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Did You See the Unicycling Clown? Inattentional Blindness while Walking and Talking on a Cell Phone

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SUMMARY

We investigated the effects of divided attention during walking. Individuals were classified based on whether they were walking while talking on a cell phone, listening to an MP3 player, walking without any electronics or walking in a pair. In the first study, we found that cell phone users walked more slowly, changed directions more frequently, and were less likely to acknowledge other people than individuals in the other conditions. In the second study, we found that cell phone users were less likely to notice an unusual activity along their walking route (a unicycling clown). Cell phone usage may cause inattentional blindness even during a simple activity that should require few cognitive resources. Copyright © 2009 John Wiley & Sons, Ltd.

In experiments using driving simulators, many researchers have found that people engaged in cell phone conversations show poorer driving performance than people focused only on driving. Although drivers may encounter a number of distractions, cell phones appear to be particularly problematic: Cell phone users perform more poorly than people listening to music, listening to books on tape, or conversing with a passenger (Crudell, Bains, Chapman, & Underwood, 2005; Drews, Pasupathi, & Strayer, 2008; Hunton & Rose, 2005; Strayer & Johnston, 2001). Strayer, Drews, and Crouch (2006) also found that engaging in a cell phone conversation results in poorer driving performance than being legally drunk. Nonetheless, many people still deny that such findings apply to them and argue that they perform just as well when using a cell phone. Strayer et al. noted that although their participants claimed they experienced no difficulties driving while talking on a cell phone, they nonetheless performed more poorly in the simulated driving task they had just completed.

Trick, Enns, Mills, and Vavrik (2004) framed how divided attention may impact driving performance. They noted that some aspects of driving, such as maintaining lane position, are relatively automatic, require little attentional capacity, and may not be affected by divided attention tasks—an observation subsequently reported by other researchers studying the effects of cell phone conversations on driving performance in a simulator (Horrey & Simons, 2007; Kubuse, Bock, Dell, Garnsey, Kramer, & Mayhugh, 2006; Rakauskas, Gugerty, & Ward, 2004). Other aspects of driving require greater attentional

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capacity and thus may be disrupted by divided attention (Horrey & Simons, 2007). In particular, people using a cell phone may be less likely to notice new and distinctive stimuli, a phenomenon known as inattentional blindness (Becklen & Cervone, 1983; Mack & Rock, 1998; Neisser & Becklen, 1975; Newby & Rock, 1998; Simons, 2000; Simons & Chabris, 1999). Fougnie and Marois (2007) argued that inattentional blindness is more likely when the divided attention task involves processing by working memory rather than simply maintaining information. Since conversations involve demanding cognitive manipulations, they should induce inattentional blindness. Several researchers have observed that while driving in a simulator, cell phone users notice changed or new stimuli less often than non-distracted drivers (Beebe & Kass, 2006; Drews et al., 2008; Kass, Cole, & Stanny, 2007; Strayer, Drews, & Johnston, 2003). In support of the inattentional blindness explanation, Strayer and his colleagues (Strayer & Drews, 2007; Strayer et al., 2003) found that even though cell phone users were as likely to look at stimuli, they were less likely to recognize them on a memory test than individuals not engaged in cell phone conversations.

Cell phone users also display other problems when driving in a simulator. Compared to non-distracted drivers, cell phone users drive more slowly and follow further from a pace car (Horrey & Simons, 2007; Kubuse et al., 2006; Rakauskas et al., 2004; Strayer et al., 2003; Strayer et al., 2006; Törnros & Bolling, 2006). In a naturalistic driving study of 100 cars, Klauer, Dingus, Neale, Sudweeks, and Ramsey (2006) found that cell phone use and other forms of driver inattention were related to crash and near-crash events. Inattentional blindness may explain these deficits as well. Cell phone users may be compensating for their reduced environmental awareness by driving more slowly and following further behind other cars.

Of course, not everyone is convinced by these findings. People continue to drive while having cell phone conversations. Although many state legislatures have outlawed the use of hand-held phones and texting while driving, hands-free cell phones are still permissible. Further, our students often claim that they are able to perform divided attention tasks. In particular, students argue that years of cell phone conversations and of driving have made these tasks automatic so that attentional capacity is not unduly overloaded when driving and talking on a cell phone (see also Strayer et al., 2006).

To a certain extent, this is a potentially valid argument. Neisser and his colleagues (Hirst, Spelke, Reaves, Caharack, & Neisser, 1980; Spelke, Hirst, & Neisser, 1976) found that people could perform even very difficult divided attention tasks with extensive practice. They found that people could read while taking dictation of a separate message and argued that neither task was automatic since people retained the content of each.

Many of the simulator studies, however, may disrupt the automatic nature of driving while having a cell phone conversation that may come with extensive practice. In most studies, people use a driving simulator that differs from their own car on a route that is unfamiliar. In addition, participants use an unfamiliar cell phone and have unusual conversations with strangers during these studies. Finally, since research participants are randomly assigned to conditions (or participate in all conditions), they may not have much practice driving while talking on a cell phone. In these cases, individuals may not have developed expertise to the point where the divided attention task is learned.

In designing our studies, we looked for an observable navigation task in people's normal environment during which some individuals choose to engage in cell phone conversations. Walking is one such task. Other researchers have found some evidence that divided attention disrupts walking—making people less likely to notice novel stimuli and more

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likely to cross a street in a risky fashion (Bungum, Day, & Henry, 2005; Hatfield & Murphy, 2007; Nasar, Hecht, & Wener, 2008). We compared the walking behaviour of people conversing on a cell phone with individuals walking alone with no electronics, individuals walking and listening to a music player (a different form of electronic divided attention), and individuals walking in pairs (another form of conversational divided attention). In our first study, we looked at some measures less likely to be impacted by divided attention, such as holding to a route and some measures more likely to be affected by divided attention, such as noticing other people in the environment and near collisions. In our second study, we specifically investigated the possibility of cell phone conversations leading to inattentional blindness by seeing if people noticed an unusual stimulus—the unicycling clown.

STUDY 1

Method

Participants

Individuals were observed walking through Red Square, the large central plaza of Western Washington University. To ensure that individuals were selected without bias, the observers rotated through the participant categories (single individual with no electronics, cell phone user, music player user, pairs). After completing an observation, the observers selected the first individual entering Red Square at their observation post who fulfilled the next observation category. We collected observations of 317 individuals (148 classified as males, 169 as females; 294 classified as college-age, 18 as older, and 5 as unsure). For data analysis, we restricted observations to individuals who crossed using the most common diagonal path and who did not change condition while crossing Red Square (e.g. entered as a cell phone user, ended the call, and finished as a single individual with no electronics in use). This left observations of 196 individuals (94 males, 102 females; 180 college-aged, 11 older and 5 unsure). Of these, 43 were single individuals without electronics, 47 were cell phone users, 54 were music player users and 52 were part of a pair (for pairs, observers collected data on the closest individual).

Procedure

Trained observers were positioned in pairs at the two corners of Western Washington University's Red Square along the primary walking path (Figure 1 displays an overhead view of the square with the path marked). WWU's Red Square is a large open area surrounded by academic buildings and the library (total area is 59 120 square feet). The main diagonal path, approximately 375 feet, is travelled by many students going to classes, the library, the student union, and dorms. Students also congregate in Red Square, protests occur there, and student groups set up information booths. Passing through Red Square poses a complex navigation task.

Several data points were recorded regarding the crossing conditions each individual experienced. In particular, we noted the time of day, day of week, and whether it was during a passing time (the time between classes when many students rush to grab a cup of coffee and make their next class meeting). We also noted the weather conditions and the presence of additional activities.

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Figure 1. Overhead picture of WWU's Red Square with the common diagonal path marked (used in Studies 1 and 2) and location of the unicycling clown (Study 2)

The observers also recorded several outcome measures for each individual. These measures included: the time it took each individual to cross Red Square, if the individual stopped while crossing, the number of direction changes (defined as an instance when the observer thought the individual was moving towards one exit from Red Square and changed direction enough so that the observer believed the individual was moving towards a different exit), whether the individual weaved while crossing, whether the individual tripped or stumbled, if the individual was involved in a collision or near-collision, and if the individual explicitly acknowledged other people by waving, nodding or talking (the size of Red Square precluded observations of eye contact and facial expressions).

Results and discussion

When looking at time to traverse Red Square, we limited analysis to individuals who did not stop while crossing. We found that walking condition affected time to cross, F $(3, 178) = 15.246$, $p < .001$, $\text{MSE} = 110.595$, $\eta^2 = .204$. People talking on cell phones and those walking in pairs crossed Red Square more slowly than single individuals without electronics and individuals using music players (Table 1 includes mean crossing time in seconds). In additional analyses, we looked for gender effects and effects of Red Square

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Table 1. Outcome measures in Study 1 for cell phone users, single individuals, music player users, and pairs

	Walking condition			
Outcomes	Cell phone user	Single	Music player	Pair
Crossing time	82. 53 (13.09)	74.81 (9.57)	73.69 (8.88)	86.22 (10.12)
Changed direction	29.8%	4.7%	11.1%	17.3%
Weaving	21.3%	14.0%	5.6%	9.6%
Acknowledge others	2.1%	11.6%	13.0%	7.7%
Stopped	4.3%	2.3%	9.3%	11.5%
Near collisions	4.3%	0.0%	1.9%	0.0%

conditions. Gender had no effect on walking speed and did not interact with walking condition (Fs < 1). Moreover, we found that individuals walked faster during passing time but that this did not interact with walking condition.

We investigated other variables using χ^2 analyses. There were no differences among the non-cell phone conditions on any of these variables and thus we grouped non-cell phone users for additional power. Table 1 presents these other measures. We found that cell phone users were more likely to change direction (χ^2 (1, $N = 196$) $= 9.063$, $p = .003$) and weave (χ^2 (1, $N = 196$) $= 4.693$, $p = .030$) than other walkers. Cell phone users also tended to acknowledge other people less often than individuals in the other conditions perhaps displaying inattentional blindness (χ^2 (1, $N = 196$) $= 3.344$, $p = .067$). We found no differences in whether individuals stopped or were involved in near collision episodes because these behaviours were infrequent for all groups. No individuals in any condition tripped or stumbled.

Given the nature of this study, there are limitations regarding our findings. Since people self-selected their walking conditions, various factors beyond divided attention could have caused the cell phone users to behave differently. In addition, although the measure of time to cross was an objective measure, the other measures were judgments of the observers. To ensure consistency, observers worked in pairs, systematically selected individuals for observation, and practiced judging weaving and direction changes. Furthermore, prior to the research, we predicted that cell phone users would not experience difficulty maintaining their path based on Trick et al. (2004). Thus the unexpected finding that cell phone users displayed more weaving and direction changes is evidence that the observers were not biased.

Since people walking in pairs and those having cell phone conversations were slower, there is a possibility that any form of conversation leads to slower walking speed. However, researchers who have studied people driving in simulators typically find that cell phone conversations are more problematic than conversations with a person sitting in the simulator (Drews et al., 2008; Hunton & Rose, 2005). Consistent with such research, we also found that cell phone conversations led to problems beyond slowing people down: Cell phone users made more direction changes, displayed more weaving, and were less likely to explicitly acknowledge other people. Thus cell phone users may have experienced difficulty monitoring environmental cues important for walking because of inattentional blindness.

In Study 2, we specifically investigated if walking while talking on a cell phone led to inattentional blindness. We placed an unusual stimulus to the side of the primary diagonal walking path and asked individuals if they noticed the stimulus after they had finished crossing Red Square. Our unusual stimulus was a brightly coloured unicycling clown.

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Unicyclists are very rare on campus pathways and none of the authors have ever observed a unicycling clown on campus. Since the clown was unicycling near the walking path, this was clearly relevant to the task of safely navigating across Red Square (besides, you never know when a clown may throw a cream pie in your face).

STUDY 2

Method

Participants

Observations were collected of individuals walking along the same diagonal path used in Experiment 1. Observers were positioned at both ends of this path and attempted to interview all individuals who exited Red Square classifiable under any of the same four conditions. We interviewed 151 individuals (67 classified as males, 84 as females; 139 classified as college-age, 10 as older and 2 as unsure). Of these individuals, 78 were single individuals without electronics, 24 were cell phone users, 28 were music player users and 21 were part of a pair (for pairs, observers interviewed the closest individual).

Procedure

A clown unicycled around the large sculpture in Red Square on a pleasant afternoon in the spring (see Figure 1 for location). Data collection occurred during a single 1-hour session. The clown wore a vivid purple and yellow outfit, large shoes, and a bright red nose (see Figure 2 for a picture of the unicycling clown). Since the clown was brightly coloured and moving, he was a visually noteworthy object. The clown was also relevant to the navigation

Figure 2. A picture of the unicycling clown circling the sky-viewing sculpture

task because he was moving in a direction that could take him towards the pedestrians. While the clown unicycled, the interviewers asked all individuals who had crossed Red Square in the same four conditions used in Experiment 1 if they would respond to two questions. First, the interviewers asked if they had seen anything unusual when crossing Red Square (individuals who answered yes were asked to specify what they had seen). Second, if they did not mention seeing the clown, they were asked directly if they had seen the unicycling clown.

Results and discussion

We found evidence of inattentional blindness among cell phone users. When asked if they had seen anything unusual while crossing Red Square, cell phone users were the least likely to volunteer having seen the unicycling clown (χ^2 (3, $N = 151$) = 12.319, $p = .006$). When directly asked if they had noticed the unicycling clown, again the cell phone users were the least likely to claim that they had seen the clown (χ^2 (3, $N = 151$) = 11.041, $p = .012$). Only 25% of the cell phone users had noticed the clown and many turned around at that point to see what they had missed. In essence, 75% of the cell phone users experienced inattentional blindness to the unicycling clown. In contrast, over half of the people in the other conditions reported seeing the clown (51% of single individuals, 61% of music player users, and 71% of people in pairs). Table 2 presents the percentage of each group that stated they had seen the clown in response to the general and direct questions.

Individuals in pairs were the most likely to have seen the unicycling clown. Their rate of seeing the clown is essentially equal to what one would expect by combining the performance of two individuals. This indicates that pairs may improve performance by having more observers engaged in monitoring the environment (see Crudell et al., 2005; Strayer & Drews, 2007). Unfortunately, we cannot be sure that all individuals looked in the direction of the clown. Thus the differences could be caused by cell phone users being less likely to look around the environment. However, the clown was not far off the basic path and Strayer et al. (2003) showed that although cell phone users were as likely to look at objects in a driving simulator, there were less likely to remember the objects than people not engaged in divided attention tasks.

In Experiment 2, we were more directly able to address why cell phone users displayed some difficulties navigating through Red Square. Use of an electronic device by itself is not distracting since individuals with music players noticed the clown. Interestingly, a conversation with a partner who is physically present may actually help with the recognition of meaningful stimuli given that people walking in pairs were the most likely to notice the unicycling clown. In contrast, cell phone users may have walked slowly, changed

Table 2. The percentage of cell phone users, single individuals, music player users and pairs who noted that they saw the unicycling clown

	Walking condition			
Question	Cell phone user (%)	Single (%)	Music player (%)	Pair (%)
General question	8.3	32.1	32.1	57.1
Did you see the clown?	25.0	51.3	60.7	71.4

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directions, weaved and failed to acknowledge others in Study 1 because they were less aware of their surroundings.

GENERAL DISCUSSION

We found that individuals walking while talking on a cell phone displayed inattentional blindness in a real-world situation. They experienced more difficulty navigating through a complex environment than people in other conditions. They walked slower, weaved more often, and made more direction changes. Finally, they were less likely to acknowledge other individuals and to notice the unicycling clown thus illustrating inattentional blindness. When people engage in demanding cognitive tasks, they may not become aware of a variety of stimuli in the environment (Neisser & Becklen, 1975; Simons, 2000; Simons & Chabris, 1999). This means that they may miss more than the unicycling clown and experience difficulty recognizing and using information needed to navigate through a complex and changing environment. We found decrements even when they performed a very simple activity: Walking. Of course, the naturalistic aspect of our research highlights a limitation: Something about people who choose to have a cell phone conversation while walking may be the causal factor rather than the divided attention requirements of a phone call. Nonetheless, our research provides a real-world replication of inattentional blindness findings from lab experiments and driving simulators.

Trick et al. (2004) argued that the impact of divided attention on driving would be most noticeable for tasks that rely on controlled processes of attention. They stated that for navigating, and particularly for driving, many of these controlled processing tasks require recognition of a new or a changed stimulus in the environment. Consistent with this perspective, researchers have found that when people drive in a simulator while talking on a cell phone they fail to notice signal changes, are slower to respond to a braking car in front of them, and are less likely to notice stimuli in their environment (Beebe & Kass, 2006; Drews et al., 2008; Kass et al., 2007; Strayer et al., 2003; Treffner & Barrett, 2004). Other aspects of driving performance that are detrimentally impacted by cell phone conversations, such as driving more slowly and following further behind a pace car (Kubuse et al., 2006; Rakauskas et al., 2004; Strayer et al., 2003; Törnros & Bolling, 2006), may reflect a driver attempting to compensate for decreased environmental awareness.

One possible explanation for the effect of cell phone conversations is that they cause a particular drain on attentional resources and thus lead to inattentional blindness. Fougnie and Marois (2007) argued that divided attention tasks that drain central executive processing capacity are more likely to produce inattentional blindness. Similarly, Strayer and Johnston (2001) found that cell phone conversations were particularly disruptive in comparison to listening to books on tape, a radio broadcast, or shadowing using a cell phone. Something about the conversation seems to limit attentional capacity. We, like other researchers, found that having a conversation with a person next to you did not increase inattentional blindness (Crudell et al., 2005; Hunton & Rose, 2005; Strayer & Drews, 2007). Similarly, Klauer et al. (2006) reported that a passenger in the adjacent seat decreased accident rates whereas a cell phone conversation increased accident rates. Strayer and Drews (2007) suggested that in-vehicle conversations are less problematic because the driver and the passenger can more easily coordinate the conversation with the driving demands. Klauer et al. (2006) suggested that two observers increases the odds of noticing important aspects of the driving environment and our finding that pairs were more

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likely to see the clown is consistent with this point. Of course there are other differences between conversing with someone who is present and someone *via* a cell phone that may contribute to inattentional blindness. For example, the degraded sound quality of cell phone conversations may require more attentional resources to process both the content and the precise timing of turn-taking. In addition, an absent partner may cause an individual to engage visual processing to imagine the other person. This additional visual interference may increase inattentional blindness.

Using a naturalistic example of cell phone divided attention provided us an opportunity to investigate whether people can learn to perform this divided attention task. Neisser and his colleagues (Hirst et al., 1980; Spelke et al., 1976) showed that with substantial practice, some individuals can learn to track the content of two different messages at the same time. Due to the naturalistic nature of our observations, we have no assurance that our cell phone walkers were experts in cell phone divided attention. Nonetheless, the conditions were such that for many of our participants both tasks should be well practiced. They were navigating through a well-known environment, using their own cell phones, and most likely engaged in conversation with familiar people about familiar topics. Since they chose to do both tasks, our suspicion is that they often walk and talk on their cell phones. That people nonetheless experienced difficulty probably reflects the unpredictable nature of the navigation task. Walking across an open space is different each time—the obstacles move and are distinct. In contrast, in the studies by Neisser and his colleagues, the divided attention tasks were both well defined and depended on attending to expected information in a currently tracked channel of information. Nonetheless, Spelke et al. (1976) found that if people were not expecting coherent information during a divided attention task, then they did not notice the information even after extensive practice. In this sense, walking and talking on a cell phone replicates typical inattentional blindness studies: What the person misses are new stimuli in the unattended information. These are the items that are routinely subject to inattentional blindness (Simons, 2000). For this reason, we suspect that cell phones will always lead to poorer performance on secondary tasks that depend on becoming aware of new objects no matter how much practice an individual has.

We found that even a task as practiced as walking can be disrupted by cell phone conversations. Although walking and talking on a cell phone on campus seems unlikely to be particularly hazardous, it can cause problems. A cell phone user walking slower and changing directions complicates the navigation task for everyone else. While collisions among pedestrians may be infrequent and minor, walking and talking can cause serious accidents if bicyclists use the same pathways or if the walkers move into an area shared with cars and other vehicles. For example, Nasar et al. (2008) found that people engaged in divided attention tasks crossed a street in a more risky fashion. The hazards become greater when an individual is driving while talking on a cell phone.

One of the most dangerous aspects of cell phone divided attention is that affected individuals remain oblivious to their poor performance. Strayer et al. (2006) reported that cell phone participants were unaware of the conversation's detrimental effects because the participants felt that they performed fine even though they had just displayed problems (see also Lesch & Hancock, 2004). Similarly, many individuals with whom we have talked feel they can perform divided attention tasks such as using a cell phone and driving. However, we cannot trust these claims because people are not aware of the things they miss because of inattentional blindness. Simons and Chabris (1999) noted that when participants were shown what they had missed because of inattentional blindness, they were surprised that they could have missed it. Similarly, individuals in our study who did not report seeing the

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unicycling clown were generally surprised that they missed him. Unfortunately, when driving a car while talking on a cell phone, people may be unaware of what they are missing until it is too late.

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REFERENCES

Becklen, R., & Cervone, D. (1983). Selective looking and the noticing of unexpected events. *Memory & Cognition*, *11*, 601–608.
Beebe, K. E., & Kass, S. J. (2006). Engrossed in conversation: The impact of cell phones on simulated driving performance. *Accident Analysis and Prevention*, *38*, 415–421.
Bungum, T. J., Day, C., & Henry, L. J. (2005). The association of distraction and caution displayed by pedestrians at a lighted crosswalk. *Journal of Community Health*, *30*, 269–279.
Crudell, D., Bains, M., Chapman, P., & Underwood, G. (2005). Regulating conversation during driving: A problem for mobile telephones? *Transportation Research Part F*, *8*, 197–211.
Drews, F. A., Pasupathi, M., & Strayer, D. L. (2008). Passenger and cell phone conversations in simulated driving. *Journal of Experimental Psychology: Applied*, *14*, 392–400.
Fougnie, D., & Marois, R. (2007). Executive working memory load induces inattentional blindness. *Psychonomic Bulletin and Review*, *14*, 142–147.
Hatfield, J., & Murphy, S. (2007). The effects of mobile phone use on pedestrian crossing behaviour at signalised and unsignalised intersections. *Accident Analysis and Prevention*, *39*, 197–205.
Hirst, W., Spelke, E. S., Reaves, C. C., Caharack, G., & Neisser, U. (1980). Dividing attention without alternation of automaticity. *Journal of Experimental Psychology: General*, *109*, 98–117.
Horrey, W. J., & Simons, D. J. (2007). Examining cognitive interference and adaptive safety behaviours in tactical vehicle control. *Ergonomics*, *50*, 1340–1350.
Hunton, J., & Rose, J. M. (2005). Cellular telephones and driving performance: The effects of attentional demands on motor vehicle crash rate. *Risk Analysis*, *25*, 855–866.
Kass, S. J., Cole, K. S., & Stanny, C. J. (2007). Effects of distraction and experience on situation awareness and simulated driving. *Transportation Research Part F*, *10*, 321–329.
Klauer, S. G., Dingus, T. A., Neale, V. L., Sudweeks, J. D., & Ramsey, D. J. (2006). *The impact of driver inattention on near-crash/crash risk: An analysis using the 100-car naturalistic driving study data*. Blacksburg: Virginia Tech Transportation Institute. (NTIS No. DOT HS 810 594).
Kubuse, T. T., Bock, K., Dell, G. S., Garnsey, S. M., Kramer, A. F., & Mayhugh, J. (2006). The effects of speech production and speech comprehension on simulated driving performance. *Applied Cognitive Psychology*, *20*, 43–63.
Lesch, M. F., & Hancock, P. A. (2004). Driving performance during concurrent cell-phone use: Are drivers aware of their performance decrements? *Accident Analysis and Prevention*, *36*, 471–480.
Mack, A., & Rock, I. (1998). *Inattentional blindness*. Cambridge, MA: MIT Press.
Nasar, J., Hecht, P., & Wener, R. (2008). Mobile telephones, distracted attention, and pedestrian safety. *Accident Analysis and Prevention*, *40*, 69–75.
Neisser, U., & Becklen, R. (1975). Selective looking: Attending to visually specified events. *Cognitive Psychology*, *7*, 480–494.
Newby, E. A., & Rock, I. (1998). Inattentional blindness as a function of proximity to the focus of attention. *Perception*, *27*, 1025–1040.
Rakauskas, M. E., Gugerty, L. J., & Ward, N. J. (2004). Effects of naturalistic cell phone conversations on driving performance. *Journal of Safety Research*, *35*, 453–464.
Simons, D. J. (2000). Attentional capture and inattentional blindness. *Trends in Cognitive Science*, *4*, 147–155.

DOI: 10.1002/acp

Simons, D. J., & Chabris, C. F. (1999). Gorillas in our midst: Sustained inattentional blindness for dynamic events. *Perception*, *28*, 1059–1074.

Spelke, E., Hirst, W., & Neisser, U. (1976). Skills of divided attention. *Cognition*, *4*, 215–230.

Strayer, D. L., & Drews, F. A. (2007). Cell-phone-induced driver distraction. *Current Directions in Psychological Science*, *16*, 128–131.

Strayer, D. L., Drews, F. A., & Crouch, D. J. (2006). A comparison of the cell phone driver and the drunk driver. *Human Factors*, *48*, 381–391.

Strayer, D. L., Drews, F. A., & Johnston, W. A. (2003). Cell phone-induced failures of visual attention during simulated driving. *Journal of Experimental Psychology: Applied*, *9*, 23–32.

Strayer, D. L., & Johnston, W. A. (2001). Driven to distraction: Dual-task studies of simulated driving and conversing on a cellular telephone. *Psychological Science*, *12*, 462–466.

Törnros, J., & Bolling, A. (2006). Mobile phone use: Effects of conversation on mental workload and driving speed in rural and urban environments. *Transportation Research Part F*, *9*, 298–306.

Treffner, P. J., & Barrett, R. (2004). Hands-free mobile phone speech while driving degrades coordination and control. *Transportation Research Part F*, *7*, 229–246.

Trick, L. M., Enns, J. T., Mills, J., & Vavrik, J. (2004). Paying attention behind the wheel: A framework for studying the role of attention in driving. *Theoretical Issues in Ergonomic Science*, *5*, 385–424.

DOI: 10.1002/acp