Activating Action Tendencies: The Influence of Action Priming on Alcohol Consumption Among Male Hazardous Drinkers*

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ABSTRACT. Objective: Despite the importance of action components in information processing models of substance-use motivation, there has been relatively little research that has specifically examined the effects of behavioral cues on motivation to use alcohol. The current study examined the effects of action priming on alcohol-use motivation. **Method:** One hundred and eighty-eight hazardous drinkers completed a cue-exposure procedure followed by a beer-tasting task. Participants were exposed to their preferred alcohol beverage while they either lifted the beverage (action prime) or leaned toward the beverage (control). Following alcohol-cue exposure, participants completed a taste-test procedure in which they sampled three glasses of beer. Urges to drink following cue exposure and volume of beer consumed during the taste test were the primary dependent variables. **Results:** Ratings of urge to drink increased in both prime conditions following alcohol-cue exposure and predicted the amount of beer consumed. The priming conditions did not differentially influence urge; however, there was a significant Prime × Gender interaction for volume of beer consumed. Men in the action-prime condition consumed more alcohol in the subsequent taste-test procedure than men who were in the control condition. **Conclusions:** These results suggest that behavioral sequences associated with drinking may prime alcohol-related motivational states among hazardous-drinking men. Moreover, these action primes may affect subsequent alcohol use independent of changes in subjective indices of alcohol-related motivation. Implications for understanding the distinct effects of alcohol-related cues on controlled and automatic processes underlying alcohol use are discussed. (*J. Stud. Alcohol* **67:** 926-933, 2006)

DOES THE SELF-CONTROL OF ALCOHOL USE become more difficult after the first drink? Researchers from a variety of disciplines have attempted to understand the conditions under which alcohol consumption may be associated with self-control failure and identify the mechanisms that underlie such effects. Both alcohol-related stimuli and priming doses of alcohol have been shown to influence processes associated with appetitive motivation and inhibitory control (e.g., deWit and Richards, 2004; Fillmore and Rush, 2001). In addition to changes in cognitive processing capacity available for self-control (Baumeister and Heatherton, 1996), cognitive resources may be increasingly directed to expectations of reinforcing effects, cues of reinforcement, and subjective experiences associated with desire to use once individuals have initiated substance-use behaviors (Sayette, 2004).

Although there has now been extensive research on the effects of environmental cues on alcohol-use motivation (Carter and Tiffany, 1999), comparatively little research has been conducted on the effects of alcohol-related behavior on subsequent alcohol-use motivation. The consumption of the initial drink presents the individual with a complex set of cues that includes drinking environment, the alcoholic beverage itself, and behavioral patterns associated with alcohol consumption. Alcohol use involves a variety of actions related to obtaining, preparing, and consuming beverages. With repeated use, these behaviors may come to function as cues for substance-related reinforcement (Coffey and Lombardo, 1998; Ehrman et al., 1992).

A number of investigators have suggested that these cues influence subsequent substance use through the activation of cognitive-motivational representations (Baker et al., 1987; Goldman and Rather, 1993; Stacy, 1997; Tiffany, 1990). Although there are important distinctions among the various information processing models, many approaches have described these alcohol-related representations as memory networks that contain information about alcohol-related cues, reinforcement expectancies, and/or response elements (Baker et al., 2004; Goldman and Rather, 1993; Niaura et al., 1991; Stacy, 1997; Tiffany, 1990). According to this perspective, those who are heavier drinkers have alcohol-related representations that are more extensive, more tightly integrated, more likely to be activated in response to relevant cues (Baker et al., 1987; Goldman and Rather, 1993; Niaura et

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al., 1991). The more similar that stimulus cues are to those that are typically present during episodes of alcohol use, the more likely that these motivational networks will be activated and result in prototypical drinking behavior (Baker et al., 1987). Thus, drinking in any given episode is more likely to reflect typical alcohol-use behavior when stimulus conditions are more closely related to usual drinking episodes.

Action elements in substance use models

Investigators have incorporated behavioral components in their information processing models of alcohol-related motivation in a variety of ways (Baker et al., 2004; Goldman and Rather, 1993; Stacy, 1995; Tiffany, 1990). Some have conceptualized behavioral components in terms of general approach dispositions that are associated with other indices of substance-use motivation (e.g., Baker et al., 2004; Stewart et al., 1984). This "readiness to act" is distinct from behavior itself, instead reflecting the engagement of motivational systems (Lang, 1995; Toates, 1986).

Others (e.g., Tiffany, 1990) have suggested that substance-related memory representations may include information about specific action sequences associated with use. Tiffany (1990) has suggested that with repeated use, substance users develop specific action schemata, which consist of integrated information elements that underlie the initiation and execution of skills for substance-use behavior. As these behaviors occur repeatedly in the context of repeated cues (e.g., specific beverages, locations), substance-use schema may come to operate rapidly, efficiently, and without the need of intentional processes. According to this view, substance-use behavior may become automatic and operate in a manner that is distinct from self-report indices of substance-use motivation such as urges.

Deutsch and Strack (2006) have suggested that behavioral schemata that underlie addictive behaviors receive input from both consciously controlled and automatic sources. Behavioral schemata that mediate substance use derive input from the reflective system that provides input about the desirability and feasibility of action based on symbolic, abstract representations and an impulsive system that is based on learned associations between cues, valences, and actions which operates automatically. As Deutsch and Strack (2006) suggest, these systems often work together to guide behavioral choices. Each system contributes to the activation of behavioral schemata and may be activated by different contexts.

Although there is relatively little experimental research on the effect of specific behaviors on alcohol-related motivation, research on evaluative processing has shown that actions may prime subsequent motivational states (Neumann et al., 2003). A number of studies have shown that action may facilitate compatible evaluative processes when that action is linked with corresponding evaluations (Neumann et al., 2003). The effects of behavior on evaluative processing have been replicated with a variety of action-related primes and evaluative indices (Cacioppo et al., 1993; Chen and Bargh, 1999; Stepper and Strack, 1993; Neumann and Strack, 2000). Chen and Bargh (1999), for example, found that participants were faster to identify words as positive when the response required the action of "bringing toward" versus "pushing away." Similarly, Cacioppo et al. (1993) found that motor responses associated with approach versus avoidance (i.e., arm flexion versus arm extension) influenced evaluative judgments of previously neutral stimuli. Neumann et al. (2003) have suggested that behavioral dispositions and evaluations may have reciprocal relations in memory and that behavioral orientations may activate evaluative processes in memory automatically in a manner that is separate from actual response selection. According to this view, evaluative processes are not linked with specific behaviors but rather broad behavioral orientations of approach and avoidance that are realized at the mental level (see also Lang, 1995).

This does not mean, however, that behaviors cannot function to prime specific actions. Research on motor behavior, for example, has shown that actions may be facilitated by the previous enactment (Edwards et al., 2003) or even perception (Brass et al., 2001) of compatible behaviors. Studies of mimicry, for example, have shown that subjects who observe others performing behaviors are more likely to exhibit similar behaviors even though they remain unaware of their actions (Chartrand et al., 2005). Thus, previous research suggests that actions may prime both subsequent general action tendencies associated with motivational states and specific behaviors.

Current study

Although behaviors have been incorporated into cues in previous work (Coffey and Lombardo, 1998), the specific effects of behavioral activation (as opposed to other sensory cues) on alcohol-related motivation remain largely unknown. The current study was designed to examine how action-related primes may influence alcohol-use patterns among hazardous drinkers. Young adult hazardous beer drinkers were exposed to a cue-exposure procedure in which they were asked to either lift and sniff their most frequently consumed alcoholic beverage (action-prime condition) or lean toward the beverage and sniff when cued (control condition). The effects of cue exposure on urges to drink and subsequent alcohol consumption on a beverage taste test were then assessed. It was hypothesized that those in the action-prime condition would show stronger urges to drink and greater alcohol consumption when subsequently given access to their preferred alcoholic beverage as part of a taste test.

Method

Participants

One hundred and eighty-eight hazardous drinkers, defined by scores of 8 or greater on the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) were recruited from local newspaper and university job boards to participate in the study. Eligibility requirements included age between 21 and 35 and English as a first language. Because the study involved the consumption of beer, only participants whose most frequently consumed alcoholic beverage was beer were included. Those who currently used medications (other than oral contraceptives), were nursing or pregnant (confirmed by urine test), exhibited elevated symptoms of alcohol dependence (scores of 9 or greater on the Alcohol Dependence Scale [Skinner and Allen, 1982]), or had sought treatment for substance abuse or dependence were excluded. The mean (SD) age of participants was 22.56 (2.65) years old and mean AUDIT score was 11.22 (2.74). Participants drank an average of 13.88 (5.45) days during the previous month and consumed a mean of 4.62 (2.25) drinks per occasion. Alcohol-related characteristics by gender are presented in Table 1.

Design

The study was a between-subjects design with prime as the main independent variable. Because of expected differences in consumption, assignment to conditions was stratified by gender.

Measures

AUDIT. The AUDIT (Saunders et al., 1993) is a 10-item screening instrument used to identify persons whose alcohol consumption patterns may put them at risk for alcohol-related harm. The self-report instrument, which has been extensively validated in a number of countries, provides information about heavy alcohol use, symptoms of alcohol dependence, and alcohol-related problems.

Alcohol Dependence Scale (ADS). The ADS (Skinner and Allen, 1982) is a 25-item, self-report measure that provides a quantitative index of alcohol-dependence severity. The ADS has been shown to be a reliable and valid instrument for assessing level of dependence (Skinner and Allen, 1982).

Timeline Followback-30 days (TLFB-30). The TLFB-30 (Sobell et al., 1988), a calendar-based, interviewer-administered instrument, was used to assess alcohol consumption patterns during the previous month. It has been used extensively with a wide range of drinking populations and has been shown to be a highly reliable and valid instrument of drinking quantity, frequency, and heavy drinking episodes. The research assistant administered the TLFB following consent procedures and the collection of demographic data. A series of alcohol-use indices may be derived from this measure including total quantity of consumption in the past month (TFLB-Q) and number of drinking days (TLFB-F).

Urge to drink alcohol. Urge-to-drink ratings (Monti et al., 1993) were taken at several points during the procedure using an 11-point Likert scale. These ratings have been used in several previous studies and have shown to be well-validated self-report measures of urges to consume alcohol (Monti et al., 1993; Palfai, 2001).

Affect grid. This measure (Russell et al., 1989) assesses two central dimensions of affect, pleasure-displeasure and arousal-sleepiness (Russell, 1979). Participants rate their affect by placing an X within a 9 × 9 grid that is anchored with affect descriptors. Scores for arousal and valence are computed on single 9-point scales based on the placement of the X. Research has demonstrated its convergent and discriminant validity with more extensive measures of affect (Russell et al., 1989).

Beer taste test. Participants were asked to complete a taste-test procedure that was modeled on the work of Marlatt et al. (1973). In this task, participants were presented with three 12-oz glasses of beer. They were told that they would be asked to rate the beers on a series of adjectives after they had an opportunity to try them. Examples of the adjectives were provided to the participants. Participants were asked to sample as much or as little of each beverage as they liked that was necessary for them to adequately make judgments about the beverages. Following the instructions, participants were signaled to begin the consumption and their sip frequency was unobtrusively observed. Although taste-test procedures are often longer (Kidorf et al., 1990; Marlatt et al., 1973), the current procedure reduced the duration between the prime and the task completion to maximize the ability to detect priming effects. Participants were allowed 5 minutes to consume the alcohol during which

TABLE 1. Mean (standard deviations) scores on indices of alcohol involvement, by gender and prime condition

	Men (n = 98)		Women (n = 90)	
Variable	Control (n = 49)	Action (n = 49)	Control (n = 48)	Action (n = 42)
AUDIT	11.9 (3.9)	11.4 (3.5)	10.6 (3.5)	11.1 (3.2)
TLFB-Q	72.53 (38.8)	70.71 (32.9)	52.2 (25.9)	47.8 (17.3)
TLFB-F	15.2 (6.3)	14.9 (5.8)	12.6 (4.6)	12.6 (4.3)
TLFB-HV	5.8 (4.4)	6.2 (4.2)	6.6 (3.8)	5.5 (3.5)

Notes: Within-gender t tests did not indicate any significant differences between control and action-prime conditions on any of the alcohol variables. AUDIT = Alcohol Use Disorders Identification Test; TLFB-Q = Timeline Followback-Quantity (total alcohol consumption in the past month); TLFB-F = TLFB-Frequency (frequency of alcohol consumption in the past month); TLFB-HV = TLFB-Heavy (frequency of heavy drinking episodes [men: ≥5 drinks per occasion; women: ≥4] in the past month).

time the experimenter recorded the number of times that each participant brought the glass to his or her lips to drink. At the end of the 5-minute period, the experimenter removed the beverage from the room. The main variable of interest in this paradigm is beer volume consumed (Marlatt et al., 1973; Roehrich and Goldman, 1995; Stein et al., 2000); however, sip frequency was also recorded through a one-way mirror as an additional component of drinking topography (George et al., 1988).

Procedure

Participants were randomly assigned to a condition that was blocked by gender. After completing the pre-experimental procedures (e.g., breath alcohol analysis to confirm absence of alcohol, pregnancy test for women, consent form), participants completed an interviewer-administered TLFB. Following a brief rest period, participants began a series of questionnaire measures. At the end of the questionnaire phase, the baseline Affect Grid and urge-to-drink-alcohol measures were completed (baseline assessment). The cue-exposure component of the experiment was then initiated. Each participant was first instructed on the cue-exposure procedure by the experimenter who demonstrated the task using an empty glass. The specific instructions during this practice phase were determined by the condition to which the participant was assigned. Those in the action-prime condition were instructed to lift the beverage toward them when signaled. At the sound of a high tone, they were asked to lift the beverage and bring it toward their lips and hold it 6 inches from their nose; at the sound of a low tone, they were asked to place the glass back on the table and continue to hold it. Those in the control condition were asked to lean toward the beverage while holding it on the table and remain 6 inches from the glass when signaled by the high tone and return to an upright position when signaled by a low tone.

Following these instructions, each participant completed a series of three 2-minute cue-exposure trials. On the first trial, participants were exposed to a glass and a bottle of water (Monti et al., 1993). During this water cue-exposure trial, participants responded to the high and low tones in accord with their assigned experimental condition (i.e., action prime or control). Following the water-cue exposure, participants completed the Affect Grid and urge-to-drink-alcohol measures (water-cue assessment). Participants were then presented with a glass and a bottle of a preferred beer, and they were told that they would be asked to consume beer at some point during the study. They then began an alcohol cue-exposure trial in which they responded to tones in the same manner as they had in the water cue-exposure trial (i.e., either lifting the beverage or leaning toward it when signaled by the high tones). Following the first alcohol trial, participants were asked to complete urge and affect measures (alcohol-cue assessment). On the second alcohol trial, participants were again asked to either lift or lean when cued by tones for 2 minutes more. Urge or affect ratings were not taken following this second trial. Participants were then instructed on how to complete the beer taste-test procedure described above.

Results

Effects of action priming on urge and affect responses

Urge-to-drink ratings were taken at baseline, following the water-cue exposure and following the first alcohol-cue exposure. Urge and affect ratings by gender are presented in Table 2. To examine whether the priming task similarly influenced urges to drink, an analysis of variance (ANOVA) was conducted on urge-to-drink outcomes following cue exposure. These three levels were analyzed to see whether the action prime increased urge-to-drink responses and whether this was specific to alcohol cues. A between-within ANOVA was conducted with gender and prime conditions as the between-subjects variables. Analyses showed only a main effect of trial ($F = 179.72$, 2/183 df, $p < .001$). Within-subject contrasts showed that alcohol-cue responses (mean [SD] = 5.28 [2.48]) were significantly stronger ($F = 334.24$, 1/184 df, $p < .001$; partial $\eta^2 = .64$] than water-cue responses (mean = 2.64 [2.31]), and this effect did not differ by gender or by prime condition. Urge responses following the alcohol cue were similar in action prime (mean = 5.27 [2.44]) and control (mean = 5.29 [2.54]) conditions, suggesting that both conditions elicited urges to drink.

Parallel analyses conducted on ratings of the Affect Grid (Russell et al., 1989) also showed a main effect of trial for both pleasure ($F = 11.99$, 2/182 df, $p < .001$) and arousal ($F = 53.05$, 2/181 df, $p < .001$). Within-subject contrasts

TABLE 2. Mean (standard deviation) urge and affect ratings to cues, by gender and prime condition

	Men					
	Control ($n = 49$)			Action ($n = 49$)		
Variable	Baseline	Water	Alcohol	Baseline	Water	Alcohol
Urge to drink	2.9 (2.3)	2.9 (2.3)	5.3 (2.3)	2.7 (2.4)	2.8 (2.4)	5.2 (2.5)
Pleasantness	6.4 (1.5)	6.5 (1.4)	6.6 (1.6)	6.6 (1.2)	6.3 (1.6)	6.8 (1.2)
Arousal	5.2 (1.7)	5.3 (1.6)	6.2 (1.7)	4.9 (1.6)	5.2 (1.6)	6.0 (1.6)
	Women					
	Control ($n = 48$)			Action ($n = 42$)		
	Baseline	Water	Alcohol	Baseline	Water	Alcohol
Urge to drink	2.9 (2.7)	2.4 (2.3)	5.3 (2.8)	2.6 (2.4)	2.5 (2.2)	5.3 (2.4)
Pleasantness	6.5 (1.5)	6.2 (1.6)	6.7 (1.4)	6.8 (1.2)	6.5 (1.4)	6.9 (1.3)
Arousal	5.3 (1.8)	5.1 (1.9)	6.0 (1.9)	4.8 (1.7)	5.4 (1.6)	6.2 (1.6)

showed that both pleasure (F = 24.43, 1/183 df, $p < .001$; partial η^2 = .12) and arousal (F = 89.67, 1/182 df, $p < .001$; partial η^2 = .33) were higher following alcohol-cue exposure ($mean_{pleasure}$ = 6.74 [1.36]; $mean_{arousal}$ = 6.08 [1.69]) than following water-cue exposure ($mean_{pleasure}$ = 6.35 [1.48]; $mean_{arousal}$ = 5.25 [1.67]). There was no significant Trial × Gender, or Trial × Prime interaction observed, nor was there a main effect for either gender or prime on ratings of valence and arousal.

Effects of action priming on alcohol consumption

To investigate the influence of action priming on alcohol consumption, a 2 (Gender) × 2 (Prime) ANOVA was conducted. Mean volume of beer consumed by gender is presented in Figure 1. This analysis showed a Gender × Priming interaction (F = 5.24, 1/183 df, p = .02). Simple effects analyses were conducted separately by gender and showed that men, but not women, exhibited greater alcohol consumption in the action-prime condition compared with those in the control condition (F = 4.77, 1/96 df, p = .031). There were no significant differences observed for women (F = 0.88, 1/87 df, p = NS). Analyses of the number of sips taken during the taste-test phase revealed no significant differences by gender or group ($mean_{male\ control}$ = 16.14 [5.97], $mean_{male\ action\ prime}$ = 16.06 [6.20], $mean_{female\ control}$ = 15.52 [5.13], $mean_{female\ action\ prime}$ = 15.78 [5.69]). Secondary analyses were also conducted on consumption controlling for body weight and did not change the pattern of results.

Predicting consumption from alcohol-cue urge response and prime condition

Although the priming conditions did not influence urges, ratings of post-cue-exposure urge-to-drink ratings were associated with higher volume consumed in the taste test for both men (r = .39, 96 df, p = .001) and women (r = .23, 87 df, p = .028). A hierarchical regression analyses was conducted to examine the independent predictive value of the priming condition and urge responses among men. The priming manipulation and urge ratings following exposure to the alcohol cue accounted for more than 20% of the variance in drinking when entered on the same step (R^2 change = .45; F = 12.08, 2/95 df, $p < .001$). The priming manipulation (β = .22, p = .02; t = 2.45, 1/95 df, p = .02) and urge to drink (β = .39, $p < .001$; t = 4.30, 1/95 df, $p < .001$) each significantly predicted volume consumed for men.

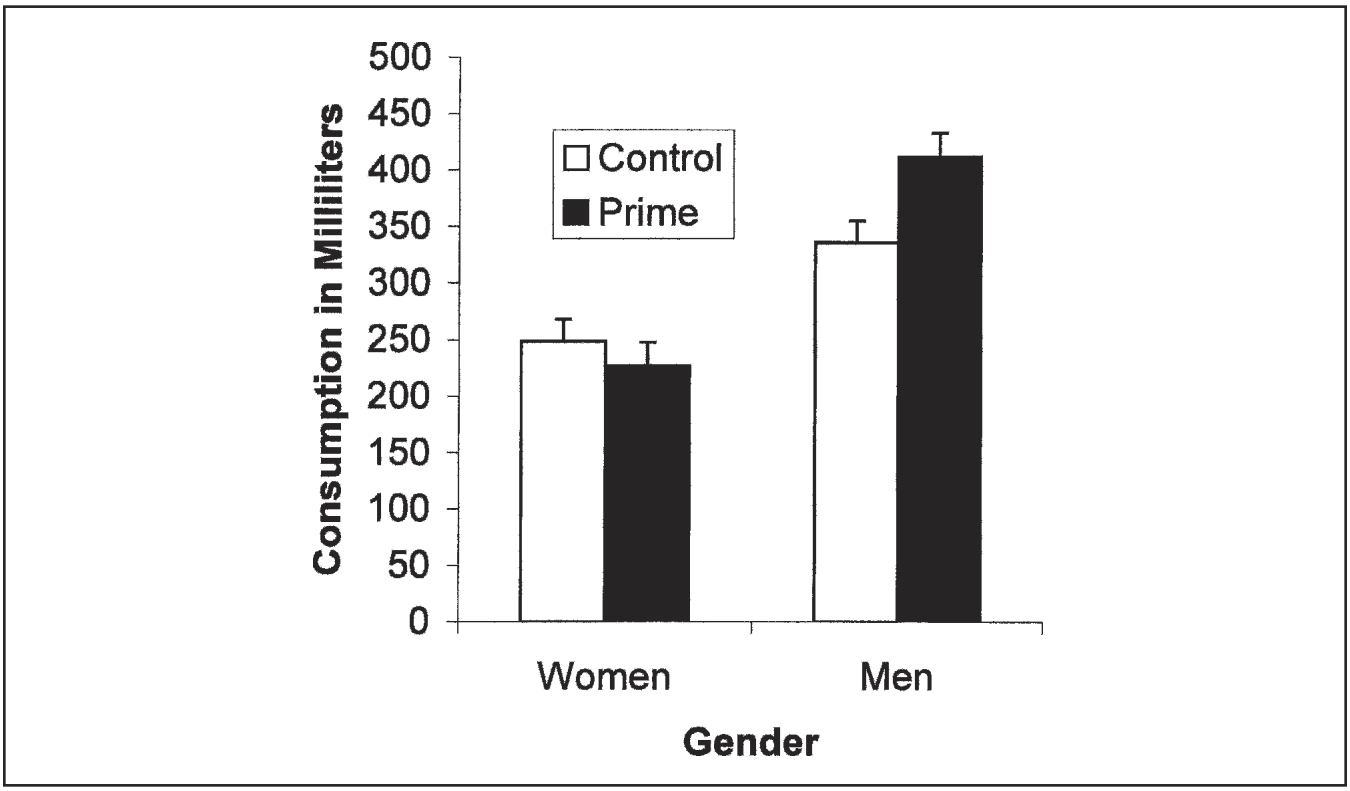

FIGURE 1. Mean volume (in milliliters) of beer consumed during the taste test, by prime condition and gender (values are means and standard error of measurement)

Discussion

The effects of initial alcohol use on subsequent efforts at self-control are, in part, influenced by its effects on alcohol-related motivational systems. A number of studies have shown that environmental cues (e.g., sight and smell of alcohol) may increase alcohol-use motivation among alcohol-dependent (Monti et al., 1993) and nondependent drinkers (e.g., Palfai, 2001; Schulze and Jones, 1999). Results of the present study suggest that behaviors associated with alcohol use may also serve to prime alcohol-related motivational states. Male participants who engaged in a behavior that was associated with alcohol consumption (i.e., lifting a beverage) consumed more alcohol when they were subsequently allowed to consume alcohol. Although previous studies have incorporated behavioral elements into their cue-exposure procedures (e.g., Monti et al., 1993), the unique effects of behavioral components on subsequent alcohol consumption have not been examined.

In the present study, this increase in alcohol consumption during the taste test did not appear to be due to specific behaviors associated with the prior priming manipulation (i.e., participants did not exhibit more lifting during the taste test). Men in the action-prime condition did not show more frequent sipping of the alcohol beverages but rather exhibited a greater volume of alcohol consumed. These results suggest that individuals may activate alcohol-related motivational systems through actions associated with alcohol use rather than prime specific behaviors.

However, the higher volume of beer consumed by men in the action-prime condition was not mediated by urges to drink. Those in the action-prime and control conditions both showed higher urges to drink alcohol when exposed to alcohol cues compared with baseline. Although urges did not account for the observed priming effects, the strength of urge responses to alcohol cues did predict the amount of alcohol consumed during the taste test. Consistent with previous work with hazardous drinkers (Palfai, 2001), urge-to-drink ratings following cue exposure were associated with the volume of beer consumed. Indeed, the subjective experience of urge to drink following alcohol-cue exposure and the prime condition predicted unique variance in alcohol consumption during the taste test. Such findings are consistent with the view that alcohol-related behaviors and subjective responses may represent independent components of alcohol-use motivation (Tiffany, 1990). Actions associated with alcohol consumption may prime alcohol-use motivation independent of its effects on urges.

Although the priming manipulation may have influenced alcohol-use motivation, other possible mechanisms for these effects should be considered. For example, the control and action priming conditions may have elicited different action identifications (Vallacher and Wegner, 1987) for the taste test. Those who interacted with the alcoholic beverage in manner that is inconsistent with their typical mode of responding (i.e., those in the control condition who leaned toward the beverage) may be more likely to represent that action in terms of lower-level identification. This lower-level identification may function to make drinkers more aware of their drinking actions and consequently be less likely to drink automatically (Wegner et al., 1989).

Results from this study suggest that the action cues may prime the drinking behavior of men but not women. These differences are consistent with other work that suggests that different stimuli may have distinct gender effects on alcohol-related motivational processes (Glautier and Spencer, 1999; Rubonis et al., 1994; Willner et al., 1998). Gender differences in frequency and quantity-of-beer consumption may in part account for these findings (Glautier and Spencer, 1999), as men typically consume more alcohol than women. However, features of experimental procedures should also be considered, as previous research suggests that certain taste-test procedures may have different ecological validity for men and women (Kidorf et al., 1990). In the current study, partial correlations (controlling for prime condition) showed that quantity of alcohol use in the past month (i.e., TLFB-Q) was associated with volume of beer consumed in the taste test for men ($pr = .33$, $p < .001$) but not for women ($pr = .06$, $p =$ NS). Future research must examine whether similar gender differences are observed with (1) alternative action primes and (2) behavioral indices of alcohol-use motivation that show similar ecological validity for men and women.

Limitations

This study provides preliminary evidence that procedural responses may prime alcohol-use motivation among male hazardous drinkers. However, there are limitations of study that should be considered when interpreting these results. First, this initial study was conducted with alcohol conditions only. All participants were exposed to both a water and alcohol trial. Thus, it is possible that these findings are the product of a general approach activation system, rather than behavior that is specific to beverage consumption. The use of neutral, nonalcohol appetitive beverage, and alcoholic-beverage conditions will be important conditions in future studies that seek to identify the mechanisms that underlie these effects. Second, the study used only a single taste-test task to assess alcohol-related behavior. Taste-test procedures that require participants to differentially attend to subjective experience while consuming alcohol may be important in this regard (e.g., George et al., 1988; Kidorf et al., 1990; Marlatt et al., 1973). Moreover, alternative measures such as behavioral-choice paradigms (Vuchinich and Tucker, 1988) and latency-choice procedures (Davidson et al., 2003) may provide an opportunity to disentangle the effects of priming on choices to initiate versus continue

alcohol-related behavior. Finally, it should be emphasized that this study was conducted with a relatively homogeneous group of hazardous drinkers who were young adults and consumed beer as their preferred beverage. Given the hypothesized effects of action priming, future work would benefit from the inclusion of drinkers with a wider range of alcohol involvement. The relative influence of behavioral activation should be stronger among those who are alcohol dependent, for example. Conducting studies among samples with problematic patterns of alcohol use may help clarify the different effects observed by gender in the current work. Finally, the effects of priming on the consumption of different beverage types remain to be explored.

Summary and implications

Despite these limitations, the current study provides important evidence about the potential role of action representations in substance-related motivation. Although a number of theorists have suggested that action tendencies may be important elements of alcohol-use motivation (e.g., Niaura et al., 1991; Tiffany, 1990), there has been relatively little systematic investigation of the effects of action-related cues on alcohol-use motivation. The study of these information-processing representations of behavioral elements and study of procedural effects on alcohol-use motivation is an important area to explore, especially for our understanding of how self-control processes may be influenced by initial alcohol consumption.

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