Automatic Alcohol Associations: Gender Differences and the Malleability of Alcohol Associations Following Exposure to a Dating Scenario*

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ABSTRACT. Objective: Little research has examined contextual influences on implicit measures of alcohol-related cognitions. The current study investigated whether contexts involving alcohol or social dating would affect automatic alcohol approach-avoid associations. **Method:** Undergraduates ($n = 112$ women, 109 men) completed an Implicit Association Test (IAT) that measured alcohol approach-avoid associations before and after reading a vignette about a date that differed on two dimensions: (1) whether alcohol was present or absent and (2) whether the date ended in attraction or friendship. **Results:** When the vignette

included an alcohol context, alcohol IAT scores increased from baseline (e.g., increased alcohol and approach associations). In a nonalcohol context, alcohol IAT scores increased from baseline when the date was not successful but not when it was successful. **Conclusions:** These results contribute to social cognitive science by indicating not only that social contexts with alcohol can influence automatic alcohol associations but also that social contexts without alcohol can influence automatic alcohol associations. (*J. Stud. Alcohol Drugs* 70: 583-592, 2009)

ADDICTION RESEARCHERS USE the construct of Automatic mental processes (Shiffrin and Schneider, 1977) to model the nonvolitional nature of addiction (see Goldman et al., 1991; Tiffany, 1990; Wiers and Stacy, 2006). Automatic processes are differentiated from controlled processes in that automatic processes are often defined as being unintentional, efficient (i.e., effortless), difficult to control, or possibly outside of awareness, whereas controlled processes are defined as being intentional, reliant on limited attentional resources, controllable, and within awareness (Bargh, 1994). Although substance use may begin as a function of controlled processes, repeated episodes of substance use may result in automatic processes playing a larger role in substance use (Oei and Baldwin, 1994). For example, early in a person's drinking career, a person might experience distress

and consider a variety of possibilities—including calling a friend, watching television, or having a drink—to cope with the distress. Should that person make the (effortful, deliberate) choice to drink and make the same choice in similar circumstances, alcohol will become increasingly associated in that person's mind with distress. Over time, it is theorized that thoughts of alcohol will occur during periods of distress without deliberation or introspection (i.e., distress will automatically activate thoughts about alcohol). Thus, alcohol can shift from being a strategy deliberately chosen as one of several strategies to a "strategy" that appears in one's mind without intention or control.

In the social cognition literature, a distinction is made between (1) implicit or indirect measures that assess processes presumed to be more automatic and (2) explicit or self-report measures that assess processes presumed to be more controlled and, perhaps, more susceptible to intentional and unintentional response biases and demand characteristics. The most widely used implicit measure is the Implicit Association Test (IAT; Greenwald et al., 1998). The IAT provides an indirect measure of the strength of associations among concepts by having participants categorize stimuli from four categories using one of two response keys. The IAT is based on the premise that stronger associations between concepts result in faster response times when they share the same response key than when they do not share the same response key.

The IAT has been used to assess a variety of alcohol-related associations. IATs assessing alcohol's association with

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valence (positive vs negative; Jajodia and Earleywine, 2003; Wiers et al., 2002) and arousal (arousal vs sedation; Wiers et al., 2002) predicted self-reported alcohol consumption. Palfai and Ostafin (2003) used the IAT to examine alcohol-action tendencies (approach/avoid) because action tendencies underlie several motivational accounts of substance use (Baker et al., 1987; Stewart et al., 1984). It positively predicted frequency of heavy drinking episodes, average quantity consumed per occasion, urge response to alcohol cues, and difficulty controlling alcohol-use behavior. Moreover, the alcohol-action tendency IAT is positively correlated with drinking behavior in the laboratory (Ostafin et al., 2008). The IAT accounts for unique variance in drinking over and above explicit alcohol-related measures (R^2 -change ranges from .04 to .10; Ostafin and Palfai, 2006; Thush and Wiers, 2007; Wiers et al., 2002).

The research on automatic alcohol-related associations is relatively new, and much remains to be learned. Important issues are whether and in what contexts such alcohol associations are likely to be activated. Initial research with explicit measures of alcohol-related associations suggests that positive outcome expectancies are activated in alcohol-related contexts (Wall et al., 2000, 2001), but only one study has been conducted with an implicit measure (Stacy et al., 1994). Stacy et al. (1994) found that, compared with participants who read a vignette in which alcohol was absent, participants who read a vignette in which alcohol was present were more likely to endorse alcohol-related behaviors in an outcome association task (i.e., writing the first behavior that comes to mind after seeing an outcome prime, such as "feeling more relaxed"). Additional research is necessary to understand the role of context in automatic alcohol associations, especially environments in which alcohol is present or likely to be present.

Alcohol and social interaction/dating

The ubiquity of alcohol's association with social interaction among college students has been documented in multiple domains, including social factors (e.g., Borsari and Carey, 2001; Neighbors et al., 2007a), social motives (e.g., Cooper et al., 1992, 1995), and social expectancies (e.g., Baer, 2002; Burden and Maisto, 2000). Echoing theories of implicit social cognition (e.g., Greenwald and Banaji, 1995), an assumption of the present study is that the connections between social interactions and drinking may result in associations in memory between alcohol and social interaction; that is, associations about alcohol may be automatically activated by being in or thinking about certain social contexts. Preliminary evidence suggests this activation occurs in situations where alcohol is present (e.g., Stacy et al., 1994), and it may also occur in contexts without alcohol. Dating contexts are among those social contexts in which automatic alcohol-related associations might be likely to be activated because

of the strong links among alcohol and romance and sex (e.g., Crowe and George, 1989; George and Stoner, 2000).

Early dating is potentially stressful and may lead to activations of alcohol associations because of alcohol's anxiolytic or tension-reducing effects (Cooper et al., 1988, 1992; George and Stoner, 2000; Greeley and Oei, 1999). Behavioral categories related to alcohol (e.g., approach vs avoid) may be influenced in dating situations regardless of the actual presence of alcohol or alcohol-related cues. To the extent that alcohol is associated with anxiolytic effects, associations with alcohol and approach might increase (and/or associations with alcohol and avoid might decrease) after an unsuccessful first date (e.g., feeling "no spark" and seeing one's date as "just" a friend) in comparison with a successful one (e.g., feeling "a spark" and seeing one's date as a potential romantic partner). Alternatively, alcohol is also associated with celebrating personally significant events (Neighbors et al., 2007a). To the extent that a successful date is associated with celebrating, associations with alcohol and approach might increase (and/or associations with alcohol and avoid might decrease) after a successful first date.

Influences on college student drinking

Individual differences, including drinking history and gender, are also linked to alcohol-related cognitive process. Consistent with our previous discussion, research has historically focused on controlled processes (measured by self-report questionnaires), with more recent research incorporating implicit measures of automatic processes. For example, heavier drinking is associated with positive alcohol outcome expectancies (Wood et al., 1996), stronger social and affect-related motivations for drinking (Read et al., 2003), and perceptions of greater prevalence and acceptance of heavy drinking among one's peers (Neighbors et al., 2007a). Parallel findings have been demonstrated with implicit measures of similar constructs (e.g., Ostafin and Palfai, 2006; Ostafin et al., 2008; Palfai and Ostafin, 2003; Wiers et al., 2002). With regard to gender, college women tend to be less approving of drinking than college men, and social approval more generally tends to be lower for heavy drinking among women than among men (Lewis and Neighbors, 2004; Neighbors et al., 2003; Prentice and Miller, 1993). Although gender differences likely extend to automatic processes, this hypothesis has not been tested directly.

Present study

The present study was designed to replicate and extend previous research on automatic alcohol-related processes. We adapted the alcohol-action tendency IAT, which measures alcohol-approach versus alcohol-avoid associations and is linked to multiple drinking behaviors (e.g., Ostafin and Palfai, 2006; Palfai and Ostafin, 2003). We first considered the

influence of drinking (operationalized as having had a heavy drinking episode [HDE] in the last 30 days) and gender on alcohol IAT scores. Consistent with previous findings (Ostafin and Palfai, 2006), we predicted that participants who did not have a recent HDE would have more negative IAT scores (stronger associations with alcohol + avoid [and water + approach] relative to associations with alcohol + approach [and water + avoid]) than those who did. Based on previous findings using self-report measures (e.g., Lewis and Neighbors, 2004; Neighbors et al., 2003; Prentice and Miller, 1993), we predicted that women would have more negative IAT scores than men. Note that our predictions of negative IAT scores are not a reflection of valence (i.e., having more positive or negative attitudes about drinking) but rather a reflection of IAT scoring methodology (i.e., the extent to which alcohol is more strongly associated with avoid relative to approach or vice versa).

Second, we investigated whether situation cues affected the alcohol IAT. We first investigated these effects in a nondrinking context, which were operationalized as dating outcomes in a hypothetical date at a coffee shop. Two possibilities were considered with respect to the impact of date outcomes. To the extent that alcohol is considered to serve anxiolytic purposes, we expected IAT scores would increase after an unsuccessful date relative to a successful date. Alternatively, to the extent that alcohol is associated with celebration, we considered IAT scores might increase after a successful date relative to an unsuccessful date (i.e., one's inclination to approach alcohol might increase and/or one's inclination to avoid alcohol might decrease). To extend Stacy et al.'s (1994) finding that automatic alcohol processes are influenced by contexts that contain alcohol cues, we also investigated the effect of situational cues in a drinking context on alcohol IAT scores. These IAT scores were predicted to increase after exposure to a vignette that contained alcohol cues irrespective of date outcome. Finally, to rule out the effects of repeated assessment, a control condition was included. We expected that exposure to the control condition, a written history of the coffee bean, would not significantly affect alcohol IAT scores. Ultimately, the study had a 2 (Participant Gender) $\times$ 2 (Dating Outcomes) $\times$ 2 (Drinking vs Nondrinking Context) $\times$ 2 (Pretest vs Posttest IAT) + 1 (Control) design. Because we had a +1 element in our research design and specific *a priori* hypotheses within each context and about the control condition, analyses were conducted separately for the nondrinking context, drinking context, and control condition (Himmelfarb, 1975).

Method

Participants

Participants were 112 female and 109 male undergraduate volunteers from a large public university in the Pacific

Northwest, who received extra course credit (roughly .05 grade points) as compensation. Ninety-six percent of the sample identified as straight/heterosexual; 3% identified as bisexual, gay, or lesbian; and 1% did not respond. Analyses were conducted with and without the participants who identified as bisexual, gay, or lesbian; those participants were retained in analyses because their inclusion did not affect the pattern of findings. Participants averaged (SD) 19.10 (2.34) years of age. Fifty-six percent identified as white, 29% as Asian American, and the remainder as Hispanic American, black, or Native American or did not respond. Sixty-four percent were in their first year of college, 23% were in their second year, and 13% were in their third or fourth year.

Measures and stimuli

Alcohol Implicit Association Test. The IAT was used to assess automatic associations with alcohol and approach versus alcohol and avoid. Stimuli (words and pictures) were based on Ostafin and Palfai (2006). The IAT compared the associations between two target concepts, beer and water, and two attribute concepts, approach and avoid. Beer and water were represented by five pictures of glasses and pitchers filled with beer and by five pictures of glasses and pitchers filled with water. Approach was represented by the following five words: approach, toward, closer, advance, and forward. Avoid was represented by the following five words: avoid, away, leave, withdraw, and escape. The IAT was developed from Greenwald's (2006) generic IAT syntax. Participants completed the IAT on personal computers using Inquisit 2.0 software.

Detailed explanations of the IAT can be found in Greenwald et al. (1998). Briefly, the IAT is composed of seven blocks: (1) a 24-trial practice block of discriminating between targets (e.g., *beer* pictures are on the left and *water* pictures are on the right), (2) a 24-trial practice block of discriminating between attributes (e.g., *avoid* words on the left and *approach* words on the right), (3) a 24-trial combination block (e.g., *beer* + *avoid* on the left and *water* + *approach* on the right), (4) a 40-trial block of the same pairing as in (3), (5) a 24-trial block of discrimination in which the location of the targets was reversed (e.g., *water* pictures on the left and *beer* pictures on the right), (6) a 24-trial combination block (e.g., *water* + *avoid* on the left and *beer* + *approach* on the right), and (7) a 40-trial block of the same pairing as in (6).

Stimuli were presented randomly within blocks. In combined blocks (Blocks 3, 4, 6, and 7), trials alternated between targets (beer or water pictures) and attributes (avoid or approach words). Stimuli were presented individually in the center of the computer screen, and instructions were to categorize the stimuli as rapidly and accurately as possible. To categorize the stimuli, participants used the "d" key located on the left side of the computer keyboard and the "k" key located on the right side of the keyboard. Participants received

feedback when they made an error and were required to correct the error to proceed to the next trial. The order of the combined trials (Pairing 1: beer + approach and water + avoid; Pairing 2: beer + avoid and water + approach) was counterbalanced: Half of the participants completed Pairing 1 then Pairing 2, and half of the participants completed Pairing 2 then Pairing 1.

The *D* measure (Greenwald et al., 2003) was used to calculate IAT scores. It is similar to an effect size (e.g., Cohen's *d*) and is calculated by (1) subtracting the average latencies of Pairing 1 from Pairing 2 (i.e., Pairing 2 – Pairing 1) and (2) dividing the result by the standard deviation of all of the combined trials. Scores were calculated such that larger (positive) scores represent stronger associations with alcohol and approach (and water and avoid) versus alcohol and avoid (and water and approach). Detailed explanations of the psychometric advantages of using the *D* measure (versus average latency differences) are found in Greenwald et al. (2003) and Cai et al. (2004).

Alcohol consumption. Alcohol consumption was measured with the Daily Drinking Questionnaire (Collins et al., 1985; Kivlahan et al., 1990) and the Quantity/Frequency Scale (Baer, 1993; Marlatt et al., 1995). The Daily Drinking Questionnaire assesses the number of standard drinks consumed on each day of a typical week during the past 3 months (Monday-Sunday). The Quantity/Frequency Scale consists of five items that assess the number of drinks and hours spent drinking on a peak drinking occasion in the last month and how many days of the month that participants drank (0 = I do not drink at all, 1 = about once a month, 2 = two to three times a month, 3 = once or twice a week, 4 = three to four times a week, 5 = nearly every day, 6 = once a day or more). Both measures included standard drink definitions. The latter measure was used to determine whether participants reported an HDE in the last month (5/4 or more standard drinks on a single occasion for men/women).

Vignette. The vignette (adapted from Lindgren et al., 2007) depicted a first date with a person of the opposite gender named Jaime. Instructions asked participants to project themselves into the story, and the vignette was written in the second person (e.g., “You are excited about meeting Jaime tonight”). The vignette was identical for male and female participants, with the exception of the pronouns describing Jaime as “he” or “she.” The vignette concluded with a participant realizing either that “there was a spark,” that he or she was sexually attracted to Jaime, and that he or she wanted to pursue a second date (“successful” date outcome). Or, the vignette concluded with a participant realizing that “there was no spark,” that he or she was not sexually attracted to Jaime, and that he or she was interested in being friends only (“unsuccessful” date outcome). In the nondrinking vignette, the date took place in a coffee shop, and Jaime and the participants were described as drinking espresso beverages. In the drinking vignette, the date took

place in a bar, and Jaime and the participant were described as drinking beer. In lieu of a vignette, the control condition consisted of a brief nonfiction excerpt of equivalent length about the history of the coffee bean.

Design and procedures

The study had a 2 (Participant Gender) $\times$ 2 (Date Outcome: successful vs unsuccessful) $\times$ 2 (IAT: prevignette vs postvignette) + 1 (control) design, with IAT as a within-subject factor. The control condition was included to assess the effect of repeated IAT administration, namely the possibility that changes in IAT scores might stem from repeated administration of the IAT rather than the content of the vignettes. Analyses were conducted separately for the nondrinking and drinking vignettes and the control condition using planned comparisons (Himmelfarb, 1975).

Participants completed study procedures individually in private rooms. They completed informed consent procedures and then the alcohol IAT. Next, they read the vignette or the nonfiction excerpt. They then completed the alcohol IAT a second time. Finally, they completed a battery of questionnaires, including demographic and alcohol consumption measures.

Results

Sample characteristics

The majority of participants (81%) reported consumption of alcohol in the last month. Thirty-nine percent of participants reported at least one HDE in the last month, and 61% reported no HDEs in the last month. Compared with participants who did not report an HDE, participants who did report an HDE also reported consuming more total drinks on the weekend (11.3 vs 1.10 drinks) and weekdays (1.87 vs 0.13 drinks), drinking on more days of the week (4.01 vs 0.80 days), and drinking more heavily on peak occasions (9.63 vs 1.11 drinks) (p 's $< .001$).

The correlations between typical weekday and weekend days and baseline alcohol IATs were also examined. Because the distribution of the alcohol consumption variables deviated from normal, correlations were conducted using Spearman's rho. As discussed previously, IAT *D* scores were calculated such that higher scores indicated stronger alcohol + approach associations; negative scores indicated stronger alcohol + avoid associations. IAT scores were positively correlated with number of weekend drinks, $p = .18$, $p < .01$; number of drinks consumed on peak occasions, $p = .20$, $p < .01$; and number of drinks consumed on a typical weekend day, $p = .21$, $p < .01$. Correlations between the IAT score and number of drinking days in last month and between IAT score and the number of weekday drinks were nonsignificant.

Prevignette alcohol Implicit Association Test scores

Baseline alcohol IAT scores were examined as a function of participants' HDE status (i.e., whether they had had one in the last month). As predicted, non-HDE participants had stronger associations with alcohol + avoid relative to alcohol + approach, as measured by the IAT (mean = $-.22$ [.35]) than did HDE participants (mean = $-.09$ [.38]) ($t = 2.49$, 218 df, $p < .05$; Figure 1). Single sample t tests were conducted on each group to examine whether IAT D scores were reliably different from zero. Non-HDE participants' IAT scores were significantly less than zero, indicating a tendency to

associate alcohol + avoid more than alcohol + approach ($t = -6.50$, 193 df, $p < .001$). In contrast, HDE participants' IAT scores did not differ from zero, indicating that they did not differentially associate alcohol + avoid relative to alcohol + approach ($t = -0.81$, 79 df, $p = \text{NS}$).

The same approach was used to test for gender differences in participants' IAT scores. As predicted, female participants (mean = $-.25$ [.34]) had stronger associations with alcohol + avoid relative to alcohol + approach than did male participants (mean = $-.03$ [.38]) ($t = 4.48$, 218 df, $p < .001$; Figure 1). Women's IAT scores were significantly less than zero, indicating that, on average, female participants had a reliable

FIGURE 1. Scores on the prevignette alcohol Implicit Association Test (IAT) as a function of drinking status (heavy drinking episode [HDE]/non-HDE) and gender. The D score represents the IAT effect. Positive D scores indicate stronger alcohol-approach associations (e.g., faster at pairing alcohol + approach [and water + avoid]), whereas negative D scores indicate stronger alcohol-avoid associations (e.g., faster at pairing alcohol + avoid [and water + approach]). $n = 133$ HDE, 87 non-HDE; 108 men and 112 women. Error bars are standard errors.

tendency to associate alcohol + avoid more than alcohol + approach ($t = -7.72$, 111 df, $p < .001$). In contrast, men's IAT scores did not differ reliably from zero, indicating that they did not differentially associate alcohol + avoid relative to alcohol + approach ($t = -0.79$, 107 df, $p = \text{ns}$). An additional follow-up analysis examined whether gender differences in IAT scores remained when controlling for typical alcohol consumption. The results of an analysis of covariance that controlled for typical drinks consumed per week indicated that gender differences in baseline IAT scores remained significant when alcohol consumption was taken into account ($F = 20.89$, 1/224 df, $p < .001$).

Postvignette Implicit Association Test scores

Next, changes in participants' IAT scores were examined. Nondrinking vignette results are presented first, followed by the drinking vignette results. Each set of analyses used the same strategy. Participants' IAT scores were subjected to a 2 (Date Outcome) $\times$ 2 (Gender of Subject) $\times$ 2 (Prevignette/Postvignette Exposure) mixed-measures analysis of variance, with date outcome and participant gender as between-subjects factors and prevignette/postvignette exposure as a within-subjects factor.

Nondrinking context. First, we examined the nondrinking vignette, which occurred in a coffee shop and in which participants were described as drinking espresso beverages. There was a main effect of vignette exposure ($F = 5.11$, 1/87 df, $p < .05$), indicating that, overall, associations with alcohol + avoid decreased (and/or associations with alcohol + approach increased), following exposure to a nonalcohol context. Consistent with expectations, this main effect was qualified by an interaction of vignette exposure and date outcome ($F = 5.10$, 1/87 df, $p < .05$; Figure 2). Post hoc analyses using dependent samples t tests indicated that IAT scores did not change significantly among participants in the successful date condition ($t = .07$, 45 df, $p = \text{ns}$). In contrast, there was significant increase in IAT scores among participants in the unsuccessful date condition ($t = 3.36$, 44 df, $p < .01$), indicating that associations with alcohol + avoid decreased (and/or associations with alcohol + approach increased) following vignette exposure. These results demonstrate that alcohol-related associations can be influenced in a context in which there is no alcohol or alcohol-related cues—in this case, a first date that ends unsuccessfully.

Consistent with findings examining baseline IATs only, a main effect for participant gender was also found. Women had stronger alcohol + avoid associations (relative to alcohol + approach) compared with men ($F = 5.14$, 1/87 df, $p < .05$). The interaction between vignette exposure and participant gender approached significance ($F = 3.47$, 1/87 df, $p = .07$) and suggested exposure to the vignette had somewhat more influence on women than on men. Specifically, women's alcohol + avoid associations tended to decrease (and/or

alcohol + approach associations increased), whereas men's associations appeared unchanged. There was no main effect of date outcome, interaction of date outcome and gender, or three-way interaction (all p 's = ns).

Drinking context. Next, we examined the drinking vignette, which occurred in a bar and in which participants were described as drinking beer (see Figure 2). As predicted, there was a main effect of vignette exposure ($F = 7.17$, 1/88 df, $p < .01$). Following exposure to the vignette, IAT scores increased from baseline, indicating that the associations between alcohol and avoid weakened (and/or the associations between alcohol and approach strengthened). There were no significant interactions related to vignette exposure or main effects of vignette ending (p 's = ns). As found elsewhere, there was a significant gender main effect, with women having stronger alcohol-avoid associations (and/or weaker alcohol + approach associations) than men ($F = 8.58$, 1/88 df, $p < .01$), but no significant interactions were found (p 's = ns).

Control. Finally, to investigate the influence of repeated IAT administration, the control condition was examined. After reading a nonfiction excerpt about the history of coffee, no differences in participants' IAT scores were observed ($t = -0.48$, 36 df, $p = \text{ns}$). Thus, changes in alcohol IAT scores observed previously were not simply from repeated administration of the IAT.

Discussion

Among the most important findings in the present study is that alcohol-related associations can be affected by situational factors in the absence of explicit alcohol cues—for example, when alcohol was absent, alcohol-avoid associations weakened (and/or alcohol-approach associations strengthened) from baseline when the date had an unsuccessful ending (i.e., no chemistry and viewing one's date as a friend only) but not when it had a successful ending (i.e., attraction and the possibility of a second date). Furthermore, the results indicated that when explicit alcohol cues were present, alcohol-avoid associations weakened (and/or alcohol-approach associations strengthened) from baseline following vignette exposure regardless of date outcome. Moreover, changes in IAT scores appeared to be responsive to the particular type of stimuli because changes were not observed following exposure to a nonfiction excerpt (i.e., the control condition).

Although the results of this study cannot definitively determine which real-world situations might influence alcohol approach-avoid associations or in what direction they might do so, they suggest intriguing possibilities. Specifically, the present findings may shed new light on affect-related drinking. Drinking as a means of reducing tension or negative affect has been previously associated with heavier and more problematic drinking (Cooper et al., 1998; George

FIGURE 2. Scores on prevignette and postvignette Implicit Association Tests (IATs) as a function of vignette ending. The *D* score represents the IAT effect. Positive *D* scores indicate stronger alcohol-approach associations (e.g., faster at pairing alcohol + approach [and water + avoid]), whereas negative *D* scores indicate stronger alcohol-avoid associations (e.g., faster at pairing alcohol + avoid [and water + approach]). For the nondrinking vignette, $n = 45$ “unsuccessful” and $n = 46$ “successful” date outcome. For the drinking vignette, $n = 45$ “unsuccessful” and $n = 47$ “successful” date outcome.

and Stoner, 2000; Greeley and Oei, 1999). Although these associations have been consistently demonstrated using self-report assessments of alcohol expectancies and motives reflecting controlled processing, the connection between a situation (e.g., an unsuccessful date) and the desire to drink may also reflect more automatic processes. Moreover, having an unsuccessful date may increase the likelihood of having

a drink without an explicit chain of cognition (e.g., “Even though I may have made a friend, I didn’t find a new partner → Alcohol will alleviate my tension → I will drink”). Pending further research evaluating this process in greater detail and its generalizability to the real world and/or other situations, one might expect alcohol + avoid associations to decrease (and/or alcohol + approach associations to increase)

in a number of situations (e.g., not getting a job, breaking up with a boyfriend/girlfriend, receiving a disappointing grade). Further examination of changes in automatic alcohol-related processes as a function of situational factors may help us better understand inclinations to drink/approach alcohol (or the inclinations to cease avoiding alcohol) that arise in the absence of cues that do not appear to be directly related to alcohol.

Study participants had, on average, negative IAT *D* scores, indicating stronger associations with alcohol + avoid (and water + approach) relative to alcohol + approach (and water + avoid). The overall direction of these findings is consistent with previous studies (Ostafin and Palfai, 2006; Palfai and Ostafin, 2003) and may reflect participants' relatively short and, overall, less severe drinking histories (e.g., they are young adults; only 39% reported having at least one HDE in the last month). With respect to individual differences, the present findings are generally consistent with previous findings of self-reported evaluations of alcohol effects and perceived acceptability of drinking. We predicted and found that women and non-HDE participants had stronger alcohol + avoid associations and/or weaker alcohol + approach associations. Moreover, the present results indicated that men's and HDE participants' IAT scores were not reliably different from zero (indicating they did not associate alcohol with avoid relative to approach or vice versa), whereas women's and non-HDE participants' IAT scores were significantly more associated in the direction of alcohol + avoid relative to alcohol + approach. Thus, men and/or heavy drinkers might be good candidates for interventions aimed at retraining automatic alcohol associations specifically aimed at increasing alcohol + avoid associations rather than decreasing alcohol + approach associations.

It is also intriguing that exposure to a nondrinking vignette yielded a trend toward an increase in women's, but not men's, IAT scores. This may suggest that the relationship between dating and alcohol is particularly strong in women. Moreover, given the link between the alcohol IAT and problem drinking (e.g., Ostafin and Palfai, 2006; Palfai and Ostafin, 2003), dating contexts may pose a risk with respect to college women's alcohol consumption. Women, who naturally have stronger alcohol-avoid associations, may "lose" that bias when in a dating context, which, although not evaluated by this study, could lead to increased drinking on their part.

The examination of factors influencing automatic alcohol approach-avoid associations, in combination with previous research demonstrating the unique influence of these associations as well as other automatic alcohol-related associations over and above self-reported expectancies and motives on drinking behavior, may provide new clinical strategies for treatment. The demonstration that a simple, brief manipulation can affect automatic alcohol-related associations suggests the potential to develop specific strategies designed

to, for example, strengthen alcohol-avoidance associations and/or weaken alcohol-approach associations. Should training be associated with changes in drinking behavior, modification of automatic associations could be another strategy for reducing alcohol consumption. It is also possible that modification of automatic alcohol-related processes may be a previously unidentified mediating mechanism of existing treatment approaches (e.g., desensitization). Beyond modification of automatic alcohol-related processes, evaluation and feedback regarding automatic alcohol-related processes may ultimately help clients identify situations that may make them want to drink even in the absence of self-reported associations between those situations and drinking.

Limitations and future directions

This study has several limitations. First, it is important to note the nature of the IAT: It is a relative measure. It assesses the strength of one association relative to the strength of another association (e.g., strength of alcohol + approach and water + avoid vs alcohol + avoid and water + approach). Therefore, when changes in IAT scores are observed, one cannot determine which association has changed (e.g., is alcohol + avoid and water + approach weakening and/or alcohol + approach and water + avoid strengthening?). To the extent that identification of the specific associations that are increasing or decreasing is of interest, other measures such as Extrinsic Affective Simon Test (De Houwer, 2003), Go/No-Go Association Task (Nosek and Banaji, 2001), and Brief IAT (Sriram and Greenwald, in press) must be used. A second limitation of this study was the homogeneity of our sample (young, mostly white, university students). Although this is a group for whom alcohol is of considerable concern and dating is of considerable importance, it is unclear whether our findings would generalize to other groups. These findings should be replicated in more diverse populations. Third, we did not assess participants' reactions following the date vignette. Based on the pattern of study findings and consistent with broader theories and findings related to tension-reduction or anxiolytic effects of alcohol, we suggested that participants might have had negative cognitions (e.g., "The date didn't go well" or "I didn't do well") and/or experienced negative affect (e.g., disappointment, rejection) in reaction to the "unsuccessful" ending of the vignette. This perspective is supported by recent evidence that eliciting negative affect can increase the strength of the alcohol IAT in some individuals (Brooks and Ostafin, submitted for publication). However, it is possible that participants had a different emotional or cognitive response and/or that different mechanisms account for the pattern of findings. Future investigations should assess participants' feelings about the outcome of the vignette to elucidate underlying mechanisms. Finally, although automatic alcohol approach-avoid associations were influenced by exposure to the vignettes,

these findings cannot speak to links to actual drinking. It is essential for future studies to examine whether nonalcohol contexts cannot only influence automatic alcohol associations but also whether this influence affects subsequent drinking behavior.

The present study examined the effect of contextual influences on automatic processes related to alcohol. Findings indicated that vignette manipulations of environmental contexts, including those that do not contain alcohol cues, can influence automatic alcohol approach-avoid associations. Collectively, the study contributes to the growing social cognitive and clinical literatures that seek to understand contextual influences on automatic processes, examine automatic process-behavior links, and determine if automatic processes represent an additional target for prevention and intervention efforts for maladaptive behaviors and mental health disorders.

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