The Moderating Effect of Stimulus Attractiveness on the Effect of Alcohol Consumption on Attractiveness Ratings

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Abstract — Aims: To explore the enhancing effect of alcohol consumption on attractiveness ratings, in that few studies on the Beer Goggles effect control the stimuli attractiveness level and researchers have seldom considered extending the effect to stimuli other than faces. Methods: Male and female participants (n = 103) were randomly assigned to alcohol consumption or placebo groups. Both groups were asked to assess the attractiveness of two types of pictures (faces and landscapes) with three levels of attractiveness for each stimulus category (high, moderate, and low). Results: We found significant interactions between beverage type and attractiveness level. Attractiveness ratings for moderate- and low-attractiveness faces were significantly higher in the alcohol compared with placebo condition, while there was no significant difference for high-attractiveness stimuli between these two conditions. As for landscapes, only low-attractiveness stimuli were rated significantly higher in the alcohol condition. Conclusion: Whether or not alcohol consumption leads to an increase in attractiveness ratings depends on the initial attractiveness of the stimulus materials. Alcohol consumption tends to affect ratings for stimuli with relatively low attractiveness. Furthermore, this effect is not limited to faces; it extends to other types of stimuli like landscapes.

INTRODUCTION

Harmful drinking impairs individuals’ ability to control their behaviour (Mulvihill et al., 1997). With the weakening of self-control, alcohol consumption can motivate sexual compulsivity, contributing to risky sexual behaviours (Cooper, 2002; Griffin et al., 2012) and even sexual assault (Norris and Griffin, 1999). Since individuals seek the company of those whose faces attract them (Huston, 1973; Gangestad and Buss, 1993), researchers have investigated the Beer Goggles effect, which describes the phenomenon whereby attractiveness ratings for faces increase after alcohol consumption.

Researchers have speculated that alcohol consumption can enhance ratings of facial attractiveness (Agocha and Cooper, 1999). Pennebaker et al. (1979) observed that alcohol consumers in a bar gave higher attractiveness ratings to individuals of the opposite sex at closing time. This result was not affected by the raters’ sex. This effect was also found in a correlation study on the relationship between blood alcohol concentration (BAC) and face ratings (Gladue and Delaney, 1990). Jones et al. (2003) conducted the first quasi-experiment to investigate whether the raters’ sex influences attractiveness ratings, and found that alcohol drinkers rated opposite-sex faces as more attractive than non-drinkers. However, the validity of the quasi-experiment is questionable due to a sampling bias, since all participants were recruited in a bar. Additionally, the use of participants’ self-report, rather than an experimental manipulation to measure level of alcohol intake, further weakened the validity of the study.

To overcome these drawbacks, Parker et al. (2008) conducted the first laboratory experiment to verify the effect more stringently. This experiment not only replicated the results of previous studies, indicating that alcohol consumption leads to an increase in attractiveness ratings, but also showed that the effect is not specific to opposite-sex faces. Furthermore, some researchers adopted a breath test to measure participants’ BAC as a measure of alcohol consumption before they made attractiveness ratings. Results showed that both moderately (BAC = 0.01–0.09%), and highly intoxicated participants (BAC = 0.10–0.19%) gave significantly higher attractiveness ratings than non-intoxicated controls (Lyvers et al., 2011).

Since many studies have verified the Beer Goggles effect using several methods and paradigms, the enhancing effect of alcohol consumption on face attractiveness ratings appears to be stable. Therefore, it is surprising that Neave et al. (2008) did not replicate the Beer Goggles effect. They speculated that their failure to replicate the results might have been due to stimulus selection, since they used only faces that received ‘average’ ratings during material preparation. Selecting very similar stimuli in terms of attractiveness may obscure the effect of alcohol consumption on attractiveness ratings. Furthermore, Halsey et al. (2010) found that alcohol drinkers performed worse in symmetry judgment than did placebo drinkers. The result indicated that alcohol consumption can reduce the accuracy in discerning symmetry for facial stimuli. Since symmetric faces are more attractive than asymmetric ones (Fink et al., 2006; Little et al., 2008), it is suggested that facial symmetry influences the Beer Goggles effect. The relationship between symmetry and attractiveness could potentially explain how the Beer Goggles effect may be influenced by stimulus attractiveness levels.

Additionally, it is unlikely that the enhancing effect of alcohol consumption on attractiveness ratings is limited to faces. Previous studies have confirmed that alcohol consumption influences various psychological processes, such as motion control (Houa et al., 2010), and risky decision-making (Goudriaan et al., 2011; van Ravenzwaaij et al., 2012). It is possible that alcohol consumption also enhances attractiveness ratings for other categories. Attwood et al. (2012) used both facial and landscape pictures to test the Beer Goggles effect,
finding a similar enhancing effect of alcohol consumption for both types of stimuli. However, the study used insufficient landscape stimuli, weakening its external validity; thus the enhancing effect could not be extend to other stimuli. Therefore, more studies are required to systematically investigate whether the Beer Goggles effect is a general phenomenon or is specific to certain stimuli, especially in relation to aesthetics.

Since Neave et al. (2008) construed that not having considered attractiveness levels may have resulted in their inability to verify the Beer Goggles effect, we therefore explored this further by manipulating stimulus attractiveness levels (high, moderate and low). Halsey et al. (2012) found alcohol consumption had a weaker influence on the preference for symmetric, rather than asymmetric faces. The former were usually regarded as more attractive than the latter. Thus, it is reasonable to hypothesize that alcohol consumption does not affect attractiveness ratings for highly attractive stimuli. Furthermore, we manipulated the stimulus category (face or landscape) to clarify whether the enhancing effect is specific to faces. If alcohol consumption leads to higher attractiveness ratings for both facial and landscape stimuli, we can conclude that the Beer Goggles effect reflects a universal phenomenon.

**METHOD**

**Design and overview**

In this experiment, beverage type (alcohol, placebo) was a between-subjects variable, and attractiveness level (high, moderate, low) was a within-subjects variable. Two categories of stimuli (faces and landscapes) were presented in a random order.

**Participants**

A total of 103 (58 women, 45 men) heterosexual undergraduate students (age range: 18–24) with alcohol consumption experience were recruited. All participants were asked to abstain for many alcohol and psychiatric drugs for 24 h prior to the experiment. Participants signed a consent form indicating that they voluntarily participated in scientific research that possibly involved alcohol consumption.

**Materials**

The stimuli included two types of pictures of the same size (413 × 310 pixels), both faces and landscapes; pictures were presented in a random order.

**Face stimuli**

We selected male and female ID photos from the Internet where the subjects had a neutral expression, were sitting in similar poses and were not wearing jewellery or glasses. Age rating was conducted on the faces in the photos; those that were judged to be outside the age range of 25–35 were excluded. After collection, all face images were converted to full colour and edited in Photoshop to standardize the background. In a pilot study, 20 undergraduates rated the attractiveness of the standardized photos on a nine-point Likert scale that ranged from ‘very unattractive’ to ‘very attractive’. Photos with extreme attractiveness scores (1 and 9) were removed to avoid potential ceiling and floor effects. Ultimately, 109 face photographs (50 male and 59 female) were divided into three attractiveness levels. There was no significant difference in attractiveness ratings between male and female faces (F\(_{1,108}\) = 1.71, \(P = 0.194\)). There were 15 low-attractiveness (\(M = 3.81, \ SD = 0.26\)), 20 moderate-attractiveness (\(M = 5.01, \ SD = 0.24\)), and 15 high-attractiveness (\(M = 6.12, \ SD = 0.30\)) male faces, and 19 low-attractiveness (\(M = 3.98, \ SD = 0.26\)), 24 moderate-attractiveness (\(M = 5.04, \ SD = 0.29\)), and 16 high-attractiveness (\(M = 6.13, \ SD = 0.29\)) female faces. Attractiveness ratings differed significantly between the three levels (F\(_{2,108}\) = 535.74, \(P < 0.001\)).

**Landscape stimuli**

All materials were collected from public resources on the Internet, International Affective Picture System (Lang et al., 2005) and Chinese Affective Picture System (Lu et al., 2005). The images contained simple, natural and social landscapes without animals or figures. The landscape stimuli were standardized in the same manner as the face stimuli. A pilot study on attractiveness ratings was conducted to select 20 low-attractiveness (\(M = 4.37, \ SD = 0.05\)), 20 moderate-attractiveness (\(M = 5.02, \ SD = 0.27\)) and 20 high-attractiveness (\(M = 6.13, \ SD = 0.29\)) landscape images. Attractiveness ratings differed significantly between the three levels (F\(_{2,59}\) = 463.61, \(P < 0.001\)).

The following questionnaires were used in this experiment: the Alcohol Use Disorders Identification Test (AUDIT) (Bohn et al., 1995), the Spielberger State–Trait Anxiety Inventory (STAI) (Spielberger et al., 1983) and the visual analogue scales (VAS) (de Boer et al., 2004). The ten AUDIT items assess the amount and frequency of alcohol consumption, alcohol addiction, and serious consequences of alcohol consumption. The STAI includes two 20-item subscales (state and trait). We use STAI-S to test whether anxiety levels fluctuate before and after alcohol consumption (Steele and Josephs, 1988), and STAI-T is adopted to match the levels of trait anxiety between alcohol and placebo groups. In the VAS, participants rate their agreement to items such as happy, drowsy, anxious, irritable and drunk on a 100-mm continuous scale ranging from ‘not at all’ to ‘extremely’.

**Procedures**

Upon participants’ arrival at the lab, they were weighed and asked (via oral self-report) whether they had complied with the request to abstain from alcohol for 24 h. Participants who met the requirements were instructed to complete a set of questionnaires, including the AUDIT, STAI (STAI-T & STAI-S) and VAS. These self-report measures of personality, mood and craving were used as a baseline.

Participants were then randomly assigned to a group that either consumed a 300 ml alcohol mix or a placebo drink of equal total volume. The mix had an alcohol content proportional to 0.5 g/kg of the participant’s weight, consisting of vodka at 40% alcohol and a branded vitamin beverage, ‘Mizone’. The placebo drink contained only the vitamin beverage of the same brand and flavour. To eliminate the difference in taste, if any, both alcohol and placebo drinks were kept chilled in advance. Participants were asked to consume the drink that possibly contained alcohol within 15 min, at a constant speed.
After drinking, participants received a brief explanation of the task, wherein they were asked to provide self-paced attractiveness ratings for facial and landscape stimuli along a nine-point Likert scale that ranged from ‘very unattractive’ to ‘very attractive’. The rating task took nearly 20 min to complete. Thus, in controlling for time, it was confirmed that the entire process of attractiveness rating occurred under the effect of alcohol (Widmark, 1981). Stimuli were presented in a random order on a computer screen; participants responded by pressing numeric keys. Stimulus presentation was controlled by E-Prime v. 1.1.

After completing the attractiveness ratings, participants completed the post-test STAI-S and VAS to assess whether they experienced a significant mood fluctuation. Participants were then paid and thanked for their participation.

**Statistical analysis**

First, data from the subjective mood questionnaire were analysed in relation to a 2 × 2 repeated measures ANOVA, with drink type (alcohol, placebo) as a between-subjects variable and time (pre-drink, post-drink) as a within-subjects variable. Second, mean attractiveness ratings for the two stimulus categories (faces, landscapes) were calculated separately. Using repeated measures, we then conducted 2 × 3 mixed model ANOVAs on each stimulus category, with drink type (alcohol, placebo) as a between-subjects factor and stimulus attractiveness level (high, moderate, low) as a within-subjects factor.

**RESULTS**

**Participants**

The mean age of the 103 participants was 21 years (SD = 2.16, range 18–24). The mean AUDIT score was 4.74 (SD = 3.44), indicating that all participants consumed alcohol socially, but were not addicted. The mean STAI-T score was 39.25 (SD = 7.30, range 24–65), indicating that participants’ trait anxiety was normal according to the Chinese test report. No significant difference in age, drink consumption and trait anxiety was found between alcohol and placebo groups.

**Questionnaire measures**

A series of 2 (drink type: alcohol, placebo) × 2 (time: pre-drink, post-drink) repeated measures ANOVAs were conducted on the VAS and STAI-S data. The analysis of VAS data revealed a significant drink type × time interaction ($F_{(1,101)} = 47.33, P < 0.001, \eta^2 = 0.319$) for post-drink ratings. The simple effect tests revealed a significant increase in post-drink ratings in the alcohol condition ($P < 0.05$), but no significant change in the placebo condition, indicating a successful manipulation of alcohol consumption. Consistent with previous studies (Wright and Terry, 2002), we found an interaction between drink type and time for ‘irritable’ ratings ($F_{(1,101)} = 10.63, P < 0.01, \eta^2 = 0.095$). In relation to the placebo group, participants in the alcohol condition scored significantly higher on irritation level ($P < 0.05$). However, for other mood ratings (happy, anxious or drowsy), there were no significant main or interaction effects. Similarly, no significant main effects or interactions were found in the STAI-S data.

**Attractiveness rating task**

We conducted a 2 × 3 mixed model-repeated measures ANOVA to separately examine the attractiveness rating data for the three categories of stimuli. Drink type (alcohol, placebo) was a between-subjects variable and stimulus attractiveness (high, moderate, low) was a within-subjects variable.

**Faces**

There was a significant difference in ratings between stimuli of different attractiveness levels ($F_{(2, 202)} = 704.88, P < 0.001, \eta^2 = 0.875$). This confirms that the manipulation of stimulus attractiveness level was successful. The main effect of drink type was significant ($F_{(1, 101)} = 5.99, P = 0.016, \eta^2 = 0.056$), indicating that alcohol drinkers ($M = 5.13, SD = 1.23$) gave higher overall attractiveness scores than participants who consumed the placebo ($M = 4.81, SD = 1.47$). In addition, we found a significant interaction between drink type and stimulus attractiveness, ($F_{(1, 101)} = 5.58, P = 0.018, \eta^2 = 0.051$) (see Fig. 1). The simple effect analyses showed that attractiveness ratings were significantly higher in the alcohol condition than the placebo condition, for both low-attractiveness and moderate-attractiveness face. Specifically, for the low-attractiveness faces, alcohol drinkers rated significantly higher on facial attractiveness ($M = 3.90, SD = 0.77$) than placebo drinkers ($M = 3.32, SD = 0.97$), $P = 0.001$. Similarly, for the moderate-attractiveness faces, a significantly higher rating in the alcohol ($M = 5.13, SD = 0.65$) rather than the placebo group was obtained ($M = 4.85, SD = 0.76$), $P = 0.044$. However, for the high-attractiveness faces, there was no difference in attractiveness ratings between alcohol ($M = 6.36, SD = 0.69$) and placebo conditions ($M = 6.26, SD = 0.83$). These results demonstrate that the enhancing effect of alcohol consumption on attractiveness ratings only occurs for low- and moderate-attractiveness faces.

**Landscapes**

Similar to faces, main effect of attractiveness level for landscapes yielded a significant difference in ratings between...
stimuli of different attractiveness levels ($F_{(2, 203)} = 545.46, P < 0.001, \eta^2_p = 0.844$). There was also a significant interaction between drink type and attractiveness level ($F_{(1,101)} = 6.196, P = 0.008, \eta^2_p = 0.058$) (see Fig. 2). The simple effects analysis revealed that alcohol drinkers gave higher ratings for low-attractiveness landscapes ($M = 3.92, SD = 1.08$) than did placebo drinkers ($M = 3.51, SD = 0.97$), ($F_{(1, 101)} = 4.12, P = 0.045, \eta^2_p = 0.039$). In contrast, there were no differences in attractiveness ratings between alcohol and placebo conditions for moderate- and high-attractiveness landscapes. Thus, an enhancing effect of alcohol consumption on only attractiveness ratings for low-attractiveness landscapes was found.

**DISCUSSION**

To our knowledge, the present paper is the first to consider the attractiveness levels of stimulus materials in the investigation of the Beer Goggles effect and systematically attempt to extend the effect into other types of stimuli.

The results replicated the Beer Goggles effect. Consistent with previous studies (Jones et al., 2003; Parker et al., 2008; Attwood et al., 2012), a main effect of drink type on attractiveness ratings was obtained. We found that attractiveness ratings for faces were significantly higher in the alcohol than in the placebo condition, implying that alcohol consumption can indeed increase attractiveness ratings for faces. The STAI-S and VAS analyses showed that alcohol consumption had no influence on self-reported ratings of happiness, anxiety or drowsiness. It thus rules out the possibility that the increase in attractiveness ratings was due to general emotional fluctuations.

More importantly, the results also suggest that the enhancing the effect of alcohol consumption on ratings of attractiveness can be moderated by the attractiveness of the stimuli. Specifically, alcohol consumption only led to higher attractiveness ratings for low- and moderate-attractiveness stimuli. It is well known that symmetry is an important characteristic of attractive faces (Little et al., 2008). Souto et al. (2008) found that alcohol consumption decreased participants’ ability to distinguish between symmetric and asymmetric figures. Thus, it is possible that alcohol drinkers perceived the asymmetric faces as symmetric, leading to higher attractiveness ratings. Therefore, we support that alcohol consumption indirectly enhanced ratings of facial attractiveness by weakening the drinkers’ visual perception.

However, alcohol consumption did not influence attractiveness ratings for high-attractiveness faces. This is consistent with Halsey’s study (2012) in which alcohol consumption did not affect preference for symmetric faces. Ceiling effects can be ruled out, because we discarded stimuli with extremely high ratings in the pilot study. These results may be explained as a by-product of an automatic processing mechanism wherein attractive traits, such as symmetry, may induce strong responses from information processing systems during the cognitive process of making attractiveness ratings (Rhodes, 2006). This automatic response would not be affected by alcohol consumption, resulting in the failure to find the Beer Goggles effect for high-attractiveness stimuli.

Moreover, the moderating effect of attractiveness ratings in the Beer Goggles effect can also extend to landscape stimuli. Since the by-product explanation attributes preferences to general information processing mechanisms (Rhodes, 2006), the Beer Goggles effect should not be limited for faces. We found that alcohol consumption could also lead to higher attractiveness ratings for landscapes. Similar to the results for faces, the enhancing effect of alcohol consumption was moderated by attractiveness levels of landscape stimuli. We found increased attractiveness ratings for low-attractiveness landscapes, but for landscapes with moderate- and high-attractiveness, the enhancing effect did not occur. Recent neuroaesthetic studies using landscape images found that the visual experience of ugliness was correlated with activity in the amygdala (Ishizu and Zeki, 2011). It was confirmed that alcohol consumption could decrease the activation of amygdala (Sripada et al., 2011). Hence, it could be suggested that alcohol drinkers became insensitive to low-attractiveness stimuli, and experienced less discomfort. Therefore post-drink inhibition of amygdala activity can explain the singular enhancing effect for only the least attractive stimuli.

The present findings contribute to theoretical development as well as practice. It provides an explanation for the positive alcohol expectancy as a strong predictor of alcohol consumption (Lee et al., 1999; Palfai and Wood 2001; Wardell et al., 2012). The enhancing effect of alcohol consumption on attractiveness can bring the positive experiences for low-attractiveness individuals, which motivate them to drink alcohol. Moreover, the findings help explain socializing patterns. People tend to date and seek the companionship of attractive individuals. One could therefore infer from the present findings that less attractive people would spend longer durations in a bar to increase their odds of being regarded as more attractive and thus, of finding companionship. On the other hand, the effect can also promote the occurrence of sexual assault after drinking. On account of the enhancing effect on attractiveness, if sexual compulsivity cannot be contained by the weakened self-control, horrific sexual crimes could result.

In conclusion, the present research confirmed the Beer Goggles effect in a laboratory environment. Additionally, we found that the effect was moderated by the attractiveness level of stimulus materials. Alcohol consumption only led to an increase in attractiveness ratings for low- and moderate-attractiveness but not high-attractiveness faces. Furthermore, we demonstrated that the moderation effect can extend to landscape stimuli. Alcohol consumption led to higher attractiveness ratings only for
landscapes with low attractiveness. These results advance the research framework for studying and understanding the Beer Goggles effect.

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