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Context-dependent access to alcohol-related concepts stored in memory

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Key words: alcohol, context, memory

Abstract

It was investigated whether a verbal alcohol-related prime would promote accessibility of alcohol-related concepts stored in memory, and if so, whether such a priming effect would be more pronounced in a drinking-related environment. Participants were instructed to generate sentences with alcohol-ambiguous words after the presentation of a verbal alcohol-related stimulus, and after the presentation of a neutral prime in either a pub-like environment or an office-like setting. Participants generated more alcohol-related sentences in the pub than in the office. Presentation of the alcohol prime promoted the accessibility of alcohol-related concepts only in the participants having completed the sentence generation task in the office environment. The results suggest that, rather than facilitating the priming of alcohol cognitions, a drinking-related context functions as an alcohol cue directly promoting the access to alcohol-related concepts stored in memory.

Introduction

Learning and memory play important roles in the development and maintenance of addictive behaviour. In general, it is argued that drinking experience leads to the storage of alcohol-related information in associative memory networks containing a central conceptual node 'alcohol' and surrounding nodes describing cues and effects related to alcohol use (1). Due to frequent alcohol use, this alcohol-associative memory network will become increasingly elaborate and more tensely interconnected, and hence more accessible. Access to such alcohol-related concepts from memory are thought to be conducive to the expression of alcohol drinking behaviour (2).

Priming can facilitate access to these alcohol-related representations. In many studies, word association tasks have been used to study the activation of alcohol-related cognitions. For instance, Stacy et al. (3) primed alcohol-related cognitions by letting participants read alcohol outcome expectancies and asking the participants to write down the first behaviour that pops in mind. This study revealed that, in line with the assumption that alcohol-related cognitions are stored in memory in an associative network, heavier drinkers reported more alcohol-related behaviours. Stacy et al. (4) found similar results when they primed participants using alcohol-ambiguous words. Memory activation of alcohol cognitions has indeed been found to predict drinking behaviour. For instance, Roehrich and Goldman (5) found that priming of alcohol out-

come expectancies led to an increase in alcohol drinking behaviour. In addition, Stacy (6) reported results from a large prospective study showing that memory activation of alcohol-related cognitions predicts drinking behaviour.

The observed priming effect of alcohol-related representations shows considerable conceptual overlap with an associative learning-oriented view on alcohol use, which states that alcohol drinking behaviour leads to the formation of alcohol-related associations between alcohol cues, such as the perceptual characteristics of one's favourite alcoholic drink, and an alcohol effect. Alcohol cues come to predict an alcohol effect and thus come to elicit cue reactivity, such as an increase in the subjective urge to drink and psychophysiological responses (e.g. changes in heart rate and skin conductance level). Cue reactivity is thought to play an important role in maintaining drinking behaviour (7). Schulze and Jones (8) argue that alcohol cues may also lead to the activation of alcohol-related outcome expectancies. The notion that the activation of alcohol-related cognitions may be cue-reactive has also been proposed by Glautier and Spencer (9). Comparing light, moderate and heavy drinkers, they investigated whether alcohol-related cues could activate or facilitate access to alcohol-related concepts stored in memory. Participants had to generate sentences with alcohol-ambiguous words. More alcohol-related sentences were produced when alcohol cues had been presented prior to the task. Further, heavy drinkers were more prone to interpret alcohol-ambiguous words as being alcohol-related. On the basis of these results, one could argue that the activation of alcohol cognitions from memory can indeed be cue-reactive.

Since learning does not take place in a vacuum, but always against a specific array of background stimuli (e.g. environment, mood, and time), it is conceivable that contextual information also becomes encoded in memory during the learning of alcohol-related concepts, and hence may influence the accessibility of the alcohol-related memory network. Wall et al. (10) observed that environmental context (a bar versus a laboratory setting) influenced expectations regarding the effects of alcohol. Participants held more positive alcohol outcome expectancies in the bar than in the laboratory (11). Although these results indicate that contextual information affects the activation of alcohol-related cognitions, it is not clear how such contextual information is encoded in memory. Contemporary associative learning research has shown

that context need not be encoded as a stimulus directly associated with a given outcome. An environmental context can come to control, or modulate, the activation of a specific association in memory (12). With regard to alcohol drinking behaviour, a similar assumption was proposed by Drummond (13), who suggested that a drinking-related environment may not serve as a cue directly eliciting alcohol cue reactivity, but merely affects reactivity indirectly by increasing the perceived salience of an explicit alcohol-related cue.

In the present study, it was investigated whether alcohol-related concepts can be primed by the presentation of a verbal alcohol-related stimulus, and if so, whether the environmental context in which the prime is presented affects the degree of primed access to alcohol-related cognitions. It was expected that such a prime would promote the accessibility of alcohol-related concepts, particularly when presented in a drinking-related context.

Methods

Participants. A total of 70 participants took part in the experiment (13 men and 57 women aged 19.8 ± 3.3). Most participants were first-year psychology students at Maastricht University. The participants reported consumption of 9 ± 9.6 alcoholic drinks in the week prior to their participation in the experiment. Upon completion of the experiment, each participant was debriefed and received course credits or € 7.

Procedure, materials and design. Participants were randomly assigned to take part in the experiment in one of two environmental contexts. They were tested in groups of 7–12 in either a pub-like or an office-like setting. The pub was a dimly lit room at the psychology department building of Maastricht University, measuring ca. 30 m². It contained a wooden floor, 5 small wooden tables and 12 wooden chairs. A bar was placed at the left side of the room. On the left wall, behind the bar, bottles containing alcohol of different brands stood on wooden shelves. Mirrors were placed against the hind wall of the room, and different alcohol advertising posters hung on the remaining walls. The office setting was a brightly lit room at Maastricht University, measuring ca. 20 m², that contained a green carpet floor, and a large, white table surrounded by 12 desk chairs. A filing cabinet stood against the hind wall and a large whiteboard was placed against the front wall at the right from the exit.

Upon arrival, participants first received both verbal and written instructions and signed a consent form. Participants were told that the main purpose of the experiment was to qualitatively measure individual differences in creative writing. They were told that they would have to perform two sentence generation tasks. These tasks were largely based on the sentence generation task as described by Glautier and Spencer (9). Both tasks consisted of 15 words that were read and spelled out loud one at a time by the experimenter. Immediately after each presented word, the participants had 30 s to write down a sentence containing the presented word. The first word of each task was either 'beer' (a specific alcohol-related word), or 'milk' (a non-alcohol-related word). Of the other 14 words, 4 words had an alcohol-ambiguous meaning and the other words were neutral fillers. The number

of alcohol-related sentences generated with the ambiguous words served as the dependent variable. When the first word of the first sentence generation task had been 'beer', then 'milk' was the first word of the second task and vice versa.

After completion of the first sentence generation task, participants had to perform a spelling task. Each participant received a short text in which they had to indicate the spelling errors. The text did not hold any references to alcohol whatsoever and was intended to attenuate a potential carry-over effect of the semantic prime ('milk' or 'beer') presented on the first sentence generation task. After the spelling task, participants performed the second sentence generation task. Three independent raters separately classified the generated sentences as either alcohol-related or not, and the eventual classification was made on a majority rule basis (9).

After completing the second sentence generation task, each participant had to fill in a drinking history questionnaire on which they indicated the number of standard alcoholic drinks they had consumed during the week prior to their participation in the experiment. This Dutch questionnaire is based on the timeline follow-back procedure (TLFB), which is frequently used in alcohol and drug research and has proved to be a reliable measure of assessing drinking behaviour (14). Next, the participants were debriefed explaining the true purpose of the experiment, after which they received either course credits or payment.

Results

A verbal prime ('milk' versus 'beer') \times context (pub versus office) analysis of covariance was conducted with the number of drinks in the week prior to testing as the covariate and the number of generated alcohol-related sentences with the alcohol-ambiguous words as the dependent variable. The results are depicted in Figure 1.

A main effect of environmental context (pub versus office) was found ($F(1, 67) = 7.56, P < 0.01$), indicating that participants generated more alcohol-related sentences with the alcohol-ambiguous words in the pub than in the office. No main effect of the prime was found ($F(1, 67) < 1$). The covariate proved to be significant ($F(1, 67) = 4.68, P < 0.05$), indicating that the more alcohol one had drunk in the week prior to testing, the more alcohol-related sentences were generated. A prime \times context interaction effect was found ($F(1, 67) = 4.17, P < 0.05$), indicating that the prime

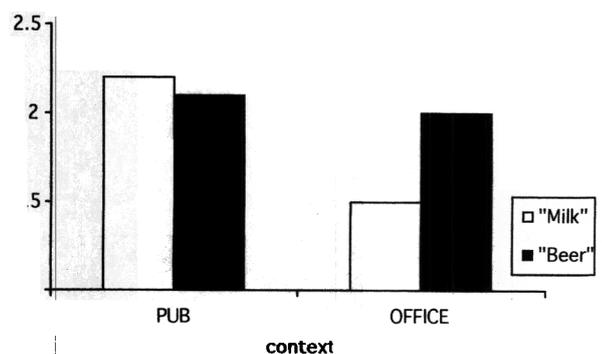


Figure 1. Mean number of alcohol-related sentences generated by the participants after the alcohol-related ('beer') and the neutral verbal prime ('milk') for each context (pub versus office).

did have an effect on the activation of alcohol-related cognitions but that this effect differs between the two groups.

Post-hoc *t*-tests revealed that for the participants in group Pub, the prime ('milk' or 'beer') did not affect the interpretation of the alcohol-ambiguous words ($t = 0.68$, n.s.), whereas the word 'beer' did promote an alcohol-related interpretation of the ambiguous words in the participants tested in the office ($t = 2.17$, $P < 0.05$).

Discussion

It was hypothesized that environmental context would indirectly affect priming of alcohol-related concepts stored in memory. No support for this hypothesis was found. Rather than controlling the degree of priming by a verbal alcohol stimulus, an alcohol-related environment directly appears to facilitate access to the alcohol-related memory network. Alcohol-ambiguous words were more easily interpreted as alcohol-related when presented in the pub than when presented in the office. These results provide further evidence for the view that the activation of alcohol-related concepts from memory can be facilitated through priming. The presentation of a verbal alcohol stimulus, exposure to an alcoholic drink (9) and exposure to a drinking-related setting can all promote the access to an alcohol memory network. The results also demonstrate that the priming effect of these alcohol-related stimuli and contexts do not simply add up (15). Further, the results extend previous findings that alcohol memory accessibility is affected by prior alcohol drinking experience, indicating that alcohol-related concepts are acquired and stored in memory in an associative manner (9).

Although these findings appear to be quite straightforward, there is an alternative explanation for the apparent context-dependent activation of alcohol-related concepts. A drinking-related environment, such as a pub, comprises a constellation of distinct alcohol-related stimuli. It is possible that not the entire alcohol-related context, but rather a single, specific feature of this environment promoted access to the alcohol-related meaning of the ambiguous words. It could well be that any other type of context that does not comprise such a constellation of specific alcohol cues (e.g. physiological state, mood or time of day) will affect the priming of alcohol-related cognitions in a more indirect manner. Greeley and Ryan (16) suggest that a withdrawal state may function as an internal context signalling that drug-taking behaviour will be negatively reinforced. In other words, an internal contextual variable might control the meaning of drug-related cues and subsequent drug-taking behaviour. However, whether such contextual information will indirectly affect the extent to which a specific alcohol-related cue can activate alcohol cognitions from memory remains to be examined. Further, it should be noted that participants in the present study were either tested in an office-like or a pub-like environment. Both contexts were situated in the Maastricht University psychology department building. More outspoken or even a different pattern of results might have been found if participants had been tested in either a real pub or office.

It has been demonstrated that particularly positive

alcohol outcome expectancies are more strongly activated in a drinking-related environment. The differential memory activation of alcohol-related cognitions across settings may provide an account for the observed contextual variability in alcohol consumption (10, 15, 17). Our findings provide support for this situational-specificity hypothesis. However, determining the exact relation between context-specific activation of alcohol-related cognitions, the motivation to consume alcohol and subsequent alcohol drinking behaviour requires further experimental testing.

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