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An explanation for enhanced perceptions of attractiveness after alcohol consumption

L.G. Halsey[a,*], J.W. Huber[a], R.D.J. Bufton[a], A.C. Little[b]

[a]School of Human and Life Sciences, Roehampton University, London SW15 4JD, UK

[b]Department of Psychology, University of Stirling, Stirling FK9 4LA, UK

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Abstract

Acute alcohol consumption increases ratings of attractiveness to faces. This may help to explain increased frequencies of sexual encounters during periods of alcohol intoxication. At least in part, such increased attraction may be the result of alcohol consumption decreasing ability to detect bilateral asymmetry, presumably because of the reductions in the levels of visual function. We tested the hypotheses that acute alcohol consumption decreases ability to detect asymmetry in faces and reduces preference for symmetrical faces over asymmetrical faces. Twenty images of a pair of faces and then 20 images of a single face were displayed on a computer, one at a time. Participants were instructed to state which face of each of the face pairs displayed was most attractive and then whether the single face being displayed was symmetrical or not. Data were collected near campus bars at Roehampton University. Sixty-four self-selecting students who undertook the study were classified as either sober (control) or intoxicated with alcohol. For each face pair or single face displayed, participant response was recorded and details of the alcohol consumption of participants that day were also obtained. Sober participants had a greater preference for symmetrical faces and were better at detecting whether a face was symmetrical or otherwise, supporting the hypotheses. A further, unexpected finding was that males made fewer mistakes than did females when determining whether individual faces were asymmetrical. The reduced ability of inebriated people to perceive asymmetry may be an important mechanism underlying the higher ratings of facial attractiveness they give for members of the opposite sex and hence their increased frequency of mate choice.

Keywords: Attraction; Faces; Symmetry perception; Acute alcohol consumption

Introduction

Throughout the animal kingdom, individuals discriminate between potential mates with regard to their physical appearance. Evolutionary psychologists typically consider that such discrimination represents a sexually selected adaptation to enhance mate choice (Thornhill and Gangestad, 1999). For instance, the degree of symmetry in bilateral elements of the body provides a veritable indication of phenotypic quality (Watson and Thornhill, 1994). Comparative data for a range of organisms demonstrates that individuals who are more exposed to environmental or gene stressors during development exhibit a greater divergence from structural symmetry (Jones et al., 2001; Leary and Allendorf, 1989; Møller, 1992). Therefore, symmetry may well play an important role in mate selection. Subtleties of body morphology are also an important factor in human mate choice with preferences for symmetry in breasts (Singh, 1995) and in general body shape (Tovée et al., 2000). As might be expected, ratings of attractiveness by people about adult members of the opposite sex are also influenced by degree of facial bilateral symmetry (Little et al., 2007; Perrett et al., 1999).

Studies conducted in both a ‘‘field’’ setting (Jones et al., 2003) and a laboratory setting (Parker et al., 2008) have demonstrated that acute alcohol consumption increases ratings of attractiveness to faces of the opposite sex, which may help to explain increased frequencies of mate choice, that is, sexual practice, during periods of alcohol intoxication (hereafter ‘‘intoxication’’). A further study (Egan and Cordan, 2008) found only alcohol-induced increases in ratings of facial attractiveness for sexually mature (female) faces wearing make-up. However, this finding agrees with those of the aforementioned studies, which presented stimuli of mature individuals (i.e., older than 18 years). A recent paper suggests that, in part, this increase in attractiveness ratings during intoxication may be the result of alcohol consumption decreasing ability to detect bilateral asymmetry (Souto et al., 2008), presumably because of

* Corresponding author. Tel.: +44(0)208-392-8120; fax: +44(0)208-392-3531.

E-mail address: l.halsey@roehampton.ac.uk (L.G. Halsey).

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reductions in level of visual function (Andre, 1996; Colzato et al., 2004; Watten and Lie, 1996). However, Souto et al. (2008) assessed perception of asymmetry using simple geometric images and it is presently unclear whether perception of symmetry in faces involves the same or different brain mechanisms as perception of symmetry in patterns and shapes (Oinonen, 2003; Rhodes et al., 2005; Wilkinson et al., 2000; Wilson and Wilkinson, 2002). Furthermore, Souto et al. (2008) did not test the effects of alcohol consumption in combination with symmetry/asymmetry on ratings of attractiveness.

The present study progresses the work of Souto et al. (2008) by testing whether acute alcohol consumption decreases ability to detect asymmetry in faces and, furthermore, whether such consumption reduces preference for symmetrical faces. We hypothesize that participants intoxicated with alcohol are less able to detect asymmetry in faces and have a reduced preference for symmetrical faces over asymmetrical faces. If supported, this would suggest that during periods of acute alcohol consumption the reason that people find faces more attractive may be because of their reduced ability to detect asymmetry in faces, and this may also explain their reduced preference for symmetrical faces.

Materials and methods

Design

A between-groups design was used in the present study, which was quasi-experimental as participants were self-assigned to a group. Participants, classed as either sober or intoxicated, undertook two tests. Test ''a'': they were shown a series of paired faces where the two faces of a pair were of the same person and had been manipulated such that one was symmetrical and the other asymmetrical, and were asked to choose the more attractive face. Test ''b'': they were shown a series of single faces to which they responded on whether they perceived the image to be symmetrical or asymmetrical. For test ''a,'' the dependent variable was the number of paired faces of which the participants preferred the symmetrical face, and for test ''b,'' it was the number of correctly identified asymmetrical faces.

Participants and location

In total 69 participants (33 males and 36 females, 66 were white, 3 were of various Asian ethnicities, combined mean age ± one standard deviation: 22 ± 5.0 years) undertook the test between March and June of 2008, and the data from 64 of them were included in analyses. Data for five participants were not included because they were not classified as either sober or intoxicated. Data for the present study were collected from students and bar staff around the bars at Roehampton University, London. Thus, similarly to the study by Egan and Cordan (2008) and Jones et al. (2003), the present study has strong ecological validity. In other words, the study findings are more likely to be representative of the effects that acute alcohol consumption has on people in typical life situations in terms of ability to perceive facial asymmetry and preference for facial symmetry. In turn, findings supporting the first study hypothesis are more likely to be true explanations, at least in part, for the increases in mate choice by people who are intoxicated. Most of the data were collected between the hours of 20:00 and 23:00, and all between 19:15 and 01:30. Sober people and intoxicated people were tested during both the earlier hours and the later hours of the evening. The tests were conducted at locations near to the bar where each particular participant had been present. However, the locations chosen ensured that those participants received minimal distraction from their surrounding environment while undertaking the tests, that is, outside the bar or in an adjacent room. Requests were made to potential participants to undertake the test on the evening of the test and, in the case of intoxicated participants, after they had been drinking. Therefore, participants were never encouraged to drink in preparation for doing the test. All the participants were tested voluntarily. The procedures followed were in accordance with the ethical standards of Roehampton University and with the Helsinki Declaration of 1975, as revised in 1983. None of the participants who undertook the test sober reported that they consistently abstained from drinking alcohol.

Before undertaking the test, participants were asked to wear glasses if they required them and they were also asked if their glasses corrected their eyesight to normal in terms of viewing the computer screen. After the test, all the participants reported that they could view the faces on the computer screen clearly.

Stimuli

All images were photographs of white individuals (aged between 18 and 25 years) without spectacles or obvious facial hair. Photographs were taken under standardized lighting conditions and with the participants posed with a neutral expression, following previous studies (Jones et al., 2003; Parker et al., 2008). To equate size, all images were aligned to standardize the position of the pupils in the image. Composite images, composed of multiple images of different individuals, were used as base faces (10 male and 10 female composite images each made of 5 individual images). The composite faces were created using specially designed software. Details of the software and the compositing and transformation techniques can be found in Benson and Perrett (1993) and Tiddleman et al. (2001). This technique has been used to create composite images in many previous studies (Benson and Perrett, 1993; Little and Hancock, 2002; Tiddleman et al., 2001). Images were made perfectly symmetrical and then a transform applied. The transform was different for each image representing the difference between an original image and its symmetrical counterpart. In this way, the transform then applied the symmetry apparent in an original individual image. A similar technique, although not using composites, has been used in previous studies (Little et al., 2007). The transform then created two images, one symmetrical and one asymmetrical, for each base face. Images were then masked on the outline of the face so that hair and clothing cues were not visible in the image. Fig. 1 shows an example of transformed faces made using these methods.

The size of each face image as it appeared on the computer screen (IBM Thinkpad model 2682, length of diagonal: 36 cm) was approximately 15×10 cm wide. Participants sat with the screen directly in front of them and viewed it freely from a distance of approximately 50 cm. Twenty pairs of faces were presented to participants in test "a" (Fig. 1), and 20 single faces were presented to participants in test "b." All of the faces presented in test "b" had been shown in test "a."

Procedure

An explanation of the task was read to the participant from an instruction sheet, which fully informed them about the nature of the study. The participants were then asked to provide information including their age, weight, how much they estimated they had drunk so far that day, at what time they had started drinking, and at what time they had last eaten a meal.

Firstly, 20 paired faces were shown to participants; one face was symmetrical and the other asymmetrical. They were displayed using PowerPoint (Microsoft Corp.). The pairs of faces were shown in the same order to all the participants, which alternated between female and male image pairs. In 10 pairs, the symmetrical face was displayed on the left. Each pair of faces appeared on the screen for 5 s after which the screen became blank. After this point, the participant told the experimenter which face they found more attractive. When the participant was ready, the experimenter pressed a key on the keyboard to view the next image. The duration of the test itself was approximately 2 min.

Fig. 1. A pair of faces shown to participants in test "a." The left-hand face is symmetrical, whereas the right-hand face is asymmetrical. Participants were asked which face they found more attractive.

Secondly, 20 single faces were shown, displayed in the same pseudo-random order to all the participants. Each face was either the symmetrical or asymmetrical face of the pairs shown in test "a." Seven of the faces were symmetrical. Each face was shown for 5 s after which the screen became blank. The participant then told the experimenter whether they perceived the image to be symmetrical or asymmetrical. This test also took about 2 min to complete.

All the participants were asked to abstain from drinking alcoholic beverages during the test. Directly after the test, participants were asked to blow into a portable breath alcohol analyzer (Alcosign CA-1000; Industrial Computer Components Limited, Auckland, NZ), which measures the amount of alcohol in the deep lung air. This provides an estimate of blood alcohol levels: blood alcohol content (BAC, %, g alcohol/100 g blood).

Participants were allowed to stop their participation at any time during the test.

Determining sober and intoxicated groups

Of the 69 participants who undertook the test, 64 were classified into either the sober or intoxicated group. A considerable majority of the people present at the bars during the periods that the tests were conducted had drunk alcohol to some extent that day. To ensure satisfactory group-level sample sizes, the sober group of participants necessarily included some individuals who had drunk a small amount of alcohol. Based on the experience in conducting previous, related research (e.g., Souto et al., 2008), it was anticipated that for participants to experience a reduced ability to perceive asymmetry in a face they would often need to be fairly heavily intoxicated. The breath alcohol analyzer only gave a maximum reading of 0.08%, which is the legal limit for driving in the UK and is a value which does not typically indicate being heavily under the influence of alcohol. Therefore, classification of participants was undertaken based on several criteria including BAC values. Participants were deemed sober if their BAC value was 0.05% or less and they had either drunk less than four units of alcohol that day or had drunk less than six units that day and at a rate lower than two units per hour. The average amount having been drunk that day by sober participants was 1.2 units. Participants were deemed as intoxicated if their BAC value was 0.08%, indicating that their blood alcohol levels were 0.08% or higher, and either they had drunk a total of 10 or more units of alcohol that day or had drunk more than 6 units at a rate higher than 2 units per hour just before taking the tests. Participants were not included in statistical analysis if excluded from the two groups. This exclusion of five participants served as a "buffer" with the intention of creating a more marked difference in the mean amount of alcohol ingested and concentration of alcohol in the blood of the intoxicated group compared with the sober group.

Analysis

Values are provided as means ± standard error of the mean. To test for a preference in sober and intoxicated participants for symmetrical faces, single-sample *t*-tests were run to compare the number of times in test ‘‘a’’ that the symmetrical face was preferred compared with the number of times such a face should be preferred if symmetry does not influence attraction (i.e., by chance and hence 50% of the time; 10 times). Paired *t*-tests were used to test for differences between the sober and intoxicated groups. Firstly, a difference was tested for in the percentage of sober and intoxicated participants who preferred the symmetrical face over the asymmetrical face across a set of face pairs (test ‘‘a’’). Secondly, a difference was tested for in the ability of sober and intoxicated participants to detect symmetry and asymmetry across a set of single faces (test ‘‘b’’). Across all participants, correlations were conducted on preference for the symmetrical face of a face pair against ability to detect symmetry or asymmetry in faces. Finally, paired *t*-tests were used to test for differences in responses by males and females to the two tests, within the sober group and within the intoxicated group.

Several statistical tests were undertaken to check that certain possible confounds and methodological limitations were not influencing the results. Pearsons’s correlations were run to test for relationships indicating a learning effect by participants during the test ‘‘b,’’ that is, between ability to perceive whether a face is symmetrical or asymmetrical and the number of faces already viewed, for both groups separately. Pearson’s correlations were also run to test for relationships between the responses of participants in both test ‘‘a’’ and test ‘‘b’’ against time of day, again for both groups separately, to check that the time the test was taken did not affect responses to the tests. Statistics were run in Excel (Microsoft Corp.) and SPSS v.15 (SPSS Inc.).

Results

For the 69 participants, 36 were classified as sober, 28 as intoxicated, and 5 as neither. For the sober and the intoxicated groups, both the frequency distribution of the data for test ‘‘a’’ and for test ‘‘b’’ did not differ significantly from normal (one-sample Kolmogorov−Smirnov tests, $P > .05$ in all the cases).

Effects of intoxication on preference for and detection of asymmetry

Both sober participants and intoxicated participants preferred symmetrical to asymmetrical faces (test ‘‘a,’’ single-sample *t*-test, preference for symmetrical faces: 66.9 ± 3.25%; $t_{35} = 5.21$, $P \leq .001$ and 59.3 ± 2.91%; $t_{27} = 3.19$, $P \leq .01$, respectively). However, sober participants preferred the symmetrical face over the asymmetrical face of a pair significantly more often than did intoxicated participants (paired *t*-test, $t_{19} = 2.95$, $P \leq .01$; Fig. 2).

When participants were asked to decide whether a face was symmetrical or asymmetrical (test ‘‘b’’) across the set of faces shown, sober participants more frequently gave the correct answer than did intoxicated participants. This was the case both when considering the symmetrical and asymmetrical faces (paired *t*-test, number of wrong answers: 3.5 ± 0.36, 4.7 ± 0.51; $t_{19} = 2.47$, $P \leq .05$) and when considering only the asymmetrical faces (paired *t*-test, number of wrong answers: 2.9 ± 0.31, 3.9 ± 0.48; $t_{12} = 2.39$, $P \leq .05$).

A Pearson’s correlation found no significant correlation between preference for symmetry and ability to perceive symmetry or asymmetry across all the participants ($r_{64} = 0.21$, $P = .11$); however, a Spearman’s Rho correlation, which tests for any form of monotonic relationship, reported a significant, positive correlation ($r_{64} = 0.28$, $P \leq .05$).

Comparison of preference and detection between genders

There was no significant difference in the responses of male and female participants to test ‘‘a’’ (paired *t*-test, sober, $t_{19} = 0.326$, $P = .748$; intoxicated, $t_{19} = 1.727$, $P = .110$). There were significant differences in the responses of the genders to test ‘‘b‘‘ in sober participants when considering the symmetrical and asymmetrical faces (paired *t*-test, number of wrong answers: 2.8 ± 0.42, 4.3 ± 0.54; $t_{19} = 2.358$, $P \leq .05$) and when considering only the asymmetrical faces (paired *t*-test, number of wrong answers: 2.2 ± 0.35, 3.5 ± 0.49, $t_{19} = 2.143$, $P \leq .05$), with females giving wrong answers more often in both cases. There was also a significant difference in the responses of males and females to test ‘‘b’’ within intoxicated participants when only the asymmetrical faces were considered (paired *t*-test, number of wrong answers: 3.6 ± 0.43,

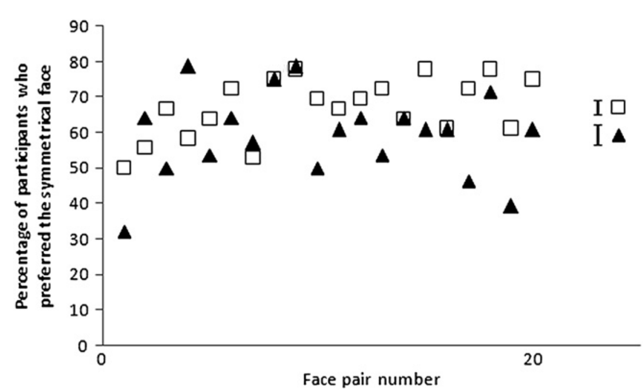

Fig. 2. The percentage of sober (open squares) and intoxicated (closed triangles) participants who preferred the symmetrical face over the asymmetrical face of each face pair. The face pairs are numbered in the order that they were shown to participants. The values on the far right are means of all the 20 face pairs, and the associated bars represent ±one standard error.

4.2 ± 0.96, $t_{19} = 3.313$, $P \leq .01$), again with females giving more wrong answers. However, there was no significant difference within intoxicated participants when considering symmetrical and asymmetrical faces together (paired *t*-test, number of wrong answers: 4.5 ± 0.66, 4.9 ± 0.95, $t_{19} = 2.000$, $P = .060$).

Control variables

In test "b," there was no improvement in the ability of participants to perceive whether a face was symmetrical or asymmetrical during the course of viewing the 20 faces (Pearson's correlation, sober: $r = -0.305$, $P = .191$; intoxicated: $r = -0.099$, $P = .677$). There was no relationship between the responses of participants and the time of day (Pearson's correlation, test "a," sober: $n = 36$, $r = 0.115$, $P = .505$; test "a," intoxicated: $n = 27$, $r = 0.097$, $P = .630$; test "b," sober: $n = 36$, $r = -0.282$, $P = .096$; test "b," intoxicated: $n = 27$, $r = -0.118$, $P = .559$).

Discussion

Confirming previous results, sober participants had a preference for symmetrical versus asymmetrical faces (Little et al., 2007; Perrett et al., 1999). Intoxicated participants also had a preference for symmetrical faces. However, the preference of intoxicated participants for symmetrical faces was less than that of sober participants. Intoxicated participants were also less able to detect when faces were asymmetrical than were sober participants. Furthermore, there was some evidence for a correlation between symmetry preference and detection, which was also reported by Oinonen and Mazmanian (2007).

Together, these findings provide evidence for the hypotheses of the present study that intoxication reduces ability to detect asymmetry in faces (supporting the claims of Souto et al., 2008) and reduces preference for symmetrical faces. In reality, faces are always asymmetrical and hence the effect of intoxication in reducing ability to perceive that asymmetry may be an important mechanism underlying higher ratings of facial attractiveness for members of the opposite sex when inebriated (Jones et al., 2003), at least in sexually mature females wearing make-up (Egan and Cordan, 2008), and, in turn, increased frequency of mate choice. This mechanism may also at least in part explain the otherwise unexpected finding that intoxicated heterosexual participants rate same sex faces more highly compared with sober heterosexual participants (Parker et al., 2008). The reduced preference for symmetrical faces by intoxicated participants may be explained by the fact that those participants exhibit a greater increase in perceived attractiveness of less symmetrical faces than more symmetrical faces. However, it is far from certain that the reduction in ability to perceive asymmetry by intoxicated participants explains their reduction in facial symmetry preference. The correlation between symmetry preference and detection does not, of course, infer causality and the correlation coefficient, although significant, was not strong. This in fact suggests that there is a limit on the impact that reduction in detection ability has on symmetry preference.

There was also an effect of gender on the ability of participants to discern whether a face was symmetrical or asymmetrical. To our knowledge, this difference has not been reported before. Males made fewer mistakes than did females when asked to decide whether individual faces were symmetrical or not, in both the sober and intoxicated conditions. This might be at least partly explained by the fact that physical appearance is considered to play a larger role in the mate choices of males than females (Buss and Schmitt, 1993). For example, Rhodes et al. (1998) reported that males find the appeal of symmetrical opposite sex faces stronger than do females. However, there was no gender difference in preference for symmetrical versus asymmetrical faces in the present study.

Similarly to the studies of Egan and Cordan (2008), Jones et al. (2003), and Souto et al. (2008), the "field" element of the present study, while providing ecological validity (Sheridan, 1979), meant that it did not include specific controls for potential personality differences between the two groups of participants. The present study cannot rule out the possibility that intoxicated participants generally tend to drink more than do sober participants and that this either resulted in different personality types in the two participant groups and/or that chronic alcohol consumption affects asymmetry detection (Oinonen and Sterniczuk, 2007). However, none of the sober participants claimed that they consistently abstained from alcohol and indeed a number of them were seen regularly drinking on the campus while data were being collected for the present study. Furthermore, the relatively young age of most of the study participants meant that they were unlikely to have had the opportunity to develop chronic alcoholism.

Intoxicated participants might experience changes alongside deterioration in visual perception that would affect performance on the test, for example effects of fatigue, particularly if they have been drinking and active for a large proportion of the day. Yet importantly, none of the intoxicated participants was observed to be sufficiently inebriated, or indeed tired, that they undertook the test without due care, concentration, and composure from start to finish. Indeed, it was noteworthy how well intoxicated participants concentrated on the tests, presumably partly because people are usually interested in faces. These observations are supported by the symmetry preference shown by intoxicated participants indicating that they were not performing at random. However, longer, more arduous tests might have been confounded by a difference in mental focus between sober and intoxicated groups. An important and arguably necessary aspect of the tests used in the present study was that they were concise in nature, with participants exposed to a relatively small number of stimuli such that they had to concentrate for only a couple of minutes at a time.

However, using a small number of stimuli has the disadvantage of providing a smaller opportunity to uncover a significant difference (i.e., the design had a lower power), which was problematic in the present study because, for example, testing for a difference in preference for symmetrical faces is subtle. This is because even with no symmetry preference whatsoever, participants would on average be expected to report the symmetrical face of a pair to be more attractive for 10 out of the 20 pairs shown to them, that is, 50% of the time by chance, whereas the preference of sober participants for symmetrical faces is not always particularly high despite being significant (e.g., 57% by European participants; Little et al., 2007). Therefore, the present study was searching for a small signal when testing for a difference in symmetry preference between sober and intoxicated participants with only a small number of stimuli used to reveal that signal.

Furthermore, the stimuli varied considerably in terms of how differently sober and intoxicated participants reacted to them, for example with certain face pairs eliciting a much higher symmetry preference in sober participants compared with intoxicated participants than other face pairs (Fig. 2). The reasons for this variation are unclear but may indicate that stimuli could in general be improved, enhancing the ability to uncover differences between sober and intoxicated people. Use of a breath alcohol monitor that provided a greater range of readings at a higher resolution, coupled with a greater subject sample size, would have provided the opportunity to test for correlations between levels of intoxication and perception of faces as well as differences between groups, which arguably would give more compelling evidence of a true association with alcohol consumption. However, this assumes a strong relationship between blood alcohol levels and its effect of that alcohol on relevant perceptual capacities.

The present study's design is validated despite the aforementioned methodological constraints and the subtlety of the effect being tested for, because it provides evidence for intoxication reducing the ability to detect facial asymmetry within the naturalistic setting of university bars. This finding could represent one of the mechanisms to explain the increased perceived attractiveness of faces after acute alcohol consumption. In turn, this mechanism could help explain the increased frequency of sexual encounters by inebriated people. Although this mechanism is almost certainly not the only one explaining increased frequency of sexual encounters, because, for example, alcohol is known to reduce behavioral inhibitions, the effects found in the present study could operate in an additive fashion with other effects of intoxication.

Although our study does not address the issue of the underlying mechanisms that may explain the effects of alcohol on symmetry perception, there are a number of papers that report on physiological effects of acute alcohol consumption on visual ability. For example, Andre (1996) suggests that ethanol reduces contrast sensitivity, particularly for details (i.e., higher frequencies of visual information). Face perception and the detection of symmetry are likely to rely on the perception of high frequencies. Thus, alcohol may reduce perception of detail and therefore reduce the ability to detect symmetry. Given that inebriation appears to reduce judiciousness of mate choice, future studies should test whether mate choices made during alcohol intoxication result in reduced benefits in terms of potential offspring fitness, using indirect measures such as compatibility of genes, relationship length, and measures of relationship satisfaction (Roberts and Little, 2008). Furthermore, investigations should be undertaken into whether other changes that occur during intoxication, such as reduced behavioral inhibitions, serve as the main explanations to decrease mate choosiness or if reduced perceptual capacity is a dominant mechanism. Such studies may be best served with a controlled, experimental design including randomization and a placebo group (Parker et al., 2008).

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