Development Of Context-Aware Measures Of Alcohol-Related Impulsivity
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Key findings

- Inhibitory control is affected by context (e.g. environmental cues).
- As inhibitory control levels may vary, one’s ability to control consumption behaviour in alcohol-related environments may also vary.
- Findings may vary based on the methodology used to test inhibitory control.

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Background

In recent years, research has begun moving away from artificial lab settings and examining how alcohol-related behaviour and cognitions are affected by real-life social and environmental contexts (Monk & Heim 2013a; 2013b; Wall, McKee, & Hinson, 2000). However, a possible shortcoming of this work is its reliance on people’s self-reports, which can be tainted by the potential for participants to respond in order to gain favour or avoid negative perceptions (as opposed to honestly). As a result, there has been an increasing drive towards examining the thoughts outside conscious awareness that drive drinking. One such implicit process is impulse control, which is a well-documented determinant of alcohol consumption (Papachristou et al., 2013). However, how impulse control manifests itself under different environmental conditions is less understood.

Despite the far-reaching nature of research on inhibitory control and alcohol consumption (c.f., for example, Baumeister et al., 1998; Baumeister, 2002; Petry, 2001), further exploration of the effect of contextual forces on such inhibitory processes is warranted. This may offer an implicit measure of the effect of alcohol-related cues on cognitions and could afford important insights for the improvement of alcohol-focussed interventions. In a hitherto unused approach, the present study therefore adapted two existing measures of inhibitory control in order to assess how contextual cues (both visual and auditory) may impact reaction time, accuracy and false alarm rates. The first study measured participants’ response times and accuracy when responding to alcohol-related and non-alcohol-related targets in a Go/No Go task. Auditory cues (alcohol-related and neutral) were also presented during these responses to assess the effect of such cues on inhibition. The second study recorded participants’ eye movements in a pro- and anti- saccade task, in order to assess the time taken in looking towards and away from different targets (alcohol-related and neutral). It was anticipated that participants would be faster and more error-prone when responding to and being cued by alcohol-related stimuli (as per Kreusch et al., 2013).
Method

This research examines the effect of contextual cues on impulse control using modified versions of well-known traditional research paradigms which manipulate and measure task response times and eye movement. In the **Cued Go/No Go Task** (c.f. Marczinski et al., 2007) response inhibition (the ability to stop a dominant response) and response selection (ability to respond correctly to the stimulus presented) were tested through the presentation of both alcohol and neutral stimuli. In the standard design experimental condition, participants were required to respond to neutral images (bottles of juice) and inhibit their response when presented with alcohol images (bottles of beer). In the control condition, the stimuli were bottles of water and empty bottles respectively. In the reversed design, participants needed to respond to bottles of beer (experimental condition) and to empty bottles (control condition), and not respond to bottles of juice and bottles of water. In addition, there was an auditory cue of background bar noise in the study. In the short-cue version of the experiment, this cue randomly occurred for a short interval (48 kHz) on 50% of trials, and in the long-cue version this cue (44.14 kHz) was played throughout 50% of blocks.

In the **Saccade task** (c.f. Munoz & Everling, 2004), participants viewed stimuli presented to the left or the right of a central fixation cross. In pro-saccade blocks they were required to look toward the target, and in anti-saccade tasks they were required to inhibit that voluntary response and to look at the opposite side of the screen from the presented stimuli. The stimuli varied between a single neutral and single alcohol stimulus. The auditory cue was in the same format as the Cued Go/No Go task (one version with 50% of trials with the bar cue (short-cue), one version with 50% of blocks with the bar cue throughout (long-cue)).

Alcohol consumption was measured using the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) in order to assess any effects of consumption on performance. The effortful control sub-scale of the Adult Temperament Questionnaire (ATQ; Rothbart, Ahadi & Evans, 2000) was used to measure sub-components of attentional control (capacity to voluntarily focus as well as shift attention), inhibitory control (capacity to suppress inappropriate approach behaviour) and activation control (capacity to perform activities one would rather avoid). Both the AUDIT and ATQ were used to check there were no differences in alcohol consumption and executive control between samples. They were completed after the go/no-go and saccade tasks to avoid potential priming (c.f. Davies & Best, 1996).

Findings

**GNAT:** Demonstrated by the increase in false alarm rates (responses to stimuli they were instructed not to respond to). In the standard design, participants appeared to find it harder to inhibit responses to beer stimuli, and when the image was cued with the bar sound (short-cue group only). In particular, the short-cue group found it harder to inhibit responses to images of beer. Such findings are in-line with previous research (Petit et al., 2012), and offer further evidence that inhibitory control may be affected by contextual stimuli. This pattern of results remained after controlling for alcohol consumption, in apparent contrast with previous research suggesting that heavier consumption may increase such errors of commission (Petit et al., 2012). Such varying results may be explained by the variation in methodologies used, including the use of varying stimuli (their use of letters as the go/no go stimuli) and procedural signalling (the administration of alcohol-related questions prior to testing).
Overall, these results suggest that whilst participants’ personal alcohol consumption (AUDIT) has a significant effect on reaction times to Beer and Water images, it has no influence on incorrect responses (false alarms) to target stimuli (Beer vs. Water). Therefore, alcohol consumption may account for the excitatory interaction of bar sounds and bar images on reaction times, with higher self-reported alcohol consumption perhaps associated with heightened reaction times. However, regardless of personal alcohol consumption, participants seemed to find it harder to inhibit their responses and select when and how to respond when presented with images of alcohol (beer images) and cued with auditory alcohol-related stimuli (bar cues).

**Saccade:** Before controlling for alcohol consumption, participants were slower when making anti-saccades, as per the established literature (Vorstius et al., 2008). They were also faster when making saccades to the alcohol image, and when hearing the bar cue. Participants in the short-cue group were faster with a preceding bar cue in both pro- and anti-saccade tasks, while those in the long-cue group were slower with the bar background cue. When alcohol consumption was taken into account, the short-cue group remained faster on bar-cue trials, but the long-cue group were now slower on the same trials. This result compliments previous studies (using the GNAT) that demonstrated faster response times to alcohol stimuli (Kreusch et al., 2013; Petit et al., 2012). Prior research has suggested there is an attentional bias to alcohol stimuli (participants pay more attention to them than to neutral stimuli; Weafer & Fillmore, 2012). Therefore, participants may also be faster to attend to these stimuli.

Results seem to suggest that short bar cues may increase attentional bias to presented stimuli, insomuch as latencies, error rates and proportions of corrective saccades are reduced. However, the opposite is true for latencies in the long-cue group, suggesting a level of habituation may occur. Consequently, short bursts of bar-related noise may perhaps increase the attentional bias to stimuli, but continuous background bar noise may impair conscious control over involuntary responses, akin to our findings in the GNAT. Additionally, prior to controlling for alcohol consumption, participants were faster to respond to alcohol images, suggesting that attentional bias to these images may be associated with levels of alcohol consumption.

**Implications**

The findings offer further support for the assertion that inhibitory control may be a finite resource which may vary in certain environments, (Muraven & Baumeister, 2000), rather than a trait (Leotti, 2009). The current research may therefore have real world implications, suggesting that in alcohol-related environments, surrounded by the associated sights and sounds, inhibitory control levels may vary, and thus so too may one’s ability to control consumption behaviour.

**Conclusion**

Further research is recommended in order to investigate the observed variations in cued inhibitory response patterns across different methodological approaches, for example by increasing the number of stimuli in the saccade task.
Further Information

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References


