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David M. Sanbonmatsu
David L. Strayer
Francesco Biondi
Arwen A. Behrends
Shannon M. Moore

University of Utah
Salt Lake City, Utah

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ABSTRACT

Multitasking may diminish the self-awareness of performance that is often essential for self-regulation and self-knowledge. Participants in an experiment drove on a simulator while talking or not talking on a cell phone. The errors they made while driving were recorded. Following previous research, participants who talked on a cell phone made more serious driving errors than no cell phone participants. No cell phone participants' assessments of the safeness of their driving and general ability to drive safely while distracted were negatively correlated with the actual number of errors they made driving. Hence, more errors were associated with more negative self-assessments. In contrast, cell phone participants' assessments of the safeness of their driving and confidence in their driving abilities were uncorrelated with their actual errors. Thus, talking on a cell phone not only diminished the safeness of participants' driving, it diminished their awareness of the safeness of their driving.

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1. INTRODUCTION

A process that is often central to the pursuit and attainment of goals is monitoring (Baumeister, *Heatherton, & Tice,* 1994). In the monitoring of a task or activity, individuals track their thoughts, feelings, behavior, and circumstances, and their progress toward their goals. When discrepancies are perceived between goals or standards and performance, action may be taken to bring the self into line with those standards (Carver & Scheier, 1998; Duval & Wickland, 1972). The self-awareness characterizing monitoring also facilitates self-knowledge; by observing themselves, individuals can gain a better understanding of their skills, abilities, and preferences. When monitoring is lacking, individuals may fail to recognize the shortcomings of their performance, and, hence, may fail to take immediate corrective action. In addition, they may learn little about themselves, which may hamper their ability to make sound task-related decisions in the future (Moore, Behrends, Mazur, & Sanbonmatsu, 2014).

Factors that draw attention away from the self and diminish monitoring may contribute to self-regulatory failure (e.g., Baumeister, Heatherton, & Tice, 1994). Thus, studies have shown that the ability to monitor may be obstructed by strong emotions or drives (Sayette, Schooler, & Reichle, 2010). Researchers have speculated that self-awareness may be similarly affected by alcohol intoxication and other conditions that limit the ability to process information (e.g., Sayette & Griffin, 2011).

The monitoring of a particular activity may be obstructed by multitasking. Multitasking involves the concurrent performance of two or more functionally independent attention demanding tasks having unique goals and involving distinct stimuli, mental transformation, and response outputs. People generally multi-task to get more done and to experience more activities (Sanbonmatsu, Strayer, Medeiros-Ward, & Watson, 2013). However, multitasking can be cognitively and physically taxing. Moreover, performance of the tasks often suffers such that errors are made and overall productivity is diminished. The attentional demands of each task as well as the inhibitory requirements of task switching may also diminish task monitoring. Because attention is stretched across multiple tasks, the attention given to the self and the task context may be limited. As a consequence, individuals may be less apt to notice the ways in which their performance is falling short and less likely to make adjustments. Moreover, because their self-awareness is diminished, they may be less able to acquire knowledge of their skills and abilities, including their general ability to multi-task. This may allow delusions about their personal ability to multi-task to persevere. Indeed, our research has shown that people are overconfident about their ability to multi-task effectively and that their self-assessments are largely unrelated to their actual multitasking abilities.

An important applied context in which the self-regulatory failures associated with multitasking may occur is the automobile. When people are driving, they frequently engage in secondary tasks such as eating and grooming. One of the most common and dangerous activities behind the wheel, of course, is talking or texting on a cell phone. Over 100 million motorists in the United States are estimated to use cell phones while they drive (e.g., Glassbrenner, 2005). This is a major public safety issue because of the heightened crash risk associated with cell phone usage (e.g., Caird et al., 2008; McEvoy et al., 2005; Redelmeier & Tibshirani, 1997) and the substantial body of empirical evidence showing the impairments from talking on a cell phone. Research has demonstrated that cell phone use contributes to accidents, slower reactions, and more dangerous driving patterns (e.g., Strayer, Drews, & Johnston, 2003). Further studies have shown that cell phone conversation disrupts visual scanning and change detection (McCarley et al., 2004), and causes a form of inattention blindness whereby observers fail to see information that falls directly in their line of gaze (Strayer & Drews, 2007).

Recent work (Sanbonmatsu, Strayer, Medeiros-Ward, Behrends, & Watson, 2014) indicates that drivers are motivated to use cell phones for a variety of perceived benefits. Talking on a cell phone enables drivers to connect with family and friends and get work done. In addition, it sometimes helps to alleviate the boredom associated with driving. Although people generally acknowledge the risks, they downplay the dangers of talking on a cell phone relative to drinking and driving. Most users actually believe they can drive safely while using a cell phone; and when it comes to driving safely while distracted, they regard themselves to be more capable than others. Our findings indicate that this overconfidence is one of the strongest predictors of drivers' usage of cell phones behind the wheel.

An important reason why drivers may be overconfident about their ability to drive safely while distracted and why people more generally overestimate their ability to multi-task effectively is diminished monitoring. Drivers generally monitor their performance to ensure they are driving safely. However, when they are distracted by the mechanics of using a phone and their conversations, they may be less cognizant of the errors they are making and how badly they are driving. Because of their lack of self-awareness, they may maintain the illusion they can drive safely while talking on their cell phone and continue engaging in this risky multitasking activity. Moreover, because their ability to monitor their driving is impaired, their performance assessments are likely to be guided by their beliefs and expectations rather than actual observations.

2. THE IMPACT OF CELL PHONE USE ON THE MONITORING AND SELF-ASSESSMENT OF DRIVING

A study was conducted to examine the impact of multitasking on performance monitoring and assessment. We hypothesized that engagement in multiple tasks diminishes awareness of task performance and the accuracy of self-performance ratings. Because self-awareness of the costs of multitasking is limited, overconfidence may prevail. These effects of multitasking were investigated in the ubiquitous context of operating a motor vehicle. Participants in an experiment drove on a simulator while talking or not talking on a cell phone. Driving errors such as running a red light and swerving into the oncoming lane were recorded by an experimenter. The errors served as the measure of the actual safeness of participants' driving. Participants' self-awareness of their driving safety was measured in two ways. First, they rated the safeness of their simulator driving. Second, they attempted to remember the specific driving errors they made. Participants finished by indicating their general confidence in their ability to drive safely while distracted.

Following prior research, cell phone use was expected to increase the driving errors made by participants. More importantly, cell phone use was expected to diminish the accuracy of participants' assessments of the safeness of their driving. We also predicted that participants who were not using a cell phone would have a better memory of their errors than participants talking on a cell phone. Finally, no cell phone participants' confidence in their ability to drive safely while distracted was expected to be grounded in the actual safeness of their driving on the simulator. However, because cell phone users were expected to be unaware of the adverse effects of cell phone use on their driving, it was anticipated that their assessments of their general ability and their errors would be uncorrelated. Consequently, they were expected to display the same levels of confidence in their ability to drive safely while distracted as no cell phone participants even after flailing on the simulator.

3. METHOD

3.1 Participants

Seventy-seven undergraduates (52 females and 25 males) participated in the IRB approved study for extra course credit. They were randomly assigned to either the cell phone or no cell phone condition. The undergraduates ranged in age from 18 to 41, with an average age of 22. All participants reportedly owned a cellular phone.

A power analysis for detecting driving differences between the cell phone and no cell phone conditions was performed adopting an α of .05 (2-tailed). Following our previous research (e.g., Strayer, Drews, & Johnston, 2003), we assumed a moderate to large effect size. The analysis indicated that a sample of 30 participants in each condition was needed to demonstrate differences in driving performance. A second power analysis was performed for the planned correlational analyses of the correspondence between driving performance and assessment. Assuming a moderate to large effect size and adopting an α of .05 (2-tailed), we determined that 46 participants in each condition were needed. However, attrition resulting from motion sickness caused us to fall short of this goal. Note that individuals who were not able to complete the driving session because of motion sickness were not included in the participant count.

3.2 Stimuli and Apparatuses

The DriveSafety™ DS-600 simulator was used in this experiment. The DS-600 consists of a full cab surrounded by five large screens encompassing 270 degrees of view. Along with two side-view mirrors and a rear-view mirror, the DS-600 provides a 360-degree driving field of vision. The DS-600 requires no visual scene compression. The simulated vehicle is based on the vehicular dynamics of a generic compact passenger sedan with automatic transmission and a simulator cabin from the Ford Focus.

The driving program was designed using DriveSafety HyperDrive Authoring Suite™, a design platform using Tcl language. A city residential road database simulated an 8.2-kilometer section of road with 10 intersections and both one-way and two-way traffic. Directional arrows embedded in the driving environment provided instructions for navigation. Driving was regulated by speed limit, school zone, stop and yield signs, and traffic lights. The roadways, sign placement (e.g., distance between the crosswalk and the pedestrian crossing sign), and crosswalks were designed in accordance with the Manual on Uniform Traffic Control Devices for Streets and Highways (Federal Highway Administration, 2012).

Participants in the cell phone condition used a hands-free device provided by the experimenter. Cellular service was provided by Sprint. The cellular phone was manufactured by Samsung (Model M360) and the hands-free earpiece was manufactured by Jawbone (Model Era). Participants indicated in which ear they wished to use the hands-free earpiece.

3.3 Procedure

Participants began the study by completing a brief survey of their driving practices and beliefs. They were then familiarized with the driving simulator, using a standardized adaptation sequence designed to reduce the likelihood of motion sickness, after which commenced a 10-minute practice session. After completing the survey, cell phone condition participants were asked to generate a list of five friends or family members they could talk with during their drive. The call to a friend or family member was initiated and the volume was adjusted before participants in the cell phone condition began the primary driving session.

There were 12 potentially hazardous driving scenarios or situations that were encountered by participant drivers. The scenarios required them to take action to comply with traffic laws. Specifically, drivers were required to stop for pedestrians at a crosswalk partially obscured by other vehicles, slow down in a school zone, yield to an approaching vehicle, stop behind cars turning left while traveling on a single lane road, slow down and move over because of construction, avoid a bicyclist at a crosswalk, pull over for an ambulance, and slow down for a crosswalk partially obscured by a truck. The program was designed to minimize accidents that would disrupt driving. For example, pedestrians did not cross the road if a vehicle failed to stop at a crosswalk. The entire 8.2-kilometer drive took about 20 minutes to complete.

The experimenter observed the movements of the vehicle from behind the simulator cab. As the participant drove, the experimenter tabulated the driving errors the participant made on a checklist. The specific errors that were recorded on the checklist are presented in Table 1. Immediately after completing their drive, participants were asked to complete the exact same checklist of errors that the experimenter filled out. Thus, they attempted to indicate the frequency with which they made each of the driving errors recorded by the experimenter.

Participants finished by assessing the safeness of their driving and their general ability to drive safely while talking on a cell phone. They rated "the safeness of your driving during this experiment using the simulator" on a 7-point scale anchored by "-3" = *not at all safe* and "+3" = *highly safe*. They also rated their "overall driving performance during this experiment using the simulator" on a 7-point scale anchored by "-3" = *very bad* and "+3" = *very good*. Finally, they answered the question, "To what extent are you capable of driving safely while engaging in another task such as talking on the cell phone?" on a 7-point scale anchored by "1" = *not at all capable* and "7" = *highly capable*.

4. RESULTS

The analyses were limited to participants who completed the simulator drive or whose drive was not interrupted. The data of one participant who chose to drive 5-10 mph throughout the entire course and was rear ended repeatedly were excluded. Preliminary analyses indicated that gender did not interact with cell phone usage to affect any of the performance or assessment measures in the study. Consequently, gender was not included in the reported analyses.

4.1 Actual Driving Errors and Actual Driving Safeness

The most basic measure of the actual safeness of participants' driving on the simulator was the total number of errors they made. In order to distinguish the severity of the errors and create more detailed measures of driving safeness, we asked 69 respondents in an independent survey to indicate the seriousness of each of the driving errors or violations on a 6-point scale anchored by "0" = *not at all serious* and "5" = *highly serious*. The mean rating of each of the driving errors is presented in Table 4.1. There were two errors (failing to signal and speeding) that were clearly perceived to be less severe than the others. These errors were the only two with means below 3. Moreover, when the errors were ordered in terms of judged severity, the only significant contrast between an error and the next most serious error was between the errors of speeding and making an illegal turn, $t(68) = 2.17$, $p = .03$, $D = .53$. Consequently, failing to signal and speeding were labeled as "minor" errors while the remaining 11 were labeled as "serious" errors. The minor errors have face validity as being less severe in that they are clearly less likely to directly lead to an accident than more serious errors such as failing to yield to a vehicle with the right of way. Distinguishing the minor errors from the serious errors was important, because it was anticipated that the serious errors would be the primary basis for participants' assessments of the safeness of their driving and their confidence in their ability to drive safely while distracted.

Table 4.1 Driving errors and their ratings of severity

	Mean
Failing to signal a turn	2.51 [2.20, 2.81]
Speeding 10 miles or more mph over the posted speed limit in a particular speed zone	2.93 [2.62, 3.24]
Making an illegal turn	3.25 [2.96, 3.54]
Failing to move over for a bicyclist, pedestrian, or emergency vehicle	3.48[3.16, 3.80]
Failing to stop at a crosswalk for one or more pedestrians	3.90 [3.62, 4.18]
Failing to take appropriate action to avoid a hazard	3.99 [3.76, 4.23]
Swerving off the road (at least two wheels off the road)	4.13 [3.88, 4.38]
Swerving into the wrong lane (at least two wheels in opposite lane)	4.35 [4.15, 4.56]
Failing to stop at an intersection for a red light or stop sign	4.42 [4.21, 4.64]
Traveling in the wrong direction on a one way road	4.66 [4.51, 4.81]
Moving into a lane (traveling in the same direction) occupied by another vehicle (leading to a near collision or collision)	4.71 [4.58, 4.84]
Hitting a vehicle, pedestrian, bicyclist, or object	4.96 [4.90, 5.02]

Note: N = 69. Numbers in brackets are 95% confidence intervals of the means.

Table 4.2 presents the total, serious, and minor driving errors made in the cell phone and no cell phone conditions. A comparison of the errors in the two experimental conditions revealed that participants who used a cell phone while driving tended to make more total errors than participants in the no cell phone condition, $t(75) = 1.87$, $p = .066$, $D = .43$. Further analyses revealed that participants who talked on a cell phone made significantly more serious errors $t(75) = 2.46$, $p = .017$, $D = .56$, but not more minor errors, $t(75) = .12$, $p = .903$, $D = .04$, than no cell phone participants.

Table 4.2 Perceived and actual errors, self-assessments of driving, and perceived ability to drive safely while distracted as a function of talking vs. not talking on a cell phone while driving.

	No cell phone	Cell phone
Total driving errors	5.74 [4.79, 6.83]	7.38 [5.91, 8.86]
Serious driving errors	4.39 [3.74, 5.13]	6.00 [4.87, 7.13]
Minor driving errors	1.34 [.911, 1.85]	1.38 [.85, 1.92]
Perceived total driving errors	7.21 [5.54, 9.22]	8.23 [6.27, 10.19]
Perceived serious driving errors	5.29 [3.91, 6.96]	5.72 [4.29, 7.15]
Perceived minor driving errors	1.92 [1.37, 2.52]	2.51 [1.82, 3.21]
Perceived safeness of driving	1.13 [.65, 1.51]	-.01 [-.50, .48]
Perceived driving performance	1.26 [.74, 1.69]	.28 [-.17, .73]
Perceived ability to drive safely while using a cell phone	3.38 [2.95, 3.81]	3.12 [2.62, 3.61]

Notes: N = 77. Numbers in brackets are 95% confidence intervals of the means.

4.2 Perceived Driving Safeness and Perceived Driving Errors

Participants' assessments of the safeness of their driving and their estimations of the number of driving errors they made in the cell phone and no cell phone conditions are also presented in Table 4.2. Participants who talked on a cell phone were generally expected to perceive their driving to be less safe and to report they made more errors because of the widespread recognition and expectation that cell phones impair driving performance. Somewhat surprisingly, cell phone participants did not report that they made more driving errors than no cell phone participants, $t(75) = .77$, $p = .443$, $D = .18$. Moreover, they did not remember making more minor errors, $t(75) = 1.34$, $p = .185$, $D = .31$, and serious errors than participants who did not talk on a cell phone, $t(75) = .42$, $p = .678$, $D = .10$. However, as anticipated, participants who talked on a cell phone generally perceived that they drove less safely, $t(75) = 3.54$, $p = .001$, $D = .81$, and that their driving performance was worse than participants in the no cell phone condition, $t(75) = .3.05$, $p = .003$, $D = .70$. Participants in the cell phone and no cell phone conditions did not differ in terms of their perceptions of their general ability to drive safely while distracted following the simulator session, $t(74) = -.80$, $p = .424$, $D = .18$.

4.3 Relation between Perceived and Actual Driving Safeness

Analyses were performed to examine whether participants' assessments of the safeness of their driving were based on awareness of the actual safeness of their driving (See Table 4.3). No cell phone condition participants' assessments of their driving safety were negatively correlated with the total number of driving errors they made, though this relation was only marginally significant ($p = .106$), significantly negatively correlated with their serious driving errors, and uncorrelated with their minor driving errors. Thus, when participants did not talk on a cell phone, their assessments of the safeness of their driving tended to decrease as the total and serious driving errors they made increased. In contrast, cell phone condition participants' assessments of their driving safety tended to be positively correlated with their total and serious driving errors, though only the latter was marginally significant ($p = .102$) and uncorrelated with their minor driving errors. A comparison of the correlations revealed that self-assessments of driving safety tended to be more strongly negatively correlated with the total actual driving errors and serious driving errors in the cell phone condition than the no cell phone condition (total driving errors: $z = 1.85$, $p = .064$; serious driving errors: $z = 2.75$, $p = .006$). Hence, when participants talked on a cell phone, they were less aware of the actual safeness of their driving than when they did not talk on a cell phone.

Further suggestive evidence of cell phone participants' lack of driving self-awareness comes from an analysis of participants' memory of their driving errors. No cell phone participants' memory of their total driving errors was significantly positively correlated with their actual total errors. Their memory of their serious driving errors was similarly significantly positively correlated with the actual serious driving errors they made while their memory of their minor driving errors was not correlated with their actual minor driving errors. The pattern suggests that no cell phone participants were cognizant of the errors they were making in the simulator. In contrast, cell phone participants' memory of their total driving errors, serious driving errors, and minor driving errors were not significantly correlated with the actual number of errors they made in each of the corresponding categories. A comparison of the correlation coefficients indicates that participants' memory for their serious driving errors was marginally better in the no cell phone condition than in the cell phone condition, $z = 1.69$, $p = .091$. However, this was the only comparison that approached significance.

A final analysis examined the correspondence between participants' ratings of their overall driving performance on the simulator and their actual driving errors. Neither cell phone participants' nor no cell phone participants' assessments of their driving performances were significantly correlated with the actual, serious, or minor driving errors they made on the simulator. This is not altogether surprising, given that performance assessments are likely to have been based on facets of driving other than safety, such as how well participants generally maneuvered around the course.

Table 4.3 Correlations between actual and perceived errors and memory for errors, self-assessments of driving, and perceived ability to drive safely while distracted as a function of talking vs. not talking on a cell phone while driving.

	Actual total errors	Actual serious errors	Actual minor errors	Perceived total errors	Perceived serious errors	Perceived minor errors
Perceived safeness of driving						
Cell Phone	.16	.27	-.12	-.33*	-.37*	-.17
No Cell Phone	-.27	-.36*	-.05	-.66**	-.72**	-.20
Perceived driving performance						
Cell Phone	-.04	.11	-.35*	-.49**	-.54**	-.27
No Cell Phone	.00	-.09	-.14	-.54**	-.60**	-.15
Perceived Ability to drive safely while distracted						
Cell Phone	.10	.18	-.11	-.45**	-.45**	-.34*
No Cell Phone	-.23	-.27	-.10	-.31	-.36*	-.05
Memory for errors						
Cell Phone	.16	.01	.17			
No Cell Phone	.33*	.39*	.19			

Notes: Cell Phone N = 39. No Cell Phone N = 38.
*Significant at $p < .05$ level. **Significant at $p < .01$ level.

4.4 Predictors of Self-Assessments of Driving Ability

As expected, the correlations between the various driving assessments and perceived driving errors were very strong. From Table 4.3, it is evident that both no cell phone and cell phone participants' perceptions of their errors were strongly negatively correlated with their assessments of the safeness of their driving and their driving performance. However, as we discussed above, the data indicate that only no cell phone participants' perceptions of their errors were grounded in awareness of the actual safeness of their driving.

The final set of analyses focused on the predictors of participants' general confidence in their ability to drive safely while distracted. As we reported above, cell phone condition participants and no cell phone condition participants did not differ in their assessments of their ability to drive safely while distracted. However, they did differ in terms of the underlying basis of their confidence. From Table 4.3, it is apparent that both no cell phone and cell phone participants' confidence in their ability to drive safely while distracted was strongly negatively correlated with their perceived driving errors. Moreover, their confidence was highly positively correlated with their assessments of their driving safety [cell phone condition: $r(37) = .77$, $p < .001$; no cell phone condition: $r(35) = .44$, $p = .006$] and perceptions of their driving performance [cell phone condition: $r(37) = .65$, $p = .000$; no cell phone condition: $r(35) = .36$, $p = .028$]. Thus, the confidence of all participants appears to have been based, in part, on their perceptions of their driving safeness and performance in the simulator.

However, only no cell phone participants' confidence in their ability to drive safely while distracted appears to have been grounded in the actual safeness of their driving. The confidence of participants who did not talk on a cell phone tended to be negatively correlated with the total, serious, and minor driving errors they made, though only the correlation with serious driving errors approached significance (p = .11). In contrast, the confidence of participants who talked on a cell phone tended to be positively correlated with the total and serious driving errors they made, and uncorrelated with their minor errors, though none of these correlations were significant. A comparison of the correlation coefficients indicates that the relation between participants' assessments of their ability to drive safely while distracted was more strongly negatively correlated with their serious driving errors in the no cell phone condition than in the cell phone condition, z = 1.92, p = .05. However, this was the only contrast that was significant.

5. DISCUSSION

Cell phone use not only impaired the safeness of participants' driving in our study, it impaired their awareness of the safeness of their driving. The driving safety assessments and memory of driving errors of participants who talked on a cell phone were almost wholly uncorrelated (or correlated in the wrong direction) with the actual errors they made. When drivers are talking on a cell phone, they are often unaware of the inconsistencies in their speed, their weaving across lanes, and their near misses with other vehicles. As a consequence, they may persist in believing that they can safely talk or text on a cell phone behind the wheel.

The study furthers understanding of the impact of secondary task engagement on the self-regulation of performance. Multitasking has multiple costs. Taking on multiple tasks simultaneously can be physically taxing and stressful, and it can contribute to poorer primary task performance. Our findings indicate that an additional cost of multitasking is a decrease in the performance monitoring that is essential to self-regulation and self-knowledge (e.g., Baumeister, *Heatherton, & Tice*, 1994). Because multi-taskers are less self-aware, they may be less apt to make the adjustments necessary to bring their performance in line with their goals (e.g., Carver & Scheier, 1998) and less likely to acquire the self-knowledge of their shortcomings and abilities that is essential to decision making and improvement.

The research also increases our understanding of the motivations underlying multitasking and the usage of cell phones while driving. As we discussed previously, people tend to downplay the risks of multitasking, in part because of inflated views of their capacities (Sanbonmatsu et al., 2014). The present findings suggest that one of the contributors to overconfidence in the ability to multi-task is diminished self-awareness. People are often unaware of how doing many things at once can have a detrimental effect on their performance. Consequently, they may persist in believing that they are capable of performing multiple tasks simultaneously with minimal cost. Although participants who used cell phones in our study made more errors than no cell phone participants, they were not aware of them. As a result, their assessments of their general driving ability were unaffected by their unsafe driving. In contrast, no cell phone participants' estimations of their ability to drive safely while distracted were significantly associated with the actual serious errors they made on the simulator.

People generally acknowledge that cell phone use impairs driving performance (Sanbonmatsu et al., 2014). This expectation is likely to have led cell phone participants to assess their driving safety less favorably than no cell phone participants. However, participants who talked on a cell phone really had little idea of how well or poorly they were driving. Because cell phone users' self-assessments of their driving safety appear to be expectancy-based and not grounded in direct experience and observation (Fazio & Zanna, 1981), they are less apt to have any real impact on their driving behavior and decisions. The findings suggest that multi-taskers' self-reports of what they did and what happened should generally be treated with skepticism. Multitasking is often attention demanding to the point that people are unable to monitor themselves and the circumstances affecting their behavior. As a consequence, their assessments and accounts of their performance may often be specious.

A phenomenon that is related to self-awareness is mindfulness, which is sometimes defined as "the state of being attentive to and aware of what is taking place in the present" (e.g., Brown & Ryan, 2003). Although self-awareness can operate at many different levels (Vallacher & Wegner, 1975), mindfulness is thought to differ in that it involves greater perceptual processing, and less self-examination and reflection. Nevertheless, because mindfulness involves attention, it may be similarly impaired by multitasking. Specifically, the attentional demands of switching tasks, inhibiting off task processing, and maintaining cognizance of multiple goals may diminish the experience of actually engaging the tasks. Thus, multitasking may diminish not only self-awareness, but also the mindfulness that has been associated with greater psychological wellbeing (e.g., Weinstein, Brown, & Ryan, 2009).

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