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Short Communication

Effects of noise and distraction on alcohol perception

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ABSTRACT

Recent research demonstrated that noise unconnected to the target stimulus can alter taste perception of food, but it is not clear whether similar effects might be seen with respect to alcohol. This is particularly important, as it might help explain previous reports of higher/faster alcohol consumption in loud music environments. In the between subjects experiment here, participants ($n = 80$) completed standardised taste and olfactory tests, followed by a taste test of alcoholic beverages varying in strength (0, 1.9, 3.9, 5.6, and 7.5 pct abv) in a randomly allocated distractive or control condition. Distractive conditions were either music, shadow (listening and repeating a news story) or shadow and music (S-Music). We found that exposure to music led to higher sweetness ratings compared to all remaining groups. Interestingly, discrimination of alcohol strength was impaired for individuals in the S-Music compared to remaining groups which was accompanied by increased negative mood. This is the first experimental work to demonstrate how music and other forms of distraction alter taste perception of alcohol and suggest a mechanism by which distraction leads to increases in alcohol consumption.

1. Introduction

The extent to which auditory cues can influence food and drink perception has become a lively area of research in recent years, with a number of theories attempting to explain these effects.

In terms of background music, it has been proposed that increases in certain dimensions (e.g. volume/speed) lead to raised levels of arousal, resulting in increasing behavioural responses toward the food/drink (Gueguen, Le Guellec, & Jacob, 2004). The evidence for this theory rests on observational work, where for instance, individuals drank more alcohol and at a faster rate in an environment with loud (88 dB) compared to a more normal (72 dB) level of popular music. Though the precise mechanism linking arousal to consumption is not clear, and as acknowledged by these authors, no research has measured whether arousal actually changes in these conditions. A second theory speculates that music acts to alter mood states (e.g. increasing positive mood) and thereby concurrent activities; as has been demonstrated with pleasant music leading to longer periods spent in drinking environments (Jacob, 2006). A third theory more generally posits that music causes a distraction away from the main activity of drinking/eating and thereby may explain why perception is altered (Bellisle & Dalix, 2001; Crocker, 1950). Finally, and most relevant here is the theory that music alters the perception of the taste of the food/drink via multi-sensory integration of sensory cues and specifically the aspect of sensory dominance (Spence & Shankar, 2010). The latter is where information used to make a decision about stimuli derive from one sensory modality only, which may be straightforward in some instances – e.g. visual spatial judgments rely most heavily on the visual sense – but less so in others. In terms of sound arising from the food itself, it was demonstrated that manipulating the volume made when an individual bit into the same potato crisp resulted in altered perception of freshness and crispness (Zampini & Spence, 2004); therefore suggesting that in judging the freshness/crispness of certain foods, audition dominates over gustatory/olfactory senses. Most recently, work has addressed whether environmental sound that is unconnected to the food itself can influence perception, where it was found that the same food items were rated as less salty and sweet in a loud versus quiet (white) noise environment (Woods et al., 2011).

The aim of the present study was to extend this research to examine whether background noise can also influence the perception of alcohol. On the basis of sensory integration, we theorise that the perception and specifically the taste of alcohol may actually change as a result of background music/distraction. Relevant to the present study, work has shown that individuals who rated whisky as sweeter (and less bitter) had higher habitual alcohol consumption (Lanier, Hayes, & Duffy, 2005). This could be due to humans having an innate preference for sweet foods (Steiner, 1979), which would suggest that those who find alcohol sweeter will consume more. This also connects to work where individuals unable to discriminate alcohol from placebo consumed twice as much alcohol in the previous 6 months (Jackson, Stephens, & Duka,

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2001). Moreover, the main difference between alcohol discriminators and non-discriminators was in terms of initial dislike of the test beverage (alcohol, tonic, and tabasco). These two studies highlight the important connection between sensory factors of taste and alcohol consumption.

This may help explain why individuals drink more alcohol in a noisy environment (Gueguen et al., 2004; Gueguen, Jacob, Le Guellec, Morineau, & Lourel, 2008), in terms of alcohol being perceived as higher in sweetness (lower bitterness). We also examine the effects of background noise on perceived alcohol strength, since there is evidence linking this factor to the longer duration to consume stronger alcoholic beverages (study 1, Higgs, Stafford, Attwood, Walker, & Terry, 2008).

In order to investigate this issue, we completed an experiment to see whether music and other distractions influence perception of alcohol. We chose music rather than white noise, since this is consistent with the previous research (Gueguen et al., 2004, 2008) on alcohol and offers more ecological validity in that alcohol is more commonly experienced with music than white noise. Participants were randomly allocated to one of four conditions and simultaneously provided sensory ratings of beverages varying in alcohol content. The four conditions varied in the level of distraction: (1) control-no distraction, (2) music, (3) shadowing task, requiring the listening and repeating of a general news story, and (4) shadowing task (other ear) and music (one ear). The rationale for using shadowing tasks in addition to just music was based on the fact that in the previous study (Gueguen et al., 2008) participants were observed in pairs in popular bars which meant that in addition to being exposed to the background music, individuals were also talking to each other whilst consuming their beverages. It therefore seemed important in the present study to understand whether music alone, listening/talking or a combination of the two produce the largest variations in sensory evaluation. In order to study this experimentally, we adopted the use of a shadowing task used in previous dichotic listening research (Stafford & Scheffler, 2008), which requires the participant to both listen and repeat information and is therefore a relatively good simulation of the more natural behaviour.

Since this is the first study to investigate this question, our predictions are mainly exploratory. We tentatively theorise that the estimation of sweetness, bitterness and alcohol strength will be significantly different in the distracting versus control condition. We also wished to verify whether arousal and mood were altered by the distracting conditions, as has been theorised (Gueguen et al., 2004; Jacob, 2006). Finally, since we are examining a dimension of taste sensitivity, it was also important that prior to testing, that we measured participants general taste and olfactory sensitivity (since olfaction plays an important role in taste perception, Stevenson, Boakes, & Wilson, 2000) to check for any differences between groups.

2. Methods

2.1. Participants

Eighty university students (69 females/11 males) participated in the study, aged between 18 and 28 years of age (M = 18.9, SD = 1.7). Participants were recruited using an online system where the study was advertised as examining what factors influence our sense of alcohol perception. Participants were invited to take part if they were aged between 18 and 30 and were regular consumers of alcohol, consuming at least eight units of alcohol per week, consistent with previous research (Higgs et al., 2008). The study protocol was given ethical approval from the department's ethics committee (BPS guidelines).

2.2. Design

The study used a mixed design where participants were randomly allocated to one of four groups (Table 1) and made sensory ratings of five different drinks. Group was therefore studied between-subjects and drink was within-subjects. The main dependent variable was their sensory ratings of the five drinks.

2.3. Materials

2.3.1. Alcohol usage questionnaire (AUQ)

Patterns of habitual alcohol consumption were measured using a questionnaire (based on (Mehrabian & Russell, 1978)). Participants were accepted into the study only if their total weekly alcohol consumption was over eight units of alcohol.

2.3.2. Olfactory and taste tests

The olfactory threshold and taste tests were from the 'Sniffin Sticks' battery (Burghart Instruments, West Germany). The olfactory test uses pen like instruments to test minimum (i.e. smallest concentrations of the test odour, *n*-butanol) olfactory thresholds, whilst the taste test uses four different sprays (sweet–sour–salty–bitter) to measure whether individuals can discern the presented taste. These tests have been used widely in research (Albrecht et al., 2009; Hummel, Kobal, Gudziol, & Mackay-Sim, 2007; Seo & Hummel, 2009).

2.3.3. Arousal, thirst, and hunger

Arousal and hunger were measured using 100 mm visual analogue scales (VASs) unmarked lines anchored with "not at all" and "extremely". The adjectives were centred above each line in the following order; "alert", "thirsty", "drowsy", and "hungry".

2.3.4. Positive and negative mood

The positive and negative affect schedule (PANAS) from (Watson, Clark, & Tellegen, 1988) was used to measure mood during the experiment. The PANAS consisted of a five point Likert scales ranging from 1 (very slightly or not at all) to 5 (extremely) on which participants rated their feelings and indicated the extent to which they currently experienced 10 positive and 10 negative emotions.

2.3.5. Drinks and administration

A mini-study was conducted in order to select the most appropriate levels of alcohol and mixer. Ten participants (eight females/two males) were presented with beverages varying in alcohol content (0, 1.9, 3.9, 5.6, and 7.5 pct abv, Tesco Value vodka, 37.5% abv), in three different mixers (Tesco smooth cranberry, Schweppes Indian tonic water, Tesco pure orange juice), presented in a counterbalanced order; participants rated the taste (and other sensory characteristics including alcohol strength) using VAS. Cranberry was selected for the main study since it was not exceedingly easy to detect differences in taste (sweet/bitter) and alcohol strength, as was the case for orange or very difficult, as was tonic water. Cranberry and vodka were refrigerated separately at a temperature of 7 °C. For the main study, participants received five freshly prepared drinks (counterbalanced order), each in 25 ml shot glasses (Arcoroc, Amazon, UK): 0 pct abv (20 ml cranberry); 1.9 pct abv (19 ml cranberry/1 ml vodka); 3.9 pct abv (18 ml/2 ml); 5.6 pct (17 ml/3 ml); 7.5 pct abv (16 ml/4 ml), hence all drinks were the same volume. For each beverage, participants used VAS anchored with "low" or "not at all" followed by the relevant adjective, and "high" or "very", again followed by the relevant adjective. The following descriptors within the context of a sentence verifying the question were centred above each line in the following order; "cold", "familiar", "alcohol strength", "like", "sweet", and "bitter". These descrip-