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Interactive effects of approach motivational intensity and alcohol cues on the scope of perceptual attention

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ABSTRACT

Aims Many theoretical perspectives suggest that alcohol-related stimuli bear on attentional processes. Building upon these ideas and recent advances regarding the attention-constricting impact of approach motivational states, we predicted that mere exposure to alcohol-related images would suffice to reduce the breadth of attention among individuals who possessed a strong motivation to consume alcohol. **Design** Two studies exposed participants to alcohol and neutral cues prior to assessing attention structure. In both studies, measures of alcohol use, negative alcohol expectancies, trait approach motivation and alcohol-related approach motivation were assessed. **Setting and participants** Study 1 comprised 102 undergraduates and study 2 comprised 161 undergraduates. Studies were conducted at Texas A&M University, College Station, Texas. **Measurements** In both studies, participants were briefly exposed to pictures of various stimuli (alcohol versus neutral pictures). After each picture was displayed, participants completed a trial assessing attentional focus. **Findings** After controlling for relevant covariates, both studies demonstrated that exposure to alcohol-related pictures led to a narrowing of attentional focus among individuals who possessed a strong motivation to use alcohol. Exposure to neutral pictures, however, did not interact with alcohol-related motivation to influence attentional focus. **Conclusions** Alcohol cues narrow attentional breadth for individuals who are motivated to consume alcohol, suggesting a non-pharmacological means in which alcohol produces a narrow mindset. Alcohol cues may contribute to cognitive and behavioral deficits, as well as drinking behaviors, in part, because they lead to the inability to process a broad range of information in the environment.

Keywords Alcohol cues, alcohol myopia, approach motivation, attention biases, implicit cognition, motivational intensity.

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INTRODUCTION

Decades of research have examined the link between alcohol and attentional processes [1,2]. Much of this work has built upon the idea that, when individuals possess strong motivation to consume alcohol, stimuli associated with alcohol are more likely to attract attention. Presumably, this type of attentional bias is functional. For example, according to alcohol expectancy theory (AET; [3–5])), focusing attention on alcohol-related stimuli helps individuals to pursue the goal of obtaining and consuming alcohol efficiently by limiting the processing of stimuli that are either irrelevant to, or that would impede, goal attainment (see also [6]). Moreover, numerous theories addressing the link between addiction and attentional bias suggest that the capture of attention by stimuli associated with alcohol use will occur among individuals who are motivated to consume alcohol, even if they are not currently drinking or expect to drink at the time the alcohol-related stimuli are presented (see [1,2,7–10] for reviews).

While it is clear that alcohol cues bias the content of attention, alcohol consumption itself has also been hypothesized to produce a general shift in attention structure. Specifically, alcohol myopia theory (AMT; [11]) posits that pharmacological properties associated with alcohol consumption reduce the breadth of information available in memory, constricting the focus of attention such that it encompasses only the most proximal or salient sources of information. This narrowing of

attentional scope leads inebriated individuals to make more extreme, unmitigated behavioral choices than sober individuals, who presumably attend to and process a wider array of information. Considerable evidence supports AMT [12], with perhaps the most compelling findings showing that intoxicated individuals will exhibit either greater behavioral disinhibition or inhibition, depending on whether impelling or inhibiting cues are salient in memory [13]. Notably, AMT suggests that inebriation restricts attention towards salient information regardless of the actual content of that information (e.g. whether or not the information is expectancy-consistent or impels the individual towards the incentive).

Although the attention-based processes posited by AMT are driven pharmacologically, and therefore come into play only after drinking has begun, a recent neuropsychological model of motivation and attention hints at the possibility that, as with changes in the content of attention, changes in attentional structure may not require alcohol consumption itself (see also [6]).). According to the motivational intensity model (MIM [14]), states of high approach motivation (e.g. desire) prompt a general narrowing of attentional scope that functions to restrict cognitive access to irrelevant stimuli during goal pursuit. The results of several recent studies support this hypothesis [14–16], demonstrating that exposure to stimuli that activate approach motivational states (e.g. pictures of desserts) narrows the focus of attention compared to equally positive but non-appetitive stimuli (e.g. humorous films) or neutral stimuli (e.g. pictures of rocks). For example, studies show that individuals are less attentive to how visual stimuli are globally configured [17] after viewing appetitive stimuli. Furthermore, research suggests that the activation of approach motivational states has specific neural loci (e.g. [18–21])) and a prominent neural marker of approach-motivational intensity, heightened relative left frontal cortical activation [19], has been demonstrated to underlie the relationship between appetitive stimuli and narrowed attention ([16,22]; see also [23]). Overall, these findings suggest that appetitive stimuli narrow attention, leading individuals to 'miss the forest for the trees'.

Extrapolating from this recent research, we posit a hitherto unexplored manner by which alcohol may constrain attention. Specifically, we hypothesize that the generalized, content-independent narrowing of attention uniquely predicted by MIM theorists to accompany states of high approach motivation may be triggered by exposure to alcohol cues among individuals with stronger alcohol-related approach tendencies. In line with AET and other major models of addiction [7–10], this hypothesis builds upon the presumption that alcohol-related moderation of attentional processing does not require actual consumption and may be set in motion by the mere presence of alcohol cues. However, it also newly advances the notion that exposure to such cues may not only bias individuals to attend to different contents of information (e.g. images of alcoholic beverages), but may also limit the very range of information to which attention is directed, irrespective of its content. We probed for the existence of such a non-pharmacological effect of alcohol cues on attention structure in two experiments. Specifically, we presented participants with either images of alcoholic beverages or control images. Afterwards, we used a composite letter (i.e. Navon global–local) response time (RT) task to gauge participants' attentional scope. We predicted that alcohol-related stimuli would constrict the overall breadth of perceptual attention (i.e. reduce the size of the attentional 'spotlight') for participants who were highly motivated to drink.

STUDY 1

Methods

Participants

One hundred and two students (59% female) enrolled in an introductory psychology course participated for partial completion of course credit. Ages ranged from 18–29 [mean = 19.58, standard deviation (SD) = 1.48]. In terms of drinking behavior, four participants reported drinking alcohol almost daily, 40 reported drinking once or twice a week, 20 reported drinking about once a month, nine reported drinking three or four times a year, 12 reported drinking between one and four times in their lives, and 17 reported never having consumed alcohol.

Measures

Priming and attentional scope task. A within-participants procedure developed by Gable & Harmon-Jones [14] was adapted for the present study. Participants viewed 64 color photographs. Half the photographs were images of alcoholic beverages. The other photographs were neutral images of rocks. In each trial, a picture was displayed for 6 seconds following a 500-ms fixation cross. After each picture, another fixation cross (500 ms) appeared and a composite letter was presented until the participant responded. If a response did not occur within 5 seconds, the next trial began. Inter-trial interval varied between 18 seconds and 20 seconds.

To assess attentional breadth, we used an established measure of global/local processing [17]. In this task, large letters composed of smaller letters are presented. Each vertical and horizontal line of a large letter was made up of five closely spaced smaller letters (e.g. a T made up of Ls). Participants were asked to indicate as

quickly as possible whether the picture contained the letter T or the letter H by pressing the left shift key or the right shift key, respectively. Global targets were those in which a T or an H was composed of smaller Ls or Fs (see Appendix). For these targets, faster responses indicated that attention was focused on the 'big picture' (i.e. the global shape) as opposed to the small details (i.e. the letters that made up the target), indicating that participants possessed a broader attentional focus. Local targets were those in which a large L or F was composed of smaller Ts or Hs. For these targets, faster responses to the T or H letters indicated a relatively local (narrow) focus (i.e. attention was focused on the local details of the stimuli, or the 'trees' instead of the 'forest'). Thirty-two local and 32 global targets were presented in random order.

Alcohol and dispositional approach motivation. Four items adapted from the Behavioral Activation Scale (BAS) Drive subscale [24] were used to assess approach motivation towards alcohol. Items included 'when I want alcohol, I usually go all-out to get it', 'I go out of my way to get alcohol when I want it', 'if I see a chance to get alcohol, I move on it right away' and 'when I am going to get alcohol, I use a "no holds barred" approach' (mean = 2.34, SD = 1.37, $\alpha = 0.92$). We adapted items from the Drive subscale because this scale best reflects motivation to pursue desired goals [24], which is linked theoretically and empirically to narrowed attentional focus (e.g. [14]). Finally, participants completed the BAS/BIS scale [24] to enable assessment of generalized trait approach motivation (mean = 4.18, SD = 1.17, $\alpha = 0.90$, for Drive subscale). Research has shown that general appetitive cues narrow attention to a greater extent among those with higher trait approach motivation (i.e. those for whom the appetitive stimuli depicted should be most desirable [15]). As such, we controlled for trait approach motivation to examine whether an alcohol-related approach motivation would interact specifically with alcohol-related stimuli to constrict attention. Items were rated on a scale from 1 (not at all true) to 7 (extremely true).

Alcohol expectancies. Participants completed the 18-item negative alcohol expectancy subscale from the Comprehensive Effects of Alcohol scale (CEOA [25]). We assessed negative expectancies to account for the Easterbrook hypothesis [26] that negative arousing stimuli activate vigilant states and produce a subsequent, adaptive narrowing of attentional scope (see also [27,28]). Therefore, negative expectancies (e.g. cognitive and behavioral impairment) were included to examine whether they would also interact with the primes to influence attentional focus by fostering aversive arousal. Inclusion of these measures also helped to test whether our predicted findings were driven uniquely by alcohol-related motivation as opposed to general negative alcohol expectancies. Items were rated on a scale from 1 (disagree) to 4 (agree; mean = 2.56, SD = 0.50, $\alpha = 0.90$).

Alcohol use. Alcohol use was assessed to additionally ensure that the predicted effects were due uniquely to alcohol-related approach motivation (not merely the propensity to drink, which may be due to social norms and not the strength of the incentive *per se*; e.g. [29]). To assess typical alcohol consumption, participants completed items from the revised Drinking Styles Questionnaire (DSQ-R; [30]). A composite variable was created by averaging the standardized scores for four items assessing typical quantity and frequency of alcohol use. Examples of items include 'which of the following best describes how often you drink alcohol?' (1 = 'I have never had a drink of alcohol', 6 = 'I drink alcohol almost daily') and 'which of the following best describes how much alcohol you usually drink at one time?' (1 = 'I don't drink alcohol', 5 = 'I usually drink a lot of alcohol (more than nine beers or drinks)'.

Procedure

Participants completed a laboratory-based experiment. They were told that they would complete a few unrelated tasks sponsored by various researchers from the psychology department. Participants were escorted to a visually isolated computer and first completed the image viewing and composite letter reaction-time task. Participants then completed a survey purportedly sponsored by 'The Center for Research on Addictions' containing the measures of alcohol use, expectancies and motivation, followed by the BIS/BAS scale. Finally, they were probed for suspicion and thoroughly debriefed.

Results and discussion

Response times on the composite letter task were transformed logarithmically to compensate for skew. Trials with incorrect responses, in which the RT was more than SD from the mean for that stimulus [31], and multivariate outliers with residuals more than 3 SD away from the mean were excluded from analyses.

Two dependent variables were computed to test our main predictions. Previous research has demonstrated a general global bias on this measure, indicating that participants typically respond faster to the global targets compared to the local targets [14,15,17]. As such, following Gable & Harmon-Jones [14], we first computed a difference score between the global-alcohol and the global-neutral RTs ($\text{global}_{\text{alcohol-neutral}}$). For this score, a slower RT to the global-alcohol trials compared to the

Table 1 Summary of hierarchical regression analysis for variables predicting attentional restriction, study 1.[a]

	b	β
Step 1, $R^2 = 0.073$, $P < 0.07$, 95% CI: −0.021, 1.67		
Alcohol use	0.00	0.03
Negative alcohol expectancies	−0.03	−0.17
Trait approach motivation	0.02	0.20*
Step 2, R^2 change = 0.038, $R^2 = 0.11$, $P < 0.05$, 95% CI: 0.001, 0.219		
Alcohol-related approach motivation	0.02	0.27*

n : 101. [a]DV: $global_{alcohol\text{-}neutral}$ difference score. *$P < 0.05$.

Table 2 Summary of hierarchical regression analysis for variables predicting attentional restriction, study 1.[a]

	b	β
Step 1, $R^2 = 0.36$, $P < 0.0001$, 95% CI: 0.218, 0.502		
Alcohol use	0.00	0.01
Negative alcohol expectancies	−0.05	−0.17
Trait approach motivation	0.01	0.11
Neutral global—neutral local difference score	0.64	0.58**
Step 2, R^2 change = 0.035, $R^2 = 0.39$, $P < 0.05$, 95% CI: 0.250, 0.530		
Alcohol-related approach motivation	0.03	0.27*

n: 101. [a]DV: $alcohol_{global-local}$ difference score. *$P < 0.05$; **$P < 0.01$.

global-neutral trials would demonstrate alcohol–cue-induced attentional narrowing (i.e. the global bias would be attenuated after the alcohol pictures compared to the neutral pictures, demonstrating a restricted focus of attention). As mentioned previously, narrow attentional focus may either reflect slower RTs to the global-alcohol targets or faster RTs to the local-alcohol targets. Therefore, following Förster and colleagues [32], we also computed a difference score between the global-alcohol and the local-alcohol RTs ($alcohol_{global-local}$) to serve as a second dependent variable of attentional narrowing. For this dependent variable, higher scores again indicate a narrowing of attention following alcohol primes.

Hierarchical multiple regressions were used to test our hypothesis. Alcohol use, alcohol expectancies and trait BAS-Drive ratings were entered as covariates on the first step in both equations. In the first analysis, these variables were regressed on the $global_{alcohol\text{-}neutral}$ difference score and contributed to a marginally significant change in R^2 ($P < 0.07$), with trait BAS-Drive predicting constriction of attention following alcohol primes ($P < 0.05$). As predicted, the alcohol BAS-Drive variable, entered on the second step, also produced a significant change in R^2 ($P < 0.05$), showing that higher alcohol BAS-Drive led to slower responses to the global stimuli (i.e. attention narrowing) following alcohol primes, compared to the neutral primes ($P < 0.05$; see Table 1). A corresponding analysis was conducted to test whether alcohol BAS-Drive also predicted faster responses to local stimuli (i.e. a reduced $local_{alcohol\text{-}neutral}$ difference score). The effect of alcohol BAS-Drive was not significant in this analysis ($P = 0.91$).

In the second analysis the covariates, along with the $neutral_{global-local}$ difference score, to control for individual differences in response times [33], were regressed on the $alcohol_{global-local}$ difference score. These variables contributed to a significant change in R^2 ($P < 0.001$), with the $neutral_{global-local}$ difference score positively predicting the $alcohol_{global-local}$ difference score ($P < 0.001$). Notably, the alcohol BAS-Drive variable, entered on the second step, also produced a significant change in R^2 ($P < 0.05$), again showing that higher alcohol BAS-Drive levels engendered a narrowing of attention following alcohol primes ($P < 0.05$; see Table 2).

In sum, the findings of study 1 constitute the first evidence in support of the hypothesis that exposure to alcohol cues constricts the scope of perceptual attention (i.e. reduces the size of the attentional spotlight) among individuals who are higher in motivation to use alcohol. Although attention narrowing was obtained only among individuals higher in alcohol-related as opposed to generalized trait approach motivation, this initial experiment did not include a control group that depicted incentives other than alcohol. As such, it remained possible that the effect was not specific to alcohol cues, but would have resulted from exposure to any appetitive cue. To rule out this possibility, we replicated study 1 using a non-alcohol-incentive control group.

STUDY 2

Methods

Participants

One hundred and sixty-one students (73% female) enrolled in an introductory psychology course participated for partial completion of course credit. Ages ranged from 18–23 (mean = 18.57, SD = 0.95) years. Zero participants reported drinking alcohol almost daily, 31 reported drinking once or twice a week, 48 reported drinking about once a month, 16 reported drinking three or four times a year, 20 reported drinking between one and four times in their lives and 46 reported never having consumed alcohol.

Measures and procedure

The measures and procedure mirrored the methodology used in study 1, with the notable exception that the control images included pictures of appetitive stimuli (e.g.

Table 3 Summary of hierarchical regression analysis for variables predicting attentional restriction, study 2.[a]

	b	β
Step 1, $R^2 = 0.01$, $P = 0.61$, 95% CI: –0.020, 0.040		
Alcohol use	–0.00	–0.01
Negative alcohol expectancies	0.00	0.02
Trait approach motivation	0.01	0.11
Step 2, R^2 change = 0.036, $R^2 = 0.048$, $P < 0.05$, 95% CI: –0.015, 0.111		
Alcohol-related approach motivation	0.02	0.24*

n: 159. [a]DV: $global_{alcohol\text{-}neutral}$ difference score. *$P < 0.05$.

Table 4 Summary of hierarchical regression analysis for variables predicting attentional restriction, study 2.[a]

	b	β
Step 1, $R^2 = 0.267$, $P < 0.001$, 95% CI: 0.153, 0.381		
Alcohol use	0.00	–0.06
Negative alcohol expectancies	–0.01	–0.03
Trait approach motivation	0.00	0.03
Neutral global–neutral local difference score	0.49	0.51**
Step 2, R^2 change = 0.02, $R^2 = 0.287$, $P < 0.05$, 95% CI: 0.173, 0.401		
Alcohol-related approach motivation	0.02	0.18*

n: 159. [a]DV: $alcohol_{global\text{–}local}$ difference score. *$P < 0.05$; **$P < 0.01$.

delicious desserts) rather than pictures of rocks. These stimuli have been administered in several studies examining the effects of appetitive cues on attentional focus (e.g. [14,16,22]).

Again, after the image viewing and Navon letter task, participants completed the same measures used in the previous study including typical alcohol use, negative alcohol expectancies (mean = 2.70, SD = 0.60, α = 0.91), alcohol BAS-Drive (mean = 1.73, SD = 1.02, α = 0.90) and trait BAS-Drive (mean = 3.84, SD = 1.24, α = 0.85) before they were probed for suspicion and thoroughly debriefed.

Results

Response times were transformed logarithmically. Once again, trials with incorrect responses, trials in which the RT was more than 3 SD from the mean for that stimulus and multivariate outliers with residuals more than 3 SD away from the mean were excluded from analyses.

Again, we computed two difference scores to serve as our dependent variables. For the first regression, the covariates were regressed on the $global_{alcohol\text{-}neutral}$ difference score and did not contribute to a significant change in R^2 ($P = 0.61$). However, replicating the results of study 1, the alcohol BAS-Drive variable, entered on the second step, did produce a significant change in R^2 ($P < 0.05$), showing that higher alcohol BAS-Drive scores were associated uniquely with this type of attention-narrowing following alcohol primes relative to other incentives ($P < 0.05$; see Table 3). A corresponding analysis was conducted to assess whether alcohol BAS-Drive would predict faster responses to local stimuli ($local_{alcohol\text{-}neutral}$ difference score). Again, the alcohol BAS-Drive score was not significant in this analysis ($P = 0.84$).

In the second regression analysis, the covariates were regressed on the $alcohol_{global\text{–}local}$ difference score and contributed to a significant change in R^2 ($P < 0.001$) with the $neutral_{global\text{–}local}$ difference score positively predicting the $alcohol_{global\text{–}local}$ difference score ($P < 0.001$). Critically, the alcohol BAS-Drive variable, entered on the second step, also produced a significant change in R^2 ($P < 0.05$), again showing that higher alcohol BAS-Drive scores produced a narrowing of attention following alcohol primes ($P < 0.05$; see Table 4). Finally, although study 2 was comprised primarily of women participants, results for both analyses remained significant controlling for gender (*P*s < 0.05).

GENERAL DISCUSSION

Based on motivational approaches to understanding addictive behaviors (e.g. [3–5,11]) and recent advances concerning the attention-constricting impact of approach motivational states [14,15], we predicted that mere exposure to alcohol-related images would suffice to reduce the breadth of perceptual attention for individuals with higher motivation to use alcohol. Evidence for this type of narrowing of attention was found in two experimental studies demonstrating, for the first time, a non-pharmacological means by which alcohol moderates the overall scope of attention.

Various theories suggest that substance-related stimuli capture attention when the motivation to consume the substance is relatively intense (e.g. [7–10])). This idea is corroborated by findings showing that individuals who are motivated to consume alcohol and other drugs (e.g. heavy users, etc.) direct more attention towards substance-related stimuli compared to other types of stimuli (e.g. [1,2]). Researchers suggest that these biases in attention represent a cognitive measure of individuals' motivation to consume the substance [34,35]. Our findings support this idea and highlight a new, implicit indicator of the desire to consume addictive substances, one based on the size of the attentional spotlight rather than the content of the stimuli to which attention is directed.

These current findings suggest that the activation of alcohol-related approach motivation leads people to

focus on local, perceptual details in the environment. Importantly, this type of perceptual attention narrowing is associated with a corresponding narrowing of conceptual attention, which can be understood as the range of mental representations rendered accessible to working memory [27,36]. For example, studies have shown that focusing on local perceptual details diminishes creativity [37] leads to a greater focus on the 'here and now', as opposed to long-term goals and plans, fosters inaccuracy in face recognition tasks [38] and engenders deficits in memory for peripheral details (e.g. [39]). As such, the present findings may have significant downstream implications for research examining the deleterious effects of alcohol use on cognitive and behavioral functioning. For instance, our findings suggest that inebriation may inhibit individuals' ability to consider the long-term consequences of their behavior, in part because alcohol-related environmental cues may foster a narrow cognitive mindset. Clearly, future research needs to examine how such processes influence social behavior over and above the pharmacological effects of alcohol.

In a related vein, future studies need to examine whether the behavioral effects of cue-induced attentional narrowing mimic those of alcohol myopia [11]. Although the present findings may represent a relatively fleeting 'carryover' effect on attention [40], it is possible that the presence of alcohol cues (e.g. advertisements for alcohol beverages) may at least transiently constrict attentional scope such that relatively salient impelling (e.g. aggressive) or inhibitory (e.g. non-aggressive) cues are given greater weight than they would receive otherwise [11]. To support this idea, a recent study demonstrates that appetitive (i.e. attention narrowing) stimuli enhance memory for information presented in the central line of vision but impairs memory for information presented in the periphery ([15]; see also [39])), suggesting that appetitive stimuli shift the focus to easily accessible information (e.g. if it is salient or centrally presented) at the expense of other types of information.

Interestingly, given its ability to operate preconsumptively, cue-induced attention narrowing may have a unique role in shaping initial decisions to drink. For instance, alcohol stimuli may constrain the ability to attend to and consider information that might militate against drinking (e.g. reminders that alcohol intoxication will interfere with future activities or impair subsequent decision making [6]) for individuals who possess a strong approach motivation towards alcohol. If so, the activation of alcohol-related approach motivation may facilitate drinking not only because it reflects enhanced incentive value for alcohol use, in part because it also impedes attentional access to information that might inhibit the decision to imbibe.

In conclusion, a considerable amount of further study will be required to elucidate the dynamics and behavioral implications of the alcohol stimuli-induced attention narrowing revealed in the studies at hand. If the present results are any indication, the link between alcohol use and behavior may be considerably more complex than extant social–cognitive models would suggest, involving attentional and motivational-related processes before as well as during alcohol consumption. Understandin g the interplay between these low-level processes and the manner in which they are themselves mediated or moderated by alcohol consumption will be pivotal in developing effective strategies to combat the misuse of alcohol and its daunting social costs.

Declarations of interest

None.

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References

1. Field M., Mogg K., Bradley B. P. Attention to drug-related cues in drug abuse and addiction: component processes. In: Wiers R. W., Stacy A. W., editors. *Handbook of Implicit Cognition and Addiction*. Thouand Oaks, CA: Sage Publications; 2006, p. 151–63.
2. Field M., Cox W. M. Attentional bias in addictive behaviors: a review of its development, causes, and consequences. *Drug Alcohol Depend* 2008; **97:** 1–20.
3. Goldman M. S. Risk for substance abuse: memory as a common etiological pathway. *Psychol Sci* 1999; **10:** 196–7.
4. Goldman M. S., Del Boca F. K., Darkes J. Alcohol expectancy theory: the application of cognitive neuroscience. In: Leonard K. E., Blane H. T., editors. *Psychological Theories of Drinking and Alcoholism*, 2nd edn. New York: Guilford Publications; 2006, p. 203–46.
5. Goldman M. S., Darkes J., Reich R. R., Brandon K. O. From DNA to conscious thought: the influence of anticipatory processes on human alcohol consumption. In: Munafo M., editor. *Cognition and Addiction*. New York: Oxford University Press; 2007, p. 147–84.
6. Moss A. C., Albery I. P. A dual-process model for the alcohol-behavior link for social drinking. *Psychol Bull* 2009; **135:** 516–30.
7. Berridge K. C., Robinson T. E. The neural basis of drug craving: an incentive–sensitization theory of addiction. *Brain Res Rev* 1993; **18:** 247–91.
8. Berridge K. C., Robinson T. E. Parsing reward. *Trends Neurosci* 2003; **26:** 507–13.
9. Cox W. M., Klinger E. A motivational model of alcohol use. *J Abnorm Psychol* 1988; **97:** 168–80.
10. Franken I. H. Drug craving and addiction: integrating psychological and neuropsychopharmacological approaches. *Prog Neuropsychopharmacol Biol Psychiatry* 2003; **24:** 563–79.

11. Steele C. M., Josephs R. A. Alcohol myopia: its prized and dangerous effects. *Am Psychol* 1990; **45:** 921–33.
12. Steele C. M., Southwick L. Alcohol and social behavior I: the psychology of drunken excess. *J Pers Soc Psychol* 1985; **48:** 18–34.
13. MacDonald T. K., Fong G. T., Zanna M. P., Martineau A. M. Alcohol myopia and condom use: can alcohol intoxication be associated with more prudent behavior? *J Pers Soc Psychol* 2000; **78:** 605–19.
14. Gable P. A., Harmon-Jones E. Approach-motivated positive affect reduces breadth of attention. *Psychol Sci* 2008; **19:** 476–82.
15. Gable P. A., Harmon-Jones E. The effect of low versus high approach-motivated positive affect on memory for peripherally versus centrally presented information. *Emotion* 2010; **10:** 599–603.
16. Harmon-Jones E., Gable P. A. Neural activity underlying the effect of approach-motivated positive affect on narrowed attention. *Psychol Sci* 2009; **20:** 406–9.
17. Navon D. Forest before trees: the precedence of global features in visual perception. *Cogn Psychol* 1977; **9:** 353–83.
18. Berridge K. C. The debate over dopamine's role in reward: the case for incentive salience. *Psychopharmacology* 2007; **191:** 391–431.
19. Harmon-Jones E., Lueck L., Fearn M., Harmon-Jones C. The effect of personal relevance and approach-related action expectation on relative left frontal cortical activity. *Psychol Sci* 2006; **17:** 424–40.
20. Knutson B., Wimmer G. E. Reward: neural circuitry for social valuation. In: Harmon-Jones E., Winkielman P., editors. *Soc Neurosci*. New York: Guilford Press; 2007, p. 157–75.
21. Gable P. A., Harmon-Jones E. Relative left frontal activation to appetitive stimuli: considering the role of individual differences. *Psychophysiology* 2008; **45:** 275–8.
22. Gable P. A., Harmon-Jones E. Late positive potential to appetitive stimuli and local attentional bias. *Emotion* 2010; **10:** 441–6.
23. Fink G. R., Halligan P. W., Marshall J. C., Frith C. D., Frackowiak R. S. J., Dolan R. J. Where in the brain does visual attention select the forest and the trees? *Nature* 1996; **382:** 626–8.
24. Carver C. S., White T. L. Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: the BIS/BAS scales. *J Pers Soc Psychol* 1994; **67:** 319–33.
25. Fromme K., Stroot E., Kaplan D. Comprehensive effects of alcohol: development and psychometric assessment of anew expectancy questionnaire. *Psychol Assess* 1993; **5:** 19–26.
26. Easterbrook J. A. The effect of emotion on cue utilization and the organization of behavior. *Psychol Rev* 1959; **66:** 183–201.
27. Friedman R. S., Förster J. Implicit affective cues and attentional tuning: an integrative review. *Psychol Bull* 2010; **136:** 875–93.
28. Gable P. A., Harmon-Jones E. The blues broaden, but the nasty narrows: attentional consequences of negative affects low and high in motivational intensity. *Psychol Sci* 2010; **21:** 211–5.
29. Baer J. S. Student factors: understanding individual variation in college drinking. *J Stud Alcohol Suppl* 2002; **14:** 40–53.
30. Smith G. T., McCarthy D. M., Goldman M. S. Self-reported drinking and alcohol-related problems among early adolescents: dimensionality and validity over 24 months. *J Stud Alcohol* 1995; **56:** 383–94.
31. Fazio R. H. A practical guide to the use of response latencies in social psychological research. In: Hendrick C., Clark M. S., editors. *Review of Personality and Social Psychology*, vol. 11. Newbury Park, CA: Sage; 1990, p. 74–97.
32. Förster J., Friedman R. S., Özelsel A., Denzler M. Enactment of approach and avoidance behavior influences the scope of perceptual and conceptual attention. *J Exp Soc Psychol* 2006; **42:** 133–46.
33. Robinson M. D. Lives lived in milliseconds: using cognitive methods in personality research. In: Robins R. W., Fraley R. C., Krueger R., editors. *Handbook of Research Methods in Personality Psychology*. New York: Guilford Press; 2007, p. 345–59.
34. McCusker C. G. Cognitive biases and addiction: an evolution in theory and method. *Addiction* 2001; **96:** 47–56.
35. Sayette M., Shiffman S., Tiffany S. T., Niaura R. S., Martin C. S., Shadel W. G. The measurement of drug craving. *Addiction* 2000; **95:** S189–210.
36. Förster J., Dannenberg L. GLOMOsys: a systems account of global versus local processing. *Psychol Inq* 2010; **21:** 175–97.
37. Förster J., Denzler M. Sense creative! The impact of global and local vision, hearing, touching, tasting, and smelling on creative and analytic thought. *Soc Psychol Personal Sci* 2012; **21:** 15–9.
38. Macrae C. N., Lewis H. L. Do I know you? Processing orientation and face recognition. *Psychol Sci* 2002; **13:** 194–6.
39. Burke A., Heuer F., Reisberg D. Remembering emotional events. *Mem Cognit* 1992; **20:** 277–90.
40. Friedman R. S., Fishbach A., Förster J., Werth L. Attentional priming effects on creativity. *Creat Res J* 2003; **15:** 277–86.

APPENDIX

		Respond 'T' or 'H'
Global Trials	FFFFF	L L
	F	L L
	F	LLLLL
	F	L L
	F	L L
Local Trials	TTTTT	H
	T	H
	TTTTT	H
	T	H
	T	HHHHH