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Research Article

Lost in the Sauce

The Effects of Alcohol on Mind Wandering

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ABSTRACT—*Alcohol consumption alters consciousness in ways that make drinking both alluring and hazardous. Recent advances in the study of consciousness using a mind-wandering paradigm permit a rigorous examination of the effects of alcohol on experiential consciousness and metaconsciousness. Fifty-four male social drinkers consumed alcohol (0.82 g/kg) or a placebo beverage and then performed a mind-wandering reading task. This task indexed both self-caught and probe-caught zone-outs to distinguish between mind wandering inside and outside of awareness. Compared with participants who drank the placebo, those who drank alcohol were significantly more likely to report that they were zoning out when probed. After this increase in mind wandering was accounted for, alcohol also lowered the probability of catching oneself zoning out. The results suggest that alcohol increases mind wandering while simultaneously reducing the likelihood of noticing one's mind wandering. Findings are discussed with regard to theories of alcohol and theories of consciousness.*

Psychologists' understanding of how alcohol affects emotion and behavior has undergone considerable change in recent years. Early theories, such as the tension-reduction hypothesis, assumed that alcohol directly affects emotion, reducing "tension" and thereby disinhibiting behavior (Conger, 1956). According to more recent theorizing, however, both the reinforcing and the hazardous effects of alcohol may at least in part be cognitively mediated (Curtin, Patrick, Lang, Cacioppo, & Birnbaumer, 2001; Hull & Slone, 2004; Sayette, 1999; Taylor & Leonard, 1983). For example, Steele and Josephs' (1990) alcohol-myopia theory posits that alcohol "restricts attention to the salient, immediate aspects of experience" and "reduces processing capacity so that a greater proportion of this capacity has to be devoted to the demands of immediate, ongoing activity" (p. 929). Consider a man who has a bad workday and returns home to drink. Alcohol may relieve his worry if he is distracted by television, but he may "cry in his beer" if no such distraction is available (Steele & Josephs, 1990).

Although alcohol-myopia theory continues to stimulate much research, core elements of the theory remain unresolved. For instance, as noted by Steele and Josephs (1990, footnote 3), it remains unclear which cues will be most salient to a person who is drinking (see also Sayette, 1993). In typical studies, salient distractor cues are explicitly manipulated. For example, intoxicated participants may be asked to prepare a stressful speech, and during this preparation, some of these participants may be given a series of pleasant images to evaluate. Intoxicated participants given no explicit distraction feel at least as anxious as sober participants, presumably because they focus on the upcoming speech, whereas intoxicated participants who are distracted by the images feel less anxious than sober participants (Josephs & Steele, 1990). Yet in many cases, alcohol may be anxiolytic even without explicit distraction (for a review, see Sayette, 1993). Such findings suggest that the association between alcohol and distraction is complex. Environmental distractors can influence the impact of intoxication on emotion and behavior, but in addition, alcohol may affect sensitivity to distraction. That is, even in the absence of explicit distractors, intoxicated participants may in some instances be distracted from stressful thoughts by internally generated cognitions (Steele & Josephs, 1990). Moreover, alcohol may simultaneously increase people's susceptibility to distraction and undermine their ability to notice that they have become distracted in the first place. The current study addressed this possibility by testing the effect of alcohol on both the occurrence of mind wandering and the capacity to notice that one's mind has wandered.

Mind wandering—and, in particular, mind wandering during reading—provides an especially useful domain for exploring people's capacity for noticing distraction (Schooler, 2002; Schooler & Schreiber, 2004; Smallwood, McSpadden, & Schooler, 2008). While reading, people often mind-wander without realizing it; that is, although they are fully conscious of

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the topic that has distracted them (i.e., they are experientially conscious of that topic; Schooler, 2002), they lack explicit awareness (i.e., metaconsciousness; Schooler, 2002) of the fact that they are mind-wandering. At some point, they realize that they have been mind-wandering and that they have been reading without understanding. The capacity to intermittently take stock of the current contents of thought (referred to interchangeably as metaconsciousness or meta-awareness; Schooler, 2002) appears to play an important role both in terminating mind-wandering episodes and in minimizing their impact on performance.

This role of meta-awareness in mind wandering is supported by several lines of evidence. First, when randomly probed in an experience-sampling procedure, participants are regularly caught mind-wandering before they notice it themselves. Second, such "probe-caught" mind-wandering episodes are associated with greater comprehension disruption than are episodes when individuals catch themselves mind-wandering (Reichle et al., 2008; Smallwood, Fishman, & Schooler, 2007). Third, compared with mind-wandering episodes that occur with awareness, those that occur in the absence of awareness are associated with higher error rates on the concurrent task (Smallwood, McSpadden, & Schooler, 2008), and with different patterns of response times (Smallwood, McSpadden, Luus, & Schooler, 2008) and brain activation (Smallwood, Beach, Schooler, & Handy, 2008). Thus, mind wandering affords an opportunity to investigate not only the propensity for distraction, but also the capacity for a higher-order form of monitoring (metaconsciousness)—that is, the capacity for monitoring whether one's mind has wandered.

We aimed to examine how alcohol affects the propensity to lapse into mind wandering and the ability to detect such lapses. We employed a paradigm that we have used to study mind wandering during reading (Reichle et al., 2008; Schooler, Reichle, & Halpern, 2004; Smallwood, McSpadden, & Schooler, 2008). Participants read text displayed on a computer while simultaneously monitoring their reading performance and indicating occurrences of mind wandering (or "zoning out"). Self-caught mind-wandering episodes provided a measure of mind wandering that had reached meta-awareness. Participants also periodically responded to prompts asking if they were zoning out. The purpose of including this experience-sampling procedure (Hurlburt, 1993) in combination with the self-report measure was to catch participants zoning out before they reported this fact spontaneously—that is, to catch instances when they were mind-wandering without being aware that they were doing so. This approach has advantages over zone-out assessments recorded following task completion (see Smallwood & Schooler, 2006). By combining self-report and experience-sampling measures of mind wandering, we were able to assess the impact of alcohol both on the frequency of mind wandering (as revealed by the experience-sampling measure) and on the meta-awareness of mind wandering (as revealed by the self-report measure).

In this study, participants performed the mind-wandering task after consuming either alcohol or a placebo. We hypothesized that alcohol, which has been found to reduce self-awareness (Hull, 1981), would increase the overall amount of time spent mind-wandering (as revealed by the proportion of times that experience-sampling probes caught participants mind-wandering), and would also interfere with the capacity to notice that one's mind has wandered.

METHOD

Participants

Fifty-four native English-speaking healthy men ages 21 to 35 were recruited via newspaper ads (see Kirchner & Sayette, 2003, for details). Potential participants were excluded if they reported medical conditions that contraindicated alcohol administration, if they met the criteria for past alcohol abuse or dependence in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM–IV; American Psychiatric Association, 1994), if they were not within 15% of the ideal weight for their height, if they were illiterate, or if they reported smoking 15 or more cigarettes per day (to avoid having participants experience nicotine withdrawal during the study). To be invited to participate, the men had to report drinking an average of at least two drinks on at least one occasion per 2 weeks, or at least four drinks on at least one occasion per month, over the past year.

Eligible participants were invited to an experimental session. They were told to avoid eating or drinking caffeine within 4 hr of the session, not to use alcohol or drugs within 24 hr of the session, and not to smoke for 1 hr prior to the session. They also were told that their breath would be measured to confirm compliance. Instructions explained that participants could not drive themselves from the study. Those needing transportation were provided with money for a taxi or bus. Participants were randomly assigned to one of two groups: Half received 0.82 g of alcohol per kilogram of body weight; half received a placebo.

Equipment and Materials

The experiment was completed using an IBM-compatible computer and "homegrown" software (written in Borland C++ 4.0) that allowed participants to read text (chapters 1–5 of *War and Peace*, Tolstoy, 1864–1869/1982) in a self-paced manner. Response latencies were recorded with 1-s accuracy.

Procedure

Predrink Assessment

Participants' height and weight were recorded on arrival. Participants then ate a weight-adjusted meal and completed an informed-consent form. An initial blood alcohol concentration (BAC) reading was obtained, and participants rated their intoxication using a subjective intoxication scale (SIS) ranging

from 0 (*not at all intoxicated*) to 100 (*the most intoxicated I have ever been*).

Drink Administration

Details of the drink procedure are reported in Kirchner and Sayette (2003). Briefly, participants entered the drink-mixing room, where a researcher was waiting with a tray containing a chilled vodka bottle, a bottle of chilled cranberry-juice cocktail (Ocean Spray), a glass, a graduated cylinder, and a beaker. For participants drinking alcohol, the vodka bottle contained 100-proof vodka (Smirnoff); for those drinking placebo, the vodka bottle contained flattened tonic water (Schweppes). In the placebo condition, the glass was smeared with vodka to enhance credibility. A beverage that was 1 part vodka (or tonic water) and 3.5 parts juice was prepared and poured into the glass. The total volume of beverage consumed was the same in the alcohol and placebo conditions. Previous work has revealed that this drinking procedure provides for a successful placebo manipulation, the goal of which is to convince participants that they have consumed alcohol (Martin & Sayette, 1993).

Beginning at time zero, which ranged from 12:30 to 2:30 p.m., participants in the alcohol condition were given one third of a 0.82 g/kg dose of alcohol and asked to consume it evenly over 10 min. After 10 and then 20 min, they received the middle and final thirds of the drink and were asked to consume each of these portions evenly over the following 10 min. Immediately after the final third was finished (30 min), they were asked to rinse their mouths with water and then remained in the room for 5 min.

Postdrink Assessment

BAC readings and SIS ratings were recorded about 39 min after the start of drinking for all participants. As a control for dosage set (the belief that one is drinking alcohol), all participants received a BAC reading ranging from 0.045% to 0.047% (randomly assigned), which is approximately the highest credible reading for deceived participants (Martin & Sayette, 1993). Actual BAC levels also were recorded.

Following the initial postdrink BAC reading, participants completed a group decision-making task while waiting for BACs to approach peak levels (Sayette, Kirchner, Moreland, Levine, & Travis, 2004). Next, participants received a list of words that would subsequently be used in a process-dissociation memory test (Kirchner & Sayette, 2003). After reading this study list, participants performed the zoning-out task.

Zoning-Out Task

Each participant was asked if he had ever read *War and Peace* (either in its entirety or in part); all indicated that they had not. Participants were given 30 min to read up to 34 pages (beginning at chapter 1, with each page containing approximately 22 lines of text) of Tolstoy's (1864–1869/1982) *War and Peace*. The pages were presented on a computer, and participants pressed the "/" key (labeled "F") to advance to the next page and the "z" key (labeled "B") to return to the previous page. The text was displayed in white font against a black background at a distance that each participant chose and found comfortable.

Before starting the task, participants read a description of zoning out. The key parts of the definition were, "at some point during reading, you realize that you have no idea what you just read," and "not only were you not really thinking about the text, you were thinking about something else altogether." Participants were instructed to press the "b" key (labeled "ZO") whenever they caught themselves zoning out. In addition, they were prompted every 2 to 4 min (sampled from a uniform distribution) following a prior prompt or a self-caught zone-out. The prompt consisted of a tone and the message "Were you zoning out?" Participants were instructed to respond "yes" or "no" to each prompt by pressing the "1" or "2" key, respectively.

Following each zone-out episode, participants were instructed to answer a series of computer-administered questions about that episode (e.g., "What were you thinking about while you were zoning out?"). These questions were displayed on the computer monitor, one at a time. (The questions and response alternatives, which were selected by pressing the appropriately numbered keys, are available upon request from the authors.) Participants were free to move backward through the text and reread any sections of it as soon as they had finished answering the questions. After reading the 34 pages (or at the end of the 30-min task, whichever came first), they completed up to 20 true/false questions (depending on how much of the text they had read) that assessed how well they remembered and comprehended the content of the text. The answers to half of these questions were "true," and the questions were presented in the same pseudorandom order to all participants.

Concluding Assessments

Participants completed the testing phase of a process-dissociation task (not reported here; see Kirchner & Sayette, 2003), and BAC was measured. At this point, participants in the placebo condition completed a postexperimental questionnaire asking about the study's purpose, were debriefed, and were paid $50. Participants in the alcohol condition remained in the laboratory until their BACs fell below 0.04%, at which point they completed a postexperimental questionnaire and were debriefed. When their BACs dropped below 0.025%, they were paid $50 and permitted to leave. Before leaving, they were reminded not to drive or operate heavy machinery for the rest of the evening.

RESULTS

Participants in the alcohol and placebo conditions did not differ on a range of demographic variables, including age, ethnicity, income, and drinking patterns (see Kirchner & Sayette, 2003). Participants who drank alcohol reached a mean BAC of 0.067% just before the zoning-out task. As in prior research, SIS ratings

indicated that participants who drank alcohol felt more intoxicated ($M = 35.4$, $SD = 19.4$) than did participants who drank placebo ($M = 18.3$, $SD = 14.6$), though on the postexperimental questionnaire, all participants reported drinking at least 1 oz of vodka (see Kirchner & Sayette, 2003).

Data from 2 participants in the alcohol group and 2 in the placebo group were excluded from analyses because their reading comprehension was well below chance performance (i.e., proportion correct was at or below .33).[1] Data from the remaining 50 participants were used in the following analyses. All inferential tests were nondirectional.

The placebo group ($M = 1{,}439$ s) and the alcohol group ($M = 1{,}340$ s) did not differ significantly in time spent reading ($p = .22$). The placebo group ($M = .70$) performed marginally better than the alcohol group ($M = .61$) on the comprehension test, $t(48) = 2.50$, $p = .075$, $p_{rep} = .842$.

Of particular relevance to our hypotheses were our two measures of mind wandering. The first was the mean proportion of probes to which participants responded affirmatively (i.e., that they had been zoning out). We used this measure to index the propensity to be caught zoning out by the prompts because it adjusts for the number of prompts and is therefore preferred to the absolute number of affirmative probe responses (Reichle et al., 2008). Our second measure of mind wandering was the number of self-reported zoning-out episodes.

Results indicated that the alcohol group was significantly more likely than the control group to be caught mind-wandering by the prompts ($M = .25$, $SE = .05$, vs. $M = .12$, $SE = .03$), $t(48) = 2.15$, $p = .036$, $p_{rep} = .900$. (Means were computed by averaging across the ratios of individual participants.) The mean number of probe-caught zone-outs was 0.76 ($SE = 0.19$) for the placebo group and 1.52 ($SE = 0.34$) for the alcohol group. The number of prompts was similar for participants in the placebo group ($M = 6.80$, $SE = 0.37$) and those in the alcohol group ($M = 6.60$, $SE = 0.41$), $t < 1$, $p > .7$. Note that the slightly higher number of prompts in the placebo group actually worked against the observed difference in the proportion of probes that caught zoning out (i.e., participants in the alcohol group received fewer probes, but were nevertheless caught zoning out more often than participants in the placebo group).

The second mind-wandering measure putatively indexes meta-awareness of zoning out. Participants in the placebo group ($M = 1.48$, $SE = 0.27$) and those in the alcohol group ($M = 1.24$, $SE = 0.29$) were similar in the frequency with which they caught themselves zoning out ($t < 1$, n.s.). Despite zoning out more than twice as often as participants in the placebo group (as revealed by the probe measure), participants in the alcohol group were no more likely (and, indeed, were slightly less likely) to catch themselves zoning out. We quantified this observation by comparing the observed number of self-caught zone-outs in the alcohol group with the expected number of self-caught zone-outs in the alcohol group, given that participants in this group were approximately 2.09 times more likely than those in the placebo group to be caught (by probes) zoning out. To execute this analysis, we multiplied the mean number of self-caught episodes of mind wandering in the placebo group (1.48) by 2.09, and compared this value (3.09) with the observed number of self-caught zone-outs in the alcohol group ($M = 1.24$); the difference between these values (3.09 and 1.24) was significant, $t(48) = 2.91$, $p < .007$.

There were no significant associations between comprehension and either of the two mind-wandering measures in either condition. We also examined the responses that participants made to the computer-administered questions completed after each mind-wandering episode. Although the pattern of results was complex, it is important that participants reported thinking about a variety of different topics during the zoning-out intervals, and reported thinking about text-related topics (on average) only about 6.75% of the time. Moreover, alcohol seemed to particularly increase distraction related to sensory states, such as hunger, thirst, and other consummatory motives.

DISCUSSION

This study suggests that a moderate dose of alcohol simultaneously increases mind wandering while reducing the likelihood of noticing that one's mind has wandered. Participants who drank alcohol were mind-wandering without awareness of doing so about 25% of the time that they were engaged in the reading task. This frequency was more than double that for participants in the placebo condition. This level of mind wandering—although remarkable—is concordant with results of a previous study in which college students were caught zoning out 14 to 22% of the time (Reichle et al., 2008).[2] Also consistent with our findings are data showing that alcohol disrupts performance during a sustained attention task (Finnigan, Schulze, & Smallwood, 2007).

Despite being caught mind-wandering more than twice as often as sober participants, participants who consumed alcohol were no more likely than their sober counterparts to catch their own zoning out. In other words, participants in the alcohol group should have had many more opportunities to catch themselves, but they did not catch themselves more often than the sober participants. Apparently, they were impaired in their ability to notice mind-wandering episodes, whereas sober participants were more capable of detecting mind wandering when it occurred. We may have caught participants who drank mind-wandering

[1] One might question if participants genuinely engaged in the task when comprehension is low. It is important to note that the key effects of alcohol on mind wandering that we report remained significant when we recomputed the analyses using a more stringent criterion, including only participants whose comprehension was .5 or above.

[2] Although the actual number of times participants were caught zoning out was not large, mind-wandering even once can be associated with psychologically important consequences, such as the likelihood of making reading inferences (Smallwood, McSpadden, & Schooler, 2008).

before they caught themselves, a possibility consistent with research suggesting that individuals with low working memory capacity are more likely than those with high working memory capacity to be caught by experience-sampling probes when engaged in demanding tasks (Kane et al., 2007). Because alcohol reduces working memory capacity (Saults, Cowan, Sher, & Moreno, 2007), it follows that alcohol's impact on mind wandering may be due at least in part to working memory being compromised by alcohol.

Although a reduction in working memory capacity may be part of the source of alcohol's effects on mind wandering, it clearly is not the whole story. A particularly novel aspect of the present findings is the observation that alcohol increased the frequency of mind wandering, but decreased the proportion of mind-wandering episodes that reached meta-awareness. To our knowledge, these findings represent the first demonstration that alcohol disrupts individuals' meta-awareness of the current contents of thought. Although novel, this conclusion is consistent with prior observations that alcohol inhibits processes related to meta-awareness, including both elaboration of self-relevant information (Hull, 1981) and engagement in conflict monitoring (e.g., Curtin & Fairchild, 2003).

Participants reported thinking about text-related topics a small portion of the time. Mind wandering may function as "a kind of spontaneous mental time travel" (Mason et al., 2007, p. 395), and alcohol may prove attractive by facilitating this process (Finnigan et al., 2007). We also observed that thoughts associated with motivations to eat, drink, or smoke were more common in the alcohol condition than in the placebo condition, a finding consistent with prior work indicating that alcohol can enhance cigarette cravings (e.g., Sayette, Martin, Wertz, Perrott, & Peters, 2005).

With respect to alcohol myopia, the current data suggest a more qualified view of the impact of alcohol on attention. Although alcohol may narrow attentional focus to immediate cues in the environment, the present findings suggest that such cues may hold attention only if they remain compelling. Indeed, in the context of a relatively nonengaging task (apologies to Tolstoy enthusiasts), alcohol seemed to promote the precise opposite of alcohol myopia in that it contributed to attention leaving its central focus. Thus, the present findings suggest that individuals who have consumed alcohol may remain myopically distracted by television only if the show is suitably engaging, or may cry relentlessly in their beer only if the sorrow is sufficiently sad. Our data are consistent with alcohol facilitating the degree to which the text activated internally focused cognitions (i.e., promoted mind wandering), and thus could be compatible with alcohol myopia if one assumes, for example, that the content of the mind wandering was goal related (e.g., Klinger, 1999). Although Steele and Josephs (1990) have noted the importance of internal cues, this interpretation of their attention-allocation model seems to diverge from the original tests, in which such distraction was externally driven (e.g., Josephs & Steele, 1990), and suggests that future research should continue to address the circumstances under which alcohol may or may not create "myopia."

In addition to informing theory related to the cognitive effects of alcohol, the suggestion that alcohol may both impair sustained attention and reduce meta-consciousness of this impairment has practical implications for many domains in which alcohol is known to impair performance. The disruptive effects of alcohol on self-regulation (see Baumeister, Heatherton, & Tice, 1994; Hull & Slone, 2004) may partly reflect a compromised ability to appraise one's current state and thus regulate it accordingly.

Because the alcohol and placebo conditions had very similar numbers of self-caught zone-outs, we did not have to confront a potentially tricky concern that may apply to future research using this task: The number of probes one receives is related to the number of self-caught zone-outs. If the number of self-caught zone-outs differs between two conditions, then the time available for random prompts also would differ.

Finally, the administration of alcohol provided a unique manipulation for studying metaconsciousness, and thus adds to the growing body of evidence indicating that consideration of metaconsciousness can help to inform understanding of a host of psychological constructs. In addition to mind wandering, these include emotion (Schooler & Mauss, in press), goal pursuit (Schooler, Ariely, & Loewenstein, 2003), social cognition (Winkielman & Schooler, in press), introspection (Schooler & Schreiber, 2004), and recovered memories of abuse (Schooler, 2001). Moreover, this study demonstrates for the first time that the same manipulation can have very different effects on measures that assess whether a thought has entered consciousness and those that assess metaconsciousness. Whereas researchers typically treat self-reported and experience-sampling measures as roughly comparable proxies for the contents of thought (Smallwood & Schooler, 2006), the present study demonstrates that a variable that doubles the likelihood of mind wandering occurring (as revealed by experience-sampling measures) also diminishes the probability of mind wandering being self-reported. Such a finding suggests that distinct processes are responsible for causing a thought to occur versus allowing its presence to be noticed.

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REFERENCES

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Baumeister, R.F., Heatherton, T.F., & Tice, D.M. (1994). *Losing control: How and why people fail at self-regulation* (pp. 156–168). San Diego, CA: Academic Press.

Conger, J. (1956). Reinforcement theory and the dynamics of alcoholism. *Quarterly Journal of Studies on Alcohol*, *17*, 296–305.

Curtin, J.J., & Fairchild, B.A. (2003). Alcohol and cognitive control: Implications for regulation of behavior during response conflict. *Journal of Abnormal Psychology*, *112*, 424–436.

Curtin, J.J., Patrick, C.J., Lang, A.R., Cacioppo, J.T., & Birnbaumer, N. (2001). Alcohol affects emotion through cognition. *Psychological Science*, *12*, 527–531.

Finnigan, F., Schulze, D., & Smallwood, J. (2007). Alcohol and the wandering mind: A new direction in the study of alcohol on attentional lapses. *International Journal on Disability and Human Development*, *6*, 189–199.

Hull, J.G. (1981). A self-awareness model of the causes and effects of alcohol consumption. *Journal of Abnormal Psychology*, *90*, 586–600.

Hull, J.G., & Slone, L. (2004). Self-regulatory failure and alcohol use. In R. Baumeister & K. Vohs (Eds.), *Handbook of self-regulation research* (pp. 466–491). New York: Guilford Press.

Hurlburt, R. (1993). *Sampling inner experience in disturbed affect*. New York: Plenum.

Josephs, R.A., & Steele, C.M. (1990). The two faces of alcohol myopia: Attentional mediation of psychological stress. *Journal of Abnormal Psychology*, *99*, 115–126.

Kane, M.J., Brown, L.H., Little, J.C., Silvia, P.J., Myin-Germeys, I., & Kwapil, T.R. (2007). For whom the mind wanders, and when: An experience-sampling study of working memory and executive control in daily life. *Psychological Science*, *18*, 614–621.

Kirchner, T.R., & Sayette, M.A. (2003). Effects of alcohol on controlled and automatic memory processes. *Experimental and Clinical Psychopharmacology*, *11*, 167–175.

Klinger, E. (1999). Thought flow: Properties and mechanisms underlying shifts in content. In J.A. Singer & P. Salovey (Eds.), *At play in the fields of consciousness: Essays in honor of Jerome L. Singer* (pp. 29–50). Mahwah, NJ: Erlbaum.

Martin, C.S., & Sayette, M.A. (1993). Experimental design in alcohol administration research: Limitations and alternatives in the manipulation of dosage-set. *Journal of Studies on Alcohol*, *54*, 750–761.

Mason, M.F., Norton, M.I., Van Horn, J.D., Wegner, D.M., Grafton, S.T., & Macrae, C.N. (2007). Wandering minds: The default network and stimulus-independent thought. *Science*, *315*, 393–395.

Reichle, E.D., Morales, F.J., Laurent, P.A., Halpern, D.V., Smallwood, J., & Schooler, J.W. (2008). *Mindless reading: The monitoring and consequences of mind-wandering during reading*. Manuscript submitted for publication.

Saults, J.S., Cowan, N., Sher, K.J., & Moreno, M.V. (2007). Differential effects of alcohol on working memory: Distinguishing multiple processes. *Experimental and Clinical Psychopharmacology*, *15*, 576–587.

Sayette, M.A. (1993). An appraisal-disruption model of alcohol's effects on stress responses in social drinkers. *Psychological Bulletin*, *114*, 459–476.

Sayette, M.A. (1999). Cognitive theory and research. In K. Leonard & H. Blane (Eds.), *Psychological theories of drinking and alcoholism* (2nd ed., pp. 247–291). New York: Guilford.

Sayette, M.A., Kirchner, T.R., Moreland, R.L., Levine, J.M., & Travis, T. (2004). The effects of alcohol on risk-seeking behavior: A group-level analysis. *Psychology of Addictive Behaviors*, *18*, 190–193.

Sayette, M.A., Martin, C.S., Wertz, J.M., Perrott, M.A., & Peters, A.R. (2005). The effects of alcohol on cigarette craving in heavy smokers and tobacco chippers. *Psychology of Addictive Behaviors*, *19*, 263–270.

Schooler, J.W. (2001). Discovering memories in the light of meta-awareness. *The Journal of Aggression, Maltreatment and Trauma*, *4*, 105–136.

Schooler, J.W. (2002). Re-representing consciousness: Dissociations between consciousness and meta-consciousness. *Trends in Cognitive Sciences*, *6*, 339–344.

Schooler, J.W., Ariely, D., & Loewenstein, G. (2003). The pursuit and monitoring of happiness can be self-defeating. In J. Carrillo & I. Brocas (Eds.), *Psychology and economics* (pp. 41–70). Oxford, England: Oxford University Press.

Schooler, J.W., & Mauss, I.B. (in press). To be happy and to know it: The experience and meta-awareness of pleasure. In K. Berridge & M. Kringlebach (Eds.), *Pleasures of the brain*. Oxford, England: Oxford University Press.

Schooler, J.W., Reichle, E.D., & Halpern, D.V. (2004). Zoning out during reading: Evidence for dissociations between experience and metaconsciousness. In D.T. Levin (Ed.), *Thinking and seeing: Visual metacognition in adults and children* (pp. 204–226). Cambridge, MA: MIT Press.

Schooler, J.W., & Schreiber, C.A. (2004). Experience, meta-consciousness, and the paradox of introspection. *Journal of Consciousness Studies*, *11*(7–8), 17–39.

Smallwood, J., Beach, E., Schooler, J.W., & Handy, T.C. (2008). Going AWOL in the brain: Mind wandering reduces cortical analysis of external events. *The Journal of Cognitive Neuroscience*, *20*, 458–469.

Smallwood, J., Fishman, D.F., & Schooler, J.W. (2007). Counting the cost of the absent mind. *Psychonomic Bulletin & Review*, *14*, 230–236.

Smallwood, J., McSpadden, M., Luus, B., & Schooler, J.W. (2008). Segmenting the stream of consciousness: The psychological consequences of structural patterns in the time series of response times. *Brain and Cognition*, *66*, 50–56.

Smallwood, J., McSpadden, M., & Schooler, J. (2008). When attention matters: The curious incident of the wandering mind. *Memory & Cognition*, *36*, 1144–1150.

Smallwood, J., & Schooler, J.W. (2006). The restless mind. *Psychological Bulletin*, *132*, 946–958.

Steele, C.M., & Josephs, R.A. (1990). Alcohol myopia: Its prized and dangerous effects. *American Psychologist*, *45*, 921–933.

Taylor, S.P., & Leonard, K.E. (1983). Alcohol and human physical aggression. In R.G. Geen & E.I. Donnerstein (Eds.), *Aggression: Theoretical and empirical reviews* (Vol. 2, pp. 77–101). San Diego, CA: Academic Press.

Tolstoy, L. (1982). *War and peace*. New York: Penguin. (Original work published 1864–1869)

Winkielman, P.W., & Schooler, J.W. (in press). Unconscious, conscious, and metaconscious in social cognition. In F. Strack & J. Förster (Eds.), *Social cognition: The basis of human interaction*. Philadelphia: Psychology Press.

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