectancies would moderate the effects of actual alcohol consumption on behaviour, another untested prediction generated by our model of the alcohol-behaviour link (Moss and Albery, 2009). That is, it is not evident whether, as our model predicts, the moderating effects of drinker type would continue to influence responding under conditions of actual alcohol consumption. Some evidence (e.g. Dermen and Cooper, 2000), based upon retrospective reports of response conflict, expectancies and drinking patterns lends convergent support to the hypothesis that expectancies and drinking patterns would moderate the effects of alcohol on behaviour, but as yet there have been no experimental studies to support this prediction. This question, of the effects of expectancies on behaviour over time as blood alcohol levels increase and decrease, reveals a further unexplored question concerning the magnitude of influence of expectancies. That is, do the effects of expectancies increase, decrease or remain the same during this time? In a discussion of this issue, two opposing viewpoints have emerged. Wiers and Stacey (2010) have suggested that expectancies are derived from the controlled processing system, which is known to be weakened under alcohol and is consistent with the idea that the effects of expectancies diminish as blood alcohol levels increase. On the other hand, we (Moss and Albery, 2010) have argued that the operation of expectancies is not necessarily dependent upon controlled processing. We argue for a more automatic operation of expectancies as blood alcohol increases because of the proportional weakening of controlled processes which might otherwise moderate

the effects of expectancies. To examine the relative validity of each perspective is important in terms of understanding the alcohol-behaviour link and the relative importance of factors such as blood alcohol concentration and expectancy operation both before and after drinking commences.

In summary, this study provides evidence that myopic-type behaviour can be activated amongst certain types of drinker by simply priming them with alcohol-related cues. This is of particular significance since previously such responding had only been evidenced under conditions of actual alcohol consumption. That such effects were found only amongst heavier drinkers supports the idea that alcohol-related representations in memory are more readily accessible, and/or more easily activated, amongst individuals who have more direct and frequent experience with alcohol.

References

- Albery, I. P., Sharma, D., Noyce, S., Frings, D., & Moss, A. C. (2015). Testing a frequency of exposure hypothesis in attentional bias for alcohol-related stimuli amongst social drinkers. *Addictive Behaviors Reports*, 1, 68–72.
- Banaji, M. R., & Steele, C. M. (1989). Alcohol and self-evaluation: Is a social cognition approach beneficial? *Social Cognition*, 7, 137–151.
- Bargh, J. A., & Chartrand, T. L. (2000). The mind in the middle: A practical guide to priming and automaticity research. In H. T., & C. M. (Eds.), *Handbook of research methods in social and personality psychology*. New York: Cambridge University Press.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.
- Bushman, B. J., & Cooper, H. M. (1990). Alcohol and human aggression: An integrative research review. *Psychological Bulletin*, 107, 341–354.
- Christiansen, B. A., Goldman, M. S., & Inn, A. (1982). Development of alcohol-related expectancies in adolescents: Separating pharmacological from social-learning influences. *Journal of Consulting and Clinical Psychology*, 50(3), 336–344.
- Dermen, K. H., & Cooper, M. L. (2000). Inhibition conflict and alcohol expectancy as moderators of alcohol's relationship to condom use. *Experimental and Clinical Psychopharmacology*, 8, 198–206.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.

- Friedman, R. S., McCarthy, D. M., Förster, J., & Denzler, M. (2005). Automatic effects of alcohol cues on sexual attraction. *Addiction, 100*, 672–681.
- Geers, A. L., Handley, I. M., & McLarney, A. (2003). Discerning the role of optimism in persuasion: The valence-enhancement hypothesis. *Journal of Personality and Social Psychology, 85*, 554–565.
- Hopthrow, T., Abrams, D., Frings, D., & Hulbert, L. (2007). Groupdrink: The effects of alcohol on intergroup competitiveness. *Psychology of Addictive Behaviors, 21*, 272–276.
- MacDonald, T. K., Fong, G. T., Zanna, M. P., & Martineau, A. M. (2000). Alcohol myopia and condom use: Can alcohol intoxication be associated with more prudent behaviour? *Journal of Personality and Social Psychology, 78*, 605–619.
- Monk, R. L., & Heim, D. (2013). Environmental context effects on alcohol-related outcome expectancies, efficacy, and norms: A field study. *Psychology of Addictive Behaviors, 27*, 814–818.
- Moss, A. C., & Albery, I. P. (2009). A dual-process model of the alcohol-behavior link for social drinking. *Psychological Bulletin, 135*(4), 516–530.
- Moss, A. C., & Albery, I. P. (2010). Are alcohol expectancies associations, propositions, or elephants? A reply to Wiers and Stacy (2010). *Psychological Bulletin, 136*(1), 17–20.
- Quigley, B. M., & Leonard, K. E. (2006). Alcohol expectancies and intoxicated aggression. *Aggression and Violent Behavior, 11*, 484–496.
- Rather, B. C., & Goldman, M. S. (1994). Drinking-related differences in the memory organisation of alcohol expectancies. *Experimental and Clinical Psychopharmacology, 2*, 167–183.
- Saunders, J. B., Aasland, O. G., Babor, T. F., de la Fuente, J. R., & Grant, M. (1993). Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption. *Addiction, 88*, 791–804.
- Schneider, W., Eschman, A., & Zuccolotto, A. (2002). *E-prime user's guide*. Pittsburgh: Psychology Software Tools.
- Sharma, D., Albery, I. P., & Cook, C. (2001). Selective attentional bias to alcohol related stimuli in problem drinkers and non?problem drinkers. *Addiction, 96*(2), 285–295.
- Steele, C. M., & Josephs, R. A. (1990). Alcohol myopia: Its prized and dangerous effects. *American Psychologist, 45*, 921–933.
- Steele, C. M., & Southwick, L. (1985). Alcohol and social behaviour I: The psychology of drunken excess. *Journal of Personality and Social Psychology, 48*, 18–34.
- Steele, C. M., Critchlow, B., & Liu, T. J. (1985). Alcohol and social behaviour II: The helpful drunkard. *Journal of Personality and Social Psychology, 48*, 35–46.
- Wiers, R. W., & Stacy, A. W. (2010). Are alcohol expectancies associations? Comment on Moss and Albery (2009). *Psychological Bulletin, 136*, 12–16.