



The effects of stereotype threat and contextual cues on alcohol users' inhibitory control



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HIGHLIGHTS

- Applies the 'stereotype threat' paradigm to a legal substance (alcohol).
- Negative drink-related stereotypes influenced inhibitive cognitive performance.
- Participants were vigilant to cues that highlighted a discredited social identity.
- Alcohol-related and neutral stimuli have different effects on inhibitory control.

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ABSTRACT

Aim: Previous research indicates that users of illicit substances exhibit diminished cognitive function under stereotype threat. Advancing this research, the current study aimed to examine the effects of stereotype threat on alcohol users' inhibitory control. It also examined whether drinkers demonstrate a greater approach bias towards alcohol-related relative to neutral stimuli.

Method: Fifty-five participants were assigned randomly to a stereotype threat condition, in which they were primed with a negative stereotype linking drinking behavior to cognitive decline, or a non-threat control condition. All participants then completed a modified version of the Cued Go/No-Go Association Test that exposed participants to alcohol-related and neutral pictorial stimuli and sound cues.

Results: Stereotype threatened participants demonstrated a speed-accuracy trade off, taking significantly longer to respond to go-trials with equivalent accuracy to the control condition. They also showed reduced response accuracy to both alcohol-related and neutral stimuli in reversed instruction trials. Participants in the control condition were both more accurate and quicker to respond to alcohol-related stimuli compared to neutral stimuli.

Conclusion: These results suggest that awareness of negative stereotypes pertaining to alcohol-related impulsivity may have a harmful effect on inhibitive cognitive performance. This may have implications for public health campaigns and for methodological designs with high levels of procedural signaling with respect to not inadvertently inducing stereotype threat and impacting impulsivity.

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1. Introduction

Alcohol-dependent and heavy social drinkers often report an increase in subjective craving and demonstrate significant physiological arousal in response to alcohol-related cues (Field & Cox, 2008; Field & Duka, 2002). The link between alcohol consumption and cue reactivity has been attributed to the effects of alcohol on executive functioning, specifically diminished inhibitory control (Adams, Ataya, Attwood, & Munafò, 2013). This body of work suggests that alcohol-related cues can function as a prime that decreases individuals' ability to inhibit a dominant response by suppressing behavioral impulses (Hogarth,

Attwood, Bate, & Munafò, 2012). Consistent with this prediction, Kreuzsch, Vilenne, and Quertemont (2013) found that both problem and non-problem drinkers made significantly more commission errors (i.e., false alarms) and were quicker to respond to alcohol-related stimuli compared to neutral stimuli in a Cued Go/No-Go Association Task. Other research has examined this notion in the more naturalistic setting of a simulated bar lab, indicating that alcohol-related cues may also increase subjective craving for alcohol and consumption (Jones, Rose, Cole, & Field, 2013). Indeed, the cognitions that are associated with increases in alcohol consumption may be contextually dependent (Monk & Heim, 2013; Wall, Mckee, & Hinson, 2000). As such, environmentally salient alcohol-related cues may elicit a greater approach bias among drinkers, which may be associated with difficulty inhibiting behavioral responses (Fleming & Bartholow, 2014; Rose & Duka, 2008).

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From an alternative point of view, it could be suggested that the mere salience of alcohol-related cues may create a situational burden in which individuals perceive that they will conform to a negative stereotype regarding their drinking behavior. Alcohol-related stereotypes may be particularly pertinent in the minds of alcohol drinkers, given that public health campaigns frequently disseminate information regarding the negative outcomes of alcohol consumption and its link to cognitive decline (c.f., Drink Aware, 2014; Feldstein-Ewing, Sakhardande, & Blakemore, 2014). However, it is not clear whether such knowledge manifests in behavioral changes for those who identify with this targeted group of individuals. From a theoretical perspective, stereotype threat suggests that this may be possible (Steele & Aronson, 1995). Here, research shows that an individual's knowledge about negative societal stereotypes may deplete their working memory efficiency to bring about performance decrements on a given task (Schmader & Johns, 2003). Conversely, other researchers have argued that the experience of stereotype threat may motivate individuals to disprove the stereotype, thus influencing goal engagement and enhanced control (Jamieson & Harkins, 2007). Whilst not hitherto applied to alcohol consumption, research has documented the effects of stereotype threat on ecstasy and cannabis users' executive function performance (Cole, Michailidou, Jerome, & Sumnall, 2006; Looby & Earleywine, 2010). It is therefore conceivable that the social stigma ascribed to alcohol-related cognitive inferiority may be a significant predictor of poor performance on tests of impulsivity.

In the first of its kind, the current study aims to investigate the influence of stereotype threat on alcohol users' inhibitory control. It is predicted that individuals who are primed with a negative stereotype regarding the perceived association between alcohol consumption and impulsivity will show heightened dis-inhibitory control relative to a control condition. Furthering this, we also examine the contention that inhibitory mechanisms of selective attention, implemented in drinking behaviors, are particularly susceptible to contextual influences. In line with Kreusch et al. (2013) it is predicted that exposure to alcohol-related pictorial stimuli may reduce inhibitory control compared to neutral stimuli.

2. Method

2.1. Participants

Ethical approval was obtained at the institution where this study was carried out. Fifty-five participants (30 male; $M_{\text{age}} = 24.20$, $SD = 5.28$; 92.9% White British) were recruited via an online participation website and received £5 (\$7.85) remuneration. Participants were assigned randomly to either the stereotype threat condition or the control condition. Average AUDIT scores were 11.07 ($SD = 6.99$), which is consistent with recent research using UK student samples (Clarke, Field, & Rose, 2015).

2.2. Measures

2.2.1. Cued Go/No-Go Association Task (GNAT)

The strength of behavioral inhibition was assessed using a modified version of the Cued GNAT (Fillmore, 2003; Nosek & Banaji, 2001). The current study utilized both alcohol-related and neutral pictorial stimuli to examine the effects of contextual factors on response inhibition. In the experimental target condition, a picture of a beer bottle was used as alcohol-related stimuli and was contrasted with a water bottle. In the control target condition, alphabetical letters were employed as neutral stimuli and were contrasted with the letter 'K'. Before the start of each block, an instruction screen appeared on the computer, indicating which stimuli would be the go-target and which stimuli would be the no-go target. Standard instructions required participants to facilitate a response to go targets (water bottle; alphabetical letters) and to inhibit a response to no-go targets (beer bottle; letter 'K'). Reverse instructions required participants to facilitate a response to no-go targets and inhibit

a response to go-targets. In addition, participants also heard either a bar-related sound (i.e., the 'clinking/clashing' of bottles), which cued their responses to the pictorial stimuli, or no sound.¹

Participants completed two short practice blocks of the GNAT followed by 16 critical blocks. Each block contained 70 trials, of which the initial five were discarded from analyses as practice trials. Each target was presented individually and alcohol-related and neutral targets were presented in separate blocks. Pictorial targets were presented following an onset asynchrony of 500 ms, and remained on the computer screen until a correct response was made (or up to a maximum 500 ms). A central fixation cross was displayed for 500 ms and preceded the target on each trial. Auditory cues occurred randomly for a short interval on 50% of trials (48 kHz). Table 1 shows the prevalence of stimuli type within each block. Fig. 1 presents a schematic exemplar of the trial procedure.

2.2.2. Alcohol Use Disorders Identification Test (AUDIT)

The AUDIT (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993) was utilized to ensure that there were no differences in typical drinking behavior between the stereotype threat and control condition. This 10-item questionnaire includes 4 sub-scales that assess patterns of alcohol consumption, drinking behavior, adverse reactions and problem drinking. Responses are recorded on a 5-point Likert scale (0 = *Never*, 4 = *4 or more times*). The AUDIT resulted in high internal consistency in the present sample, Cronbach's $\alpha = .85$.

2.2.3. Adult Temperament Questionnaire (ATQ)

The effortful control sub-scale of the ATQ (Rothbart, Ahadi, & Evans, 2000) was utilized to ensure that there were no differences in self-reported executive control between experimental conditions. This sub-scale includes 35-items which measure sub-components of attentional control, inhibitory control, and activation control. Responses are recorded on a 7-point Likert scale (1 = *Extremely untrue of you*, 7 = *Extremely true of you*). Each sub-scale resulted in high internal consistency, Cronbach's $\alpha > .70$. See Table 2 for participant demographics on these measures.

2.3. Procedure

Participants were assigned randomly to either the stereotype threat or the control condition. They were seated individually at a computer and were instructed to complete two practice blocks of the Cued GNAT. Before progressing on to critical trials, the experimenter then implemented the stereotype threat manipulation. Participants in the stereotype threat condition were given additional information that linked drinking behavior with diminished inhibitory control. Here they read the following information:

Research suggests that alcohol consumption is linked to cognitive deficits. Specifically, people who use alcohol are more impulsive, and therefore are less likely to inhibit behavior. The Go-No-Go task that you are about to complete is a direct test of impulsivity. As you are a drinker, it is predicted that you will show more impulsive reaction times on this task.

Participants in the control condition were informed that the experiment was investigating the influence of contextual factors on inhibitory control. As such, they were not primed with any negative stereotype regarding the links between alcohol consumption and inhibitory control. Upon completion of the GNAT, participants completed two questions

¹ A pilot study was conducted which also included a neutral sound cue (a supermarket background sound). Findings indicated that the neutral sound affected responding differentially to both alcohol-related and no sound, suggesting that different cues have distinct effects on inhibitory control. In the current study, we removed the supermarket sound to maximize any potential differences between alcohol sounds and no sound whilst also limiting the testing time.

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