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Transportation Research Interdisciplinary Perspectives 5 (2020) 100118

Contents lists available at ScienceDirect

Transportation Research Interdisciplinary Perspectives

journal homepage: https://www.journals.elsevier.com/transportation-research-interdisciplinary-perspectives

Distracted by "distracted pedestrians"?

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ARTICLE INFO

Article history:
Received 14 November 2019
Received in revised form 21 March 2020
Accepted 11 April 2020
Available online 11 May 2020

Keywords:
Pedestrian
Safety
Injury
Phone
Framing
Bias
Vision Zero

ABSTRACT

Some observers view distracted walking as a menace, while others contend that concern is overblown. Understanding these competing frames about pedestrian safety is essential because interpretive frames influence how we try to solve problems. In this study, we survey transportation practitioners to gauge how concerned they are about distracted walking, assess whether windshield bias and professional training influence concern, and determine whether concern influences preferred policy solutions for reducing pedestrian deaths. One third of transportation practitioners surveyed view distracted walking as a large problem, estimating that it was responsible for 40% of pedestrian deaths. Practitioners were more concerned about distracted walking if they primarily use a car or spend little time in pedestrian -oriented areas (windshield bias), or if they work in engineering or public health (professional training). Most importantly, the distracted walking frame does indeed shape policy solutions. Practitioners concerned about distracted walking were more likely to endorse individual-level solutions (like educational campaigns) and were less likely support reducing vehicle speeds. Concern about distracted walking detracts attention from more deadly risk factors, more effective policy approaches, and, most importantly, is inconsistent with the ethos of making streets safe for all users, including children, the elderly, and vision impaired people. Instead of focusing on educational campaigns, practitioners should focus their pedestrian safety efforts on the biggest risk factors and the most effective solutions.

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1. Introduction

Each year thousands of people die and tens of thousands more are injured walking on streets in the United States. To make matters worse, pedestrian deaths are on the rise: up 35% between 2008 and 2017 (National Highway Traffic Safety Administration, 2019a). While many factors contribute to this trend, observers disagree sharply about the role of distracted walking. Some observers consider distracted walking a serious menace (Mwakalonge et al., 2015; Nasar et al., 2008; Nasar and Troyer, 2013; Neider et al., 2010), while critics of the idea contend that distracted walking is a myth (Boos, 2017), a con (Komanoff, 2016), or hysteria ("The Hysteria over 'Distracted' Walking,", 2017). To be clear, these critics agree that people walk distracted (Ipsos Public Affairs, 2015), but they emphasize that the harms of distracted walking are overstated and that it detracts from other methods of improving pedestrian safety.

We can think of these competing views about distracted walking as alternative frames for understanding pedestrian deaths. Frames fundamentally shape how we make sense of problems and how we go about solving them (Benford and Snow, 2000; Goffman, 1974; Rein and Schon, 1996; van Hulst and Yanow, 2014). Because framing is so central to policy outcomes, groups actively compete to advance their preferred frame. Scholars have used framing to understand a host of planning and transportation issues (Houston and Richardson Jr, 2000; Pelzer and Geertman, 2014; Ralph et al., 2019; Richardson et al., 2010; Scheffels et al., 2019).

Given the diverging viewpoints about the role of distraction and the importance of frames, this paper asks how has the distracted walking frame influenced transportation practitioners? Specifically, how prevalent is concern about distracted walking? Second, does "windshield bias" affect levels of concern (Kostelec, 2018)? In other words, do practitioners who primarily rely on a car worry more about distracted pedestrians? Third, does professional training affect levels of concern? Specifically, are engineers and public health professionals more concerned about distracted walking than planners? Finally, given that frames are known to shape policy approaches, do practitioners who worry about distracted walking offer different solutions for reducing pedestrian deaths than practitioners who do not worry?

To answer these questions, we surveyed 278 transportation practitioners and found that many are deeply concerned about distracted walking, that both windshield bias and professional training explain some of the variation in concern, and that practitioners concerned about distracted walking emphasize individual-level solutions (like education) and deemphasize systematic changes (like reducing speeds). The following section contextualizes the survey results by reviewing

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http://dx.doi.org/10.1016/j.trip.2020.100118
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distracted walking studies, offering alternative explanations for the rise in pedestrian deaths, speculating about why concern might be widespread, and detailing how a focus on distracted pedestrians could be harmful.

2. Background

2.1. Distracted walking studies

Scholars who research distracted walking focus on four questions: how many people walk distracted, how does distraction affect pedestrian behavior (i.e. crossing speed, looking left and right, identifying safe gaps in traffic, etc.), how does distraction affect the risk of getting hit or nearly hit by a car, and how many people are harmed by distracted walking? Scholars analyze distracted walking using three methods: they observe pedestrian behavior in the real world, they conduct experiments where participants are instructed to engage in distracting tasks while crossing a street (either in a simulator or with a confederate for their protection), and they consult data on crashes and injuries.

Each method has its strengths and weaknesses. Observational studies are relatively well-suited for answering questions about how often distraction occurs, although observational samples may not be representative and observers cannot precisely identifying the type of distraction (selecting a song from a playlist looks identical to texting and having a conversation on headphones can look similar to listening to music) (Simmons et al., 2020). Observational studies can also offer suggestive evidence on how distraction affects pedestrian behavior, although, without a control group we cannot attribute all observed differences in behavior to distraction. Finally, observational studies offer only limited information on whether distraction increases near misses because it is difficult for observers standing on the side of the road to make a split-second judgement unless the crossing was egregiously unsafe.

In experimental studies, participants are instructed to cross the street multiple times (either in a lab or a controlled setting), sometimes distracted and sometimes not. This design cannot reveal the prevalence of distracted walking, but can shed light on the effect of each type of distraction. Experiments are better equipped than observational studies to reveal the safety effects of distracted walking because the simulated environment allows researchers to precisely measure virtual near misses and collisions. However, experimental results may not generalize to the real world. Most importantly, participants are specifically instructed to cross the street while distracted (Schwebel et al., 2012) and outside of an experimental setting they may not engage in distracted walking. Most importantly, participants in experiments may be less cautious than they would otherwise in both a simulated environment—because the stakes are low—and in a real-life settings—because an experimenter is present to ensure their safety (Jiang et al., 2018; Simmons et al., 2020).

By 2020 there were over 50 experimental and observational studies of distracted walking. In this review, we focus on the most cited studies[1]—because they are most likely to influence practitioners' frames—and draw on a meta-review (Simmons et al., 2020) and a literature review (Mwakalonge et al., 2015) to round out the summary. A final caveat deserves mention: due to publication bias, scholars may have more success publishing findings that indicate distraction is a problem (Dickersin and Min, 1993). Publication bias, along with the possibility that experimental participants are likely less cautious than they would be otherwise, suggest that the meta-analysis may overstate the risks of distraction.

2.1.1. How many people walk distracted?

Scholars typically consider three types of distraction: talking on the phone, listening to music on headphones, and text messaging/looking at the screen (Basch et al., 2015; Thompson et al., 2013; Wells et al., 2018). Less frequently, scholars include having a conversation with another pedestrians as they cross (Thompson et al., 2013) or consuming food or beverages (Wells et al., 2018).

Observational studies reveal that a substantial minority of pedestrians are distracted, with rates of distraction ranging from 12 to 45% (Simmons et al., 2020). For instance, in a study of 1102 pedestrians at high-risk intersections in Seattle, Thompson et al. (2013) found that 30% of pedestrians are distracted, most often by listening to music using headphones (11.2%), text messaging (7.3%), or using a handheld phone (6.2%). Similarly, Wells et al. (2018) observed over nine thousand pedestrians on two college campuses and found similar rates of distraction: 19% using headphones, 8% texting, and 5% using a handheld phone.

Fortunately, listening to music, the most common form of distraction, does not appear to affect pedestrian behavior (Simmons et al., 2020). By contrast, texting and talking on the phone do seem to affect some behaviors, which we turn to now.

2.1.2. How does distraction affect behavior?

While distraction has consistently been shown to affect gait quality (Lamberg and Muratori, 2012; Licence et al., 2015), the evidence for other pedestrian behaviors—crossing with the light, looking both ways, and identifying gaps in traffic—are notably mixed.

In the observational studies introduced above, Thompson et al. (2013) found no difference in the propensity to stay within the crosswalk or to cross with the light. In fact, Wells et al. (2018) found that distracted pedestrians were actually more likely to cross with the light, which may be a form of compensatory behavior.

There is conflicting evidence on whether distraction affects how often pedestrians look both ways. Observational studies suggest that distracted pedestrians look less often (Simmons et al., 2020; Thompson et al., 2013; Wells et al., 2018), however, the authors use a stringent definition of looking both ways (physically turned the head left and right immediately before stepping into the street). Very few people do this, even when they are not distracted (35% in one study and 54% in the other). Moreover, observations were conducted at busy intersections and distracted pedestrians may cross in a group, offloading some of the responsibility for looking both ways (Simmons et al., 2020). The experimental results on the propensity to look both ways are mixed. Neider et al. (2010) and Schwebel et al. (2012) find no difference, while Stavrinos et al. (2011) use nearly identical methods and find a difference in one experiment, but not in another.[2] The meta-review suggests a small reduction in looking both ways for people who are texting but no effect for talking on the phone or listening to music (Simmons et al., 2020).

The evidence is also mixed for how distraction affects the ability to recognize and take opportunities to cross the street. Whereas Neider et al. (2010) finds that participants were less likely to identify available gaps in traffic when they were distracted, Schwebel et al. (2012) found no difference in the propensity to recognize safe crossing opportunities. Similarly, the meta-review suggests no difference in missed crossing opportunities for pedestrians listening to music or texting, but a small effect for those talking on the phone (Simmons et al., 2020). Yet even if people who are distracted do indeed take longer to identify suitable crossing gaps, this is actually a good thing. By waiting for extra-large gaps in traffic, experimental participants are compensating for the extra risk of distraction. This compensatory behavior appears to work, because Neider et al. (2010) find no difference in distracted pedestrians' ability to cross the street safely.

Again, the results are mixed on whether distracted pedestrians cross more slowly. Several observational and experimental studies seem to suggest that they do (Agostini et al., 2015; Neider et al., 2010; Thompson et al., 2013), but the meta-analysis found no link between distraction and walking speed (Simmons et al., 2020). While walking slowly would slightly

[1] The top five most cited studies on distracted walking as of March 2020: #1) Nasar et al. (2008): 348 citations; #2) Schwebel et al. (2012): 285 citations, #3) Neider et al. (2010): 195 citations, #4) Thompson et al. (2013): 176 citations, and #5) Stavrinos et al. (2011): 175 citations. The next most cited articles were cited an order of magnitude less often.

[2] Some of the data in this paper are somewhat puzzling. For instance, the authors report that undistracted pedestrians looked right and left 39.6 times on average, with a standard deviation of just 0.16. Based on the 68–95-99 rule, virtually everyone in the sample would have had to have looked left and right between 39.12 and 40.08 times (39.6 ± 3 standard deviations). That seems like remarkably consistent behavior.

increases exposure to vehicles in an intersection, Thompson et al. (2013) finds that talking on a handheld phone affects walking speed roughly the same amount as being middle age (age 45–64 v. age 18–24) and that texting affects walking speed less than being elderly (age 65+).

2.1.3. How unsafe is distracted walking?

We turn next to whether distracted pedestrians are more likely to be hit or experience a near miss. Once again, the evidence is mixed. On the one hand, Stavrinos et al. (2011) and Schwebel et al. (2012) find that experimental participants were more likely to get hit or experience a close call when distracted. On the other, Neider et al. (2010) uses similar methods and finds no difference in number of collisions, success crossing the street, or the distance to the nearest car (either when entering or exiting the roadway). What could explain these differences? Pedestrians in the Neider et al. (2010) study were able to adjust their walking speed as they crossed and, as a result, could accelerate to avoid getting hit. By contrast, pedestrians could not adjust their speed in the other studies and were consequently hit more often. In summarizing the results of 17 experiments, Simmons et al. (2020) finds a moderate increase in hits and near misses for people texting, a small increase for those on the phone, and no effect for those listening to music.

Outside of laboratory experiments, there is just one observational study that assesses the safety of pedestrian crossings (Nasar et al., 2008). Recall that observational studies of safety are essential because they take place with real risks, in contrast to low-stakes lab experiments. The headline finding is that 48% of cell phone users crossed unsafely (i.e. were "at risk of getting hit by a car"). People listening to music and those undistracted crossed unsafely less often (16% and 25%, respectively). However, there are a number of issues that call this finding into question. First and foremost, the relevant sample is very small. While the authors observed 127 pedestrians in total, just 25 of them were using phones, and only eleven of those had a car approaching when they reached the intersection. This bears repeating. The most cited study of safety and distracted walking has a sample size of just eleven people on a phone when a car approached. A small sample is not the only problem. In total, the authors report that 12 people on phones were unsafe (48% of 25). Of the eleven people on a phone when a car approached, a total of nine people walked into the intersection. Notably, some of those nine may have crossed safely given the speed and proximity of the car. Yet even if the authors considered all nine of them unsafe, they would have had to categorize three additional pedestrians as "at risk of getting hit by a car" when there was either *no car* or when a car was *already stopped*. Given these issues, it is difficult to take the headline finding seriously.

2.1.4. How many people are harmed by distracted walking?

To determine how many people are harmed by distracted walking, we need to leave observational and experimental studies aside and turn to crash and injury statistics. While distracted walking has indeed led to some injuries and deaths (Edell et al., 2013), it is difficult to say how widespread the issue is. The chief problem is that most datasets–including the widely used Fatalities Reporting System (FARS)—do not measure distraction consistently (National Safety Council, 2013). Moreover, FARS uses a peculiarly expansive definition of "pedestrian" that includes people relaxing in their yard or standing on the side of the road fixing a flat tire (Noland et al., 2017).[3] Beyond these issues, crash analysis reports are often incomplete and inaccurate (Imprialou and Quddus, 2017).

Given these caveats, what do the data suggest? A lower bound estimate for the share of pedestrian deaths due to distraction comes from Mwakalonge et al. (2015), who consulted FARS data and identified nine deaths due to distracted walking in 2011 (0.2% of all pedestrian deaths that year). Notably, the data is far from complete as just eleven states reported any distracted walking deaths.

An upper limit estimate comes from New York City data. In a citywide analysis, "pedestrian error/confusion" was cited as a factor in 21.5% of the fatal or serious injury crashes involving a pedestrian (NYC, 2010). This is likely a significant overestimate because it includes many behaviors beyond distraction, like crossing against a signal (where distraction may be a factor) or crossing midblock (where it is unlikely). Moreover, just because something is a factor in a crash does not mean that it was the *cause* of the crash (National Highway Traffic Safety Administration, 2015).

Perhaps the best estimate of the dangers of distracted walking comes from an analysis of nationwide emergency room records on cause of injury (Nasar and Troyer, 2013). Injuries due to distracted walking increased steadily over time, reaching a high of 1506 pedestrian injuries in 2010 (the most recent year data was available). This represents just 3.7% of pedestrian injuries. Before returning to our upper and lower limits for pedestrian deaths and injuries, we must discuss how the authors of this study dramatically extrapolated their results. Arguing that distraction is grossly underreported, they multiplied observed injuries by a factor of 1300, leading them to conclude that in 2010 there may have been "about 2 million pedestrian injuries relate[d] to mobile phone use." This is a gross overstatement. Their estimate of pedestrian injuries *due to distracted walking* is 30 times greater than the *total* number of pedestrian injuries (just 66,000 per year) (Komanoff, 2016). Like a game of telephone, the author's dubious extrapolation was repeated by the Governors Highway Safety Association (Fischer, 2016) and then reported as truth in the press ("Nearly two million pedestrian injuries were related to cellphone use.") (Burney, 2016). In covering this work, one reporter claimed that distracted walking, "accounted for 78% of pedestrian injuries" (Ng, 2016). This is incorrect. The relevant denominator was pedestrian injuries *involving cell phones*. As Komanoff quips, "We thus have the unremarkable finding that most pedestrians who were using a mobile phone when they were injured in traffic crashes were talking or texting — as opposed to, say, switching playlists or posting on Twitter" (Komanoff, 2016).

In sum, estimates of the share of pedestrian deaths and injuries due to distracted walking range from a low of $<1\%$ to a high of 21.5% (and as noted, the latter substantially overstates the role of distraction). With the caveat that the data are sparse, these results suggests that distracted walking is likely a factor in a relatively small share of crashes, likely five to 10% and certainly $<20\%$. This pales in comparison to other factors like speeding (responsible for 26% of fatal crashes nationwide (National Highway Traffic Safety Administration, 2019), intoxication (responsible for 47% of fatal crashes nationwide (National Highway Traffic Safety Administration, 2019a)), and driver inattention (responsible for 57% of serious pedestrian crashes in New York City (NYC, 2010)).

Comparative analysis of crash statistics raises additional doubts about the safety risks of distracted walking. Consider the pedestrian danger index (PDI), which is a crash statistic that accounts for how much walking takes place (Atherton et al., 2017). If distracted walking were a major issue, we might expect more pedestrian deaths in areas stereotypically associated with phone-addicted young people. This is not the case. Compared to the average U.S. metropolitan area (PDI = 53.8), places like Chicago (PDI = 34.2), San Francisco, CA (31.4), New York City (27.0), Seattle, WA (24.7), Cambridge, MA (18.0) and Madison, WI (16.4) all have lower rates of pedestrian risk. By contrast, pedestrian deaths are highest—five to ten times higher—in a handful of metropolitan areas in Florida, which are better known for their inhospitable streetscapes than their tech-obsessed pedestrians.

Similarly, if distracted walking were a major issue, we would expect death rates to have increased most over time among age groups who frequently use cell phones. Again, this was not the case (Hu and Cicchino, 2018). Between 2009 and 2016, the death rate per million people increased

[3] The National Highway Traffic Safety Administration defines a pedestrian as "…any person on foot, walking, running, jogging, hiking, sitting or lying down who is involved in a motor vehicle crash. Also, a traffic crash is defined as an incident that involves one or more vehicles where at least one vehicle is in transport and the crash originates on a public trafficway. Crashes that occurred exclusively on private property, including parking lots and driveways [are] excluded" As Noland et al. explain, "The focus of the definition is on the location of the motor vehicle, not the pedestrian. In contrast with how transportation planners and laypeople use the word, the NHTSA [National Highway Traffic Safety Administration] definition ignores the motivation of the "pedestrian", and whether they were engaged in traveling from an origin to a destination, and includes victims who are sitting or lying down in the road, thus muddling the meaning of "pedestrian"" (p. 4).

most for pedestrians age 60–69 (average annual increase of 5.6%) and age 30–59 (5.1%). By contrast, pedestrian deaths grew slowly for ages 20–29 (3.8%), did not increase for ages 13–19, and declined for those <13 years old.

2.2. Alternative explanations for the rise in pedestrian deaths

Besides distracted walking, what could explain the rise in pedestrian deaths between 2008 and 2017? We would expect more vehicle-pedestrian conflicts over time because the US population grew 6.9% (U.S. Census Bureau, 2019), Americans drove 8.1% more (Zaccaro, 2019), and walked to work 36% more (Hu and Cicchino, 2018; McGuckin and Fucci, 2018). That being said, crash rates—which account for population size and miles driven—also increased during this period; pedestrian deaths increased 30% per million miles driven and 28% per million people (Atherton et al., 2017).

What could explain this? First, Americans relocated to relatively riskier places to walk. The ten fastest growing states had 40% more pedestrian fatalities per person and 79% higher values on the Pedestrian Danger Index than the remaining 40 states (Atherton et al., 2017). In addition, the number of SUVs in circulation increased 37% between 2009 and 2016, while other passenger cars decreased slightly (Hu and Cicchino, 2018). Due to their size, SUVs are associated with greater risks for pedestrians (Lefler and Gabler, 2004; Roudsari et al., 2004). Even accounting for their size, vehicles have grown more powerful over time and drivers with high-power vehicles tend to travel at higher speeds (McCartt and Hu, 2017), which in turn increases crash severity (Tefft, 2013). Perhaps most importantly, distracted *driving* is incredibly risky (Caird et al., 2014; Dingus et al., 2016) and, despite laws prohibiting it (Gliklich et al., 2016), the practice remains troublingly widespread (Hill et al., 2015; Huisingh et al., 2015; Kidd and Chaudhary, 2019).

Finally, while the *change* in pedestrian deaths over time garners considerable attention, it is worth noting that 61,000 pedestrians were injured and 4784 were killed in car crashes in 2006, a year before the smartphone was introduced (National Highway Traffic Safety Administration, 2017). Those pedestrians were not distracted by their phones and the factors that led to their crashes—like high vehicle speeds—are still around today.

2.3. Why might practitioners buy into the idea of distracted walking?

Thus far we have seen that there is mixed evidence that distracted walking affects behavior and safety and that there are convincing alternative explanations for the rise in pedestrian deaths. Why might practitioners still buy into the idea of distracted walking? The idea might gain currency for a host of reasons, detailed below. In short, distracted walking is a simple idea, examples of the behavior are widespread, and many people—including scholars, journalists, automobile manufacturers, transportation practitioners, and drivers—all have an incentive to focus on distracted walking.

Perhaps the most important reason for widespread concern about distracted walking is that it is a sticky idea (Heath and Heath, 2007). Ideas are easier to recall if they are simple and intuitive. Distracted walking fits the bill. It is certainly more intuitive than more complex ideas about pedestrian safety. Moreover, examples of distracted walking are plentiful—either because we have done it ourselves or have observed someone else do it—and as a result we tend to overestimate its prevalence due to the availability heuristic (Kahneman, 2011).

In addition to being intuitive, concerns about distracted walking have gained credence from a host of well-publicized academic studies, reviewed above. Despite the paucity of evidence that distracted walking is harmful, scholars tend to describe distracted walking as a serious problem. Consider Mwakalonge et al. (2015) who call distracted walking an "imminent threat to safety" (p. 328) and "a phenomenon [that] has caused fatalities and injuries worldwide" (p. 335), while simultaneously admitting that they were, "unable to find sufficient and accurate data currently available for evaluating distracted walking problems." (p. 328) Or Neider et al. (2010) who conclude that distracted walking "*does impact* a pedestrian's ability to successfully navigate a street crossing compared to crossing when undistracted (emphasis added)." (p. 594) despite finding no difference in success crossing the street, number of collisions, number of times participants looked right and left, or distance to the nearest car. Why might scholars characterize distracted walking in this way when the evidence is mixed at best? Scholars traditionally frame their research problems as major issues worthy of inquiry and distracted walking is no exception. In the longer term, widespread concern about distraction could help secure lucrative funding streams for more studies, more simulators and more eye-tracking equipment (Simmons et al., 2020). Due to publication bias, articles are more likely to be published if the results show that distraction is significantly linked to safety (Dickersin and Min, 1993). In turn, positive results are more likely to garner attention in the press. Together, these factors may lead authors to discuss results in a way that increases concern.

As Table 1 illustrates, distracted walking has enjoyed extensive and prolonged media coverage. Distracted walking likely garners disproportionate coverage relative to its risk because reporters—in their quest for newsworthiness—have an incentive to cover unique incidents and new research findings. This is important because readers who encounter repeated coverage of distraction are more likely to buy into the idea due to the illusory truth effect (Hasher et al., 1977).

Like scholars and journalists, the automotive industry also has an incentive to promote concern about distracted walking. Recall that interests groups compete to have their preferred frames shape policy discussions (Benford and Snow, 2000; Goffman, 1974; Rein and Schon, 1996; van Hulst and Yanow, 2014) and car manufacturers are no exception. Ford Motor Company's 'pe*text*rian' campaign is illustrative (Ford Motor Company). Focusing on the behaviors of pesky pedestrians helps absolve the industry of responsibility, much like the invention of jaywalking in the 1920s (Norton, 2007). Framing the problem in this way allows the industry to continue selling oversized, powerful Sport Utility Vehicles with distracting (but lucrative) on-board entertainment systems, while avoiding calls to limit vehicle size or add crash safety equipment for people outside the vehicle (Hu and Cicchino, 2018).

Transportation practitioners may embrace the idea of distracted walking as a way to take action while navigating their professional constraints. Reducing speeds, increasing enforcement, or changing street design would demonstrably improve road safety, but these approaches face considerable political hurdles and are time-consuming and costly. By contrast, disseminating educational materials is inexpensive, straightforward, and far less controversial. In this way, educational campaigns are often the path of least resistance for improving safety. What is more, framing road

Table 1
Sample of mainstream media coverage of distracted walking.

Headline	Source and date
"Texting, music put distracted pedestrians at risk"	USA Today, Dec.12, 2012
"Study: Distracted Walking Causes More Injuries than Distracted Driving"	The Atlantic, June 20, 2013
"The dangers of texting and walking"	Fox News, June 24, 2013
"Rise in pedestrian deaths may be due to texting while walking"	LA Times, August 5, 2013
"Study: Cell phone-related injuries soar"	USA Today, Sept 17, 2013
"Texting and Talking: Cities Fight Distracted Walking"	Time Magazine, Jan. 22, 2014
"Distracted Walking: How 'Petextrians' Are Endangering Our Streets	ABC News, Aug. 10, 2015
"The dangers of distracted walking"	CBS News, Dec. 23, 2015
"New research shows danger of distracted walking"	MSN.com, Dec. 29, 2015
"'Distracted walking' can have deadly consequences"	Fox News, Dec. 30, 2015
"Texting and walking isn't funny anymore"	The Wall Street Journal, Feb. 17, 2016
"Distracted walking: The growing phone-related danger"	NBC News Jan. 1, 2016
"Smartphones may be to blame for spike in pedestrian deaths, report says"	The Today Show, March 30, 2017
"Texting while walking"	The New York Times, Oct. 25, 2017
"Distracted walking injuries rise"	CNN, Aug. 1, 2018

deaths as a problem of pedestrian behavior narrows the call to action for practitioners, just as it does for the automotive industry. Viewed as a problem of distracted walking, the changes required to save lives are superficial, not foundational. The underlying systems can remain intact, absolving practitioners from the need to rethink values, priorities, and funding structures.

Beyond these issues, we suspect that planners, engineers, and public health workers may harbor different levels of concern about distracted walking because of their unique professional perspectives. As students, practitioners in these fields experience different training—what Shulman (2005) calls signature pedagogies—where they are acculturated to the "personality of a disciplinary field, its values, knowledge, and manner of thinking" (Calder, 2006) (p. 1361). Later, as practitioners, they ascribe to distinct professional norms and codes of ethics (AICP, 2016; APHA, 2019; ITE, 2017) and are tasked with achieving distinct goals at different points in the planning process (Dumbaugh and King, 2018). Relative to planners, we expect that engineers will be more concerned about distracted walking because concern is consistent with their traditional goals (moving large volumes of vehicles at high speeds) and their tools of the trade (regulating behavior to keep the system moving smoothly). Concern about distraction is also consistent with the intellectual traditions of public health practitioners (emphasizing health risks) and with their most often used tools (educational campaigns). For these reasons, we also expect concern to be higher among public health practitioners than among planners.

Finally, "windshield bias" describes the phenomena where people who primarily experience the roadway from a vehicle tend to frame problems differently than those who primarily experience the city on foot, by bike, or by transit (Cicchino et al., 2014; Kostelec, 2018; Walker, 2012). In turn, a windshield-dominated view may lead drivers to prefer different solutions for addressing problems. For example, Cicchino et al. (2014) finds that drivers are less likely to support automatic speed enforcement than non-drivers. We hypothesize that practitioners who primarily use a car and/or spend little time in pedestrian-oriented areas will be more concerned about distracted pedestrians.

2.4. What is so wrong with focusing on distracted walking?

Attention and resources are finite and a focus on distracted walking may detract from more deadly causes of traffic deaths and from more effective solutions for saving lives. Unlike distracted walking, which is responsible for an unknown, but limited number of deaths and injuries, speeding, driver inattention, and intoxication kill thousands of people each year (National Highway Traffic Safety Administration, 2019a; National Highway Traffic Safety Administration, 2019; NYC, 2010).

More fundamentally, focusing on distracted walking is inconsistent with the aspirations of the Vision Zero, Complete Streets, and 8 80 Cities movements, which are based on the premise that streets should be safe for all users (Belin et al., 2012; Johansson, 2009). Recall that a key finding of the distracted walking studies is that people may walk more slowly, may fail to identify safe gaps in traffic, and may look right and left less often. Similarly, elderly people take longer to cross (Guerrier and Jolibois, 1998), children struggle to identify suitable crossing opportunities (Schieber and Thompson, 1996), and looking left and right does not help blind people all that much (Bentzen et al., 2004). Thus, if our approach to improving safety is to chastise distracted pedestrians, we should be comfortable with the corollary: that streets will remain unsafe for the elderly, children, and blind people, each of whom face risks similar to people walking distracted.

This is not to say that pedestrians should have free reign to walk wherever they want, whenever they want. Indeed, recall that observational studies find that distracted pedestrians are, if anything, more likely to cross with the signal than people who are not distracted (Thompson et al., 2013; Wells et al., 2018).

The focus on distracted walking rests on a false equivalence with distracted driving. While distracted pedestrians may occasionally run into a pole or step into traffic, their actions primarily endanger themselves. By contrast, due to the size and power of motor vehicles and decades of crashworthiness improvements, distracted drivers primarily imperil those around them, particularly people not inside of vehicles. Drivers should have a greater responsibility for road safety.

Data from Edmonton, Canada, puts the issue in stark relief. Edmonton drivers hit 284 pedestrians in 2017, killing nine (Vision Zero Edmonton, 2018). We could dissect the actions of the victims, but broadening our view reveals an epidemic of drivers traveling at high speeds with insufficient caution. After all, Edmonton drivers hit over 49 *thousand* objects in 2017, including 5500 *stationary* objects (like parked cars and signs). Moreover, 80% of the pedestrians that were killed were walking legally when they were run over by a driver.

With statistics like that, it is hard to stomach some pedestrian education materials. Consider a message from Seattle DOT designed specifically for seniors, who comprise 70% of the pedestrian fatalities in the city. The text reads, "Most pedestrian-involved collisions occur *in marked crosswalks*, so it's important that seniors pay attention when crossing any street [emphasis added]" (Fischer, 2016). This places the onus for safety squarely on the shoulders of elderly pedestrians rather than on the drivers who run them over. Even seemingly innocuous campaigns are actually pernicious. Consider viral marketing efforts like a "Seeing Eye Person" leading texting pedestrians around on a leash, a man texting and walking protected by bubble wrap and a helmet, or an "*E*-lane" for texters (Mwakalonge et al., 2015). These campaigns harmfully normalize the idea that pedestrians are to blame for their deaths.

Within the narrow realm of enforcement, the false equivalence between driving and walking tends to shift the focus towards pedestrians and away from drivers. During recent pedestrian safety enforcement blitzes in Los Angeles (Schultz, 2018), Philadelphia, and Delaware (Fischer, 2016) police issued the majority of warnings and tickets to pedestrians rather than drivers (81% v. 19%, 85% v. 15%, and 98% v. 2% respectively).

Recently, city officials in Honolulu, HI, Montclair, CA, and Fort Lee, NJ outlawed distracted walking and additional bans are being considered elsewhere. Not only are these efforts unlikely to do much to save pedestrians, they may also have serious unintended consequences for poor and minority communities who tend to walk more often (National Highway Traffic Safety Administration, 2019a) and who receive disproportionate enforcement attention (Baumgartner et al., 2018; Sanders et al., 2017).

Ultimately, the distracted walking frame may crowd out the pursuit of other solutions that would meaningfully improve safety for people walking. Systems-level solutions (like reducing speeds and providing pedestrian infrastructure) are effective (Fayish and Gross, 2010; Williams, 2013), but too often they sit idly on the shelf while we lament the perils of distraction. New ideas, like rating cars for crashworthiness for people *outside the vehicle* (Hu and Cicchino, 2018), might never get pursued if pedestrian distraction is seen as a primary cause of death.

In sum, while distracted walking is relatively commonplace, it does not necessarily follow that it is responsible for a large—or growing—number of pedestrian deaths and injuries. Framing pedestrian deaths as a story of distraction may crowd out more effective solutions and is incompatible with the need to protect children, the elderly, and the blind. Nevertheless, a host of factors conspire to make distracted walking an incredibly sticky idea.

3. Methods

To examine the *perceived* cause of pedestrian fatalities and preferred approaches for reducing fatalities, we surveyed practitioners during the downtime between sessions at three transportation conferences (Walk, Bike, Places in New Orleans in September 2018, Transportation Camp NYC in October 2018, and the annual meeting of the Transportation Research Board in Washington, D.C. in January 2019). To maximize the sample size, the survey was very short; it took the average participant less than two minutes to complete. In total, 297 surveys were submitted, but just 278 of them were complete. The sample is small and non-representative, which may bias the results for Q1 (i.e. concern about distracted walking may be

more or less widespread than reported here). Fortunately, the lack of representativeness will not affect the validity of the remaining questions (i.e. we can assess whether windshield bias and professional training affect levels of concern and we can assess whether concern about distracted walking affects preferred solutions within this unrepresentative group).

3.1. Survey instrument

The key challenge in this study was designing a survey instrument that did not unduly "prime" respondents to focus on distracted walking. The survey opened by having respondents select their top three approaches for reducing pedestrian deaths from this list: Reduce speed limits; Change street design to reduce speeds (e.g. chicanes, speed bumps, etc.); Provide more pedestrian-oriented infrastructure (e.g. crosswalks, pedestrian islands, etc.); Educate pedestrians about the risks of distracted walking; Ban distracted walking; Educate drivers about traffic laws; or Increase enforcement of traffic laws for drivers.[4] Again, this question appeared *before* the questions about distracted walking so as to not subtly influence responses.

Next, respondents provided data on their level of concern about distracted walking. This was done in two ways. First, respondents indicated whether they thought distracted walking was "Not a problem", "A small problem", or "A large problem" This approach has two shortcomings. Simply asking respondents about distracted walking may subtly shift their attention and increase their stated level of concern. In addition, this approach provides no information on concern about *other* factors. Some practitioners may view *all* causes of traffic deaths as a "large problem".

For these reasons, we solicited level of concern in a second way: by having respondents estimate the share of pedestrian deaths due to distracted walking. Respondents were instructed to make their best guess and to provide their answer as a percentage. The midpoint was used for the small number of respondents who offered a range of values. There was considerable consistency between the two measures of concern. Respondents who said that distracted walking was a large problem made much higher estimates of the share of deaths due to distraction (mean = 38.4, median = 33, 25th–75th percentile range: 20–50) than those who said it was a small problem (mean = 14.1, median = 10, range: 5–20) or not a problem (mean = 2.8, median = 2, range: 0–5).

Respondents also provided data on five explanatory variables (Table 2). Two questions relate to windshield bias: travel mode in a typical week (Uses a car v. does not) and how much time the respondent spends "in areas with a lot of pedestrians" (Very little time v. a lot of time). One question relates to professional training (respondents indicated their profession: Engineer, Planner, or Public Health). Finally, respondents provided their age and sex.

3.2. Analytical approach

To assess overall levels of concern (Q1), we report the share of respondents who say distracted walking is not a problem, a small problem, or a large problem, as well as the estimated share of pedestrian deaths due to distraction (mean and median) (Table 3).

To assess windshield bias (Q2), we compare level of concern among those who typically use a car v. not and those who spend little time in pedestrian-oriented areas v. a lot. To do this, we estimate a series of logistic regressions for the binary outcomes and negative binomial models for the estimated share of deaths due to distraction. For each outcome variable, we initially estimate a simple model without controls (a bivariate comparison) and then re-estimate the model with controls for age, sex, and professional training. For each model, we calculate the marginal effect of the key explanatory variable. Comparing the marginal effects across models reveals whether differences between groups persist when controlling for other factors (Fig. 1). The same regression models were used to assess the effect of professional norms (Q3), but this time we calculated marginal effects for professional training (Planner v. Engineer and Planner v. Public Health) (Fig. 2).

Finally, we compare respondents' preferred solutions for reducing pedestrian fatalities by their level of concern about distracted walking (Q4). We graphed the results (Fig. 3) and used ANOVA to assess statistical significance for these bivariate comparisons. To assess whether differences persisted when controlling for other factors, we estimated a series of logistic regression models—one for each policy option—with controls for typical travel mode, professional training, age, and sex (Table 4). Once again, we used the multivariate models to calculate marginal effects to compare those who believe distraction is a small problem v. not and a large problem v. not (Fig. 4).

[4] Respondents could write in answers as well. In many cases the written submissions closely resembled the listed options and were recoded accordingly (e.g. "Add flashing beacons at crosswalks" became "Provide more pedestrian oriented infrastructure").

Table 2
Sample characteristics.

	N	% of sample
Travel mode in a typical week		
Uses a car	203	73.0
Does not use a car	75	27.0
	278	100%
Time spent around pedestrians		
Very little time	115	41.4
A lot	163	58.6
	278	100%
Professional training		
Planner	88	29.1
Engineer	81	31.7
Public health	109	39.2
	278	100%
Sex		
Male	153	55.0
Female	125	45.0
	278	100%
Age		
<26	29	10.4
26–35	120	43.2
36–45	64	23.0
>45	65	23.4
	278	100%

Table 3
Variations in concern about distracted walking among transportation practitioners (n = 278).

	Share of transportation practitioners in the sample who believe that distracted walking is…			Estimated share of ped deaths due to distraction	
	Not a problem	A small problem	A large problem	Mean	Median
Full sample	16.9	47.5	35.6	21.4	15
By travel mode					
Typically uses a car	13.3	47.3	39.4	22.9	15
Does not	26.7	48.0	25.3	17.3	10
By time in pedestrian areas					
Spends little time	9.6	55.7	34.8	22.3	10
Spends a lot of time	22.1	41.7	36.2	20.8	15
By professional training					
Planner	23.9	52.3	23.9	15.7	10
Engineer	11.1	50.6	38.3	22.5	15
Public health	15.6	41.3	43.1	25.1	17.5
By sex					
Male	21.6	47.7	30.7	20.6	10
Female	11.2	47.2	41.6	22.5	20
By age					
<26	6.9	41.4	51.7	34.6	30
26–35	22.5	47.5	30.0	18.5	10
36–45	15.6	62.5	21.9	16.9	10
>45	12.3	35.4	52.3	25.1	20

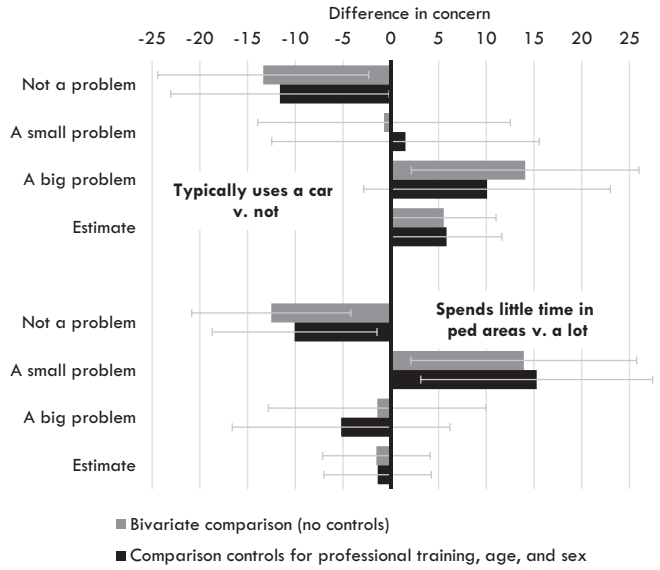

Fig. 1. Comparing concern about distracted driving by travel mode and time spent in pedestrian areas, 95% CI. Note: Estimate is difference in the average estimated share of pedestrian deaths due to distracted walking between the groups.

4. Results

4.1. Concern about distracted walking

Nearly half of the practitioners in the sample characterized distracted walking as a small problem (47.5%). On average, these practitioners estimated that 14.6% of pedestrian deaths were due to distracted walking.

Just over a third of practitioners characterized distracted walking as a large problem (35.6%). These practitioners made substantially higher estimates of the share of deaths due to distraction (mean = 38.7, two-tailed *t*-test $p < .001$). Within this group, some practitioners made very high estimates indeed: 16% estimated that over half of pedestrian deaths were due to distracted walking and 9% estimated that at least three quarters were.

At the other extreme, one sixth of practitioners said that distracted walking was not a problem (16.9%). These practitioners tended to estimate

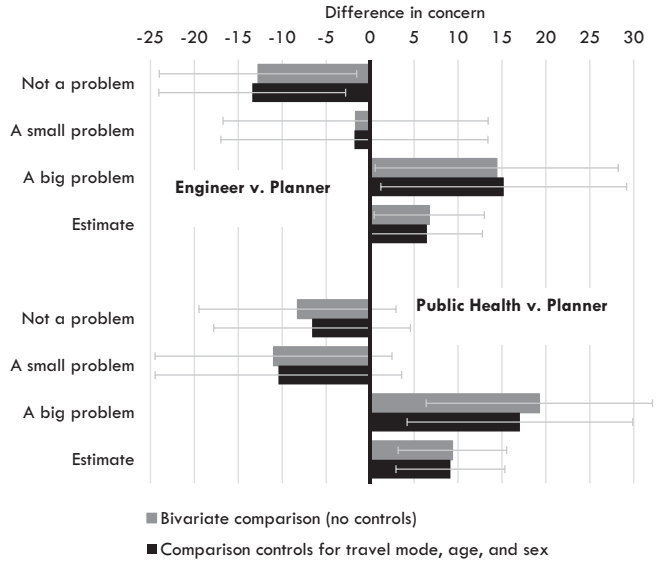

Fig. 2. Comparing concern about distracted walking by professional norms, 95% CI. Note: Estimate is difference in the average estimated share of pedestrian deaths due to distracted walking between the groups.

that very few pedestrian deaths were due to distracted walking (mean = 2.8, two-tailed t-test relative to a small problem $p < .001$).

Because data on the harms of distracted walking are so limited, we cannot say which estimates are correct. We can, however, see how concern varies across practitioners (Q2 and Q3) and how concern affects preferred solutions (Q4).

4.2. Windshield bias increases concern about distracted walking

While the plurality of respondents characterized distracted walking as a small problem, there was meaningful variation in concern based on personal characteristics (Table 3).

The table reveals evidence of windshield bias. Respondents who typically travel with a car were more likely to say that distracted walking is large problem (40% v. 25%) and were less likely to say it is not a problem (13% v. 27%). Car users also made higher estimates of the share of deaths due to distraction (mean: 23.3 v. 16.2 and median: 15 v. 10). As Fig. 1 illustrates, these differences in concern were large, statistically significant, and largely persisted when controlling for professional training, age, and sex.

Similarly, people who spent very little time in pedestrian-oriented areas were less likely to say that distracted walking is not a problem (22% v. 10%) and were more likely to say it was a small problem (56 v. 42%). Again, as Fig. 1 reveals, these differences were large, statistically significant, and persisted when controlling for personal characteristics. There were, however, no differences in the other two measures of concern.

4.3. Engineers and public health practitioners are more concerned than planners

We turn next to professional training. Overall, a majority of planners characterized distracted walking as a small problem (52%), with one quarter characterizing it as a big problem and another quarter characterizing it as not a problem. Planners estimated that 18% of pedestrian deaths were due to distracted walking.

Relative to planners, engineers were more concerned about distracted walking (see Fig. 2). Specifically, they made higher estimates of the share of deaths due to distracted walking, were more likely to characterize distracted walking as a large problem, and were less likely to say it is not a problem. Importantly, this increased concern persisted when controlling for differences in travel mode, age, and sex.

The pattern of elevated concern was similar for public health practitioners. Everything else equal, they were much more likely than planners to characterize distracted walking as a big problem and made higher estimates of pedestrian deaths.

4.4. Concern about distracted walking influences policy solutions

Fig. 3 depicts the practitioners' preferred solutions for reducing pedestrian deaths. Overall, respondents tended to prefer systems-level solutions (like providing pedestrian infrastructure and reducing speeds) to individual-level solutions (like educating drivers and pedestrians). Yet Fig. 3 reveals important differences in preferred solutions depending on concern about distracted walking. Practitioners who are concerned are less likely to support speed reduction efforts (either via design changes or by reducing speed limits), are more likely to support education campaigns (particularly for pedestrians), and are more likely to support bans on distracted walking (albeit support for a ban remained low).

Do these bivariate differences persist when controlling for professional training, typical travel mode, age, and sex? Table 4 provides the full multivariate results and Fig. 4 illustrates them. These results confirm that—everything else equal—practitioners' preferred solutions do vary meaningfully by level of concern about distracted walking. Specifically, those who characterized distracted walking as a large problem were less likely than their otherwise similar peers to support speed reduction efforts (especially via design changes). In turn, they were more likely to support educational efforts (especially for pedestrians). The pattern was similar but more muted for those who believe distracted walking is a small

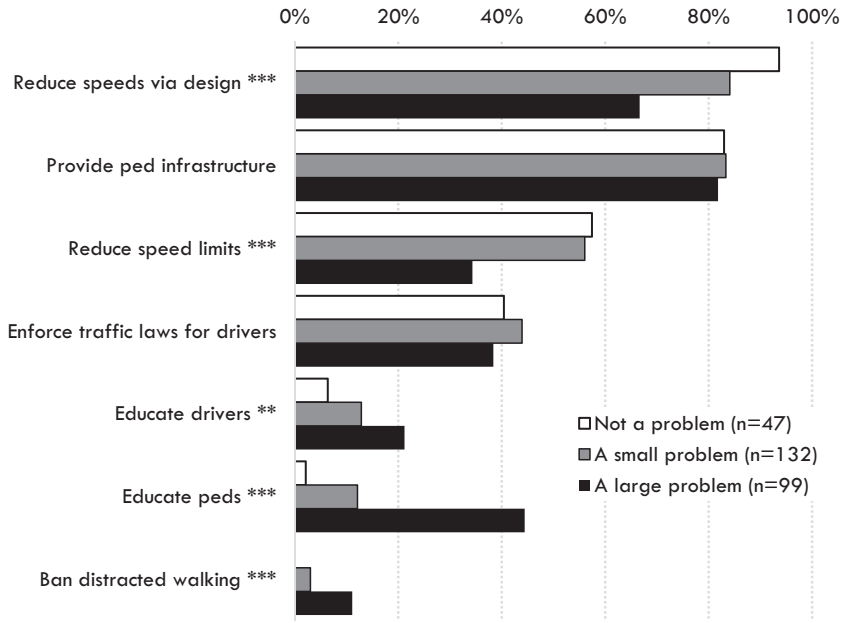

Fig. 3. Preferred pedestrian safety solutions by concern about distracted walking, descriptive results. Note: Stars denote statistical significance ***$p < .001$, **$p < .05$.

problem. Those respondents were more likely to endorse pedestrian education and were less likely to endorse speed reduction. The model for a ban on distracted walking differs slightly in that not a single person endorsed a ban on distracted walking if they believed it was not a problem (i.e. perfect prediction). Thus, this model only compares those who thought it was a large problem to those who consider it a small problem. The gap in support for a distracted walking ban is large (nine percentage points) and statistically significant. Finally, regardless of their concern about distracted walking, practitioners were equally likely to support adding pedestrian infrastructure and enforcing driving laws.

The multivariate models in Table 4 also shed light on the importance of windshield bias and professional training. Even when controlling for level of concern about distraction, respondents who use a car were less likely to endorse speed reduction via road design and were more likely to prefer educational programs. Relative to planners, engineers were less likely to endorse lowering speeds and were more likely to prefer traffic enforcement. Both engineers and public health practitioners were more likely to support educational campaigns for pedestrians. Finally, the coefficients for the pedestrian model should be interpreted with caution because the model is not statistically significant.

5. Conclusion

The aim of this paper was to see how competing frames about distracted walking influence transportation practitioners' preferred solutions for reducing pedestrian deaths. To find out, we surveyed a small, non-random sample of transportation practitioners at conferences (n = 278).

Despite relatively weak evidence about the harms of distracted walking, fully a third of the transportation practitioners we surveyed believe that distracted walking is a large problem, responsible for nearly 40% of pedestrian deaths. Among this group, some believe distraction that is an even bigger risk: 16% believe that the *majority* of pedestrian deaths are due to distracted walking and 9% believe that over three quarters are.

Due to the way the problem is framed, these concerned practitioners were much more likely to endorse educational campaigns than those who

Table 4
Comparing preferred approaches to reducing pedestrian deaths by level of concern about distracted walking, multivariate results ($n = 278$).

	(a)	(b)	(c)	(d)	(e)	(f)	(g)
	Add ped infra-structure	Reduce speed w/design	Reduce speed limits	Enforce driving laws	Educate peds	Educate drivers	Ban distracted walking
Believes distracted walking							
Is a small problem v. not	0.07	−0.97**	0.13	0.14	1.72**	0.57	(base)
Is a large problem v. not	0.08	−1.96***	−0.75*	−0.04	3.35***	1.09**	1.72***
Typical travel mode							
Uses a car v. not	−0.39	0.10	−0.34	−0.48*	0.69	1.24**	0.21
Professional training							
Engineer v. planner	−0.83*	−0.82**	−0.86***	0.80**	0.80*	0.21	0.61
Public health v. planner	−1.14**	−0.10	0.01	0.02	0.95**	−0.03	−0.57
Female (Base: Male)	0.50	0.25	−0.24	0.00	−0.14	0.32	−2.72**
Age	0.01	−0.01	0.00	−0.01	0.01	0.00	−0.01
Constant	2.00***	3.15***	0.72	0.15	−5.27***	−3.60***	−2.89***
Chi squared	9.63	25.59	23.65	14.08	60.04	14.25	24.47
Model significance	0.210	0.000	0.000	0.050	0.000	0.050	0.000

Note: Logistic regression models, ***$p < .01$, **$p < .05$, **$p < .10$.

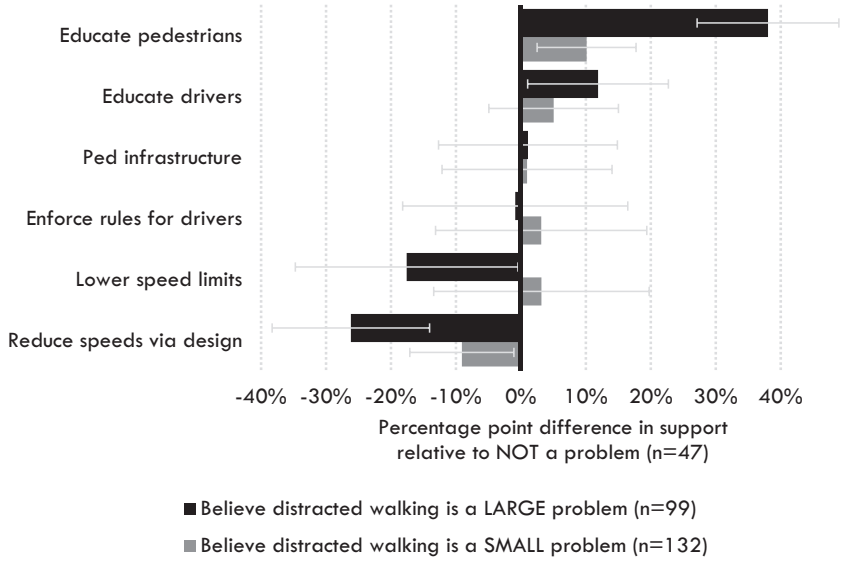

Fig. 4. Differences in preferred pedestrian safety solutions by concern about distracted walking, multivariate results (95% CI).

were not concerned. In turn, they were less likely to endorse efforts to reduce vehicle speeds via design changes or speed limits.

An additional 50% of practitioners believe distracted walking is a "small problem", responsible for roughly 15% of pedestrian deaths. Like their more concerned colleagues, these practitioners also prefer individual-level solutions (like pedestrian education) over systems level-solutions (reducing speeds via design).

The emphasis on individual-level solutions among the survey sample is particularly troubling because as transportation practitioners, our respondents are uniquely positioned to make systematic changes to improve safety. By prioritizing educational campaigns—which cost little but are largely ineffective—over proven countermeasures like speed reduction and pedestrian infrastructure, practitioners will save fewer lives. Moreover, educational campaigns that chastise pedestrians will do nothing to create safer streets for children, the elderly, or people with vision impairments, each of whom experience challenges similar to the effects of distraction. If we want to make streets safe for all users, we cannot allow educational campaigns to be the centerpiece of our strategy. Finally, despite the intuitive similarities, distracted walking is not like distracted driving. The former typically leads to embarrassment, minor injuries, and in rare cases serious injury or death. In all cases, distracted walkers almost exclusively endanger themselves. By contrast, distracted drivers operate heavy equipment that poses disproportionate risks to people outside the vehicle. Given the potential for harm, drivers have a greater obligation to avoid distraction than pedestrians.

What do these results imply for practice? First, this work underscores the importance of high-quality data on the causes of traffic crashes and every effort should be made to improve the quality and consistency of crash reports. More broadly, practitioners and scholars alike should ensure that their efforts are consistent with the ethos of Vision Zero. They can start by reframing crash analysis to focus less on who (or what) gets hit and focus more on who did the hitting. This simple shift may help recast discussions about pedestrian safety and enable more effective solutions. Rather than focus on low-hanging fruit of educational campaigns for pedestrians, practitioners should focus their pedestrian safety efforts on the biggest risk factors and the most effective solutions. Practitioners should try to counteract windshield bias by participating in walking audits and diversifying decision-making bodies to include people who regularly walk, bike, and use transit. Finally, scholars should carefully consider how well their research agenda aligns with their values and goals. Will another study of distracted walking meaningfully advance efforts to improve safety or would we be better served by tackling different questions? We can all agree that too many pedestrians die on our streets, but a misplaced focus on distracted walking will hamper our efforts to save lives and improve safety for all users.

Addendum

The authors would like to thank three anonymous reviewers for their thoughtful comments.

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

This paper was presented at the 2020 Annual Meeting of the Transportation Research Board.

Credit authorship contribution statement

Kelcie Ralph: Conceptualization, Methodology, Investigation, Formal analysis, Writing - original draft. **Ian Girardeau:** Investigation, Methodology.

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Update

Transportation Research Interdisciplinary Perspectives

Volume 9, Issue , March 2021, Page

DOI: https://doi.org/10.1016/j.trip.2021.100308

Transportation Research Interdisciplinary Perspectives 9 (2021) 100308

Contents lists available at ScienceDirect

Transportation Research Interdisciplinary Perspectives

journal homepage: www.elsevier.com/locate/trip

Erratum

Erratum regarding missing Declaration of Competing Interest statements in previously published articles

Declaration of Competing Interest statements were not included in the published version of the following articles that appeared in previous issues of "Transportation Research Interdisciplinary Perspectives".

The appropriate Declaration/Competing Interest statements, provided by the Authors, are included below.

1. "Unsafe motorization: A clog in the wheels of sustainable transportation" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100153] https://doi.org/10.1016/j.trip.2020.100153
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
2. "An exploration of policy knowledge-seeking on high-volume, low-carbon transport: findings from expert interviews in selected African and South-Asian countries" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100117] https://doi.org/10.1016/j.trip.2020.100117
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
3. "Agent-based vulnerability assessment at airport security checkpoints: A case study on security operator behavior" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100139] https://doi.org/10.1016/j.trip.2020.100139
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
4. "The effect of COVID-19 and subsequent social distancing on travel behavior" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100121] https://doi.org/10.1016/j.trip.2020.100121
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
5. "Air quality and fossil fuel driven transportation in the Metropolitan Area of São Paulo" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100137] https://doi.org/10.1016/j.trip.2020.100137
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
6. "The ultimate smart mobility combination for sustainable transport? A case study on shared electric automated mobility initiatives in the Netherlands" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100129] https://doi.org/10.1016/j.trip.2020.100129
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
7. "A framework for end-to-end deep learning-based anomaly detection in transportation networks" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100112] https://doi.org/10.1016/j.trip.2020.100112
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
8. "Ethical decision making behind the wheel – A driving simulator study" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100147] https://doi.org/10.1016/j.trip.2020.100147
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
9. "Population size and transport company efficiency – Evidence from Czech Republic" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100145] https://doi.org/10.1016/j.trip.2020.100145
   Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
10. "Toward sustainable travel: An analysis of campus bikeshare use" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100162] https://doi.org/10.1016/j.trip.2020.100162
    Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
11. "Responsible Transport: A post-COVID agenda for transport policy and practice" [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100151] https://doi.org/10.1016/j.trip.2020.100151
    Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.

DOI of original article: https://doi.org/10.1016/j.trip.2020.100147. https://doi.org/10.1016/j.trip.2020.100144. https://doi.org/10.1016/j.trip.2020.100153. https://doi.org/10.1016/j.trip.2020.100142. https://doi.org/10.1016/j.trip.2019.100060. https://doi.org/10.1016/j.trip.2020.100123. https://doi.org/10.1016/j.trip.2020.100139. https://doi.org/10.1016/j.trip.2020.100112. https://doi.org/10.1016/j.trip.2020.100154. https://doi.org/10.1016/j.trip.2020.100117. https://doi.org/10.1016/j.trip.2020.100121. https://doi.org/10.1016/j.trip.2020.100145. https://doi.org/10.1016/j.trip.2020.100162. https://doi.org/10.1016/j.trip.2020.100151. https://doi.org/10.1016/j.trip.2020.100118. https://doi.org/10.1016/j.trip.2020.100109. https://doi.org/10.1016/j.trip.2020.100159. https://doi.org/10.1016/j.trip.2020.100137. https://doi.org/10.1016/j.trip.2020.100129. https://doi.org/10.1016/j.trip.2020.100150. https://doi.org/10.1016/j.trip.2020.100110. https://doi.org/10.1016/j.trip.2020.100136.

https://doi.org/10.1016/j.trip.2021.100308
Available online 15 February 2021
2590-1982/© 2021 Published by Elsevier Ltd.
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12. “Distracted by “distracted pedestrians”?” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100118] https://doi.org/10.1016/j.trip.2020.100118
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
13. “The cruise industry and the COVID-19 outbreak” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100136] https://doi.org/10.1016/j.trip.2020.100136
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
14. “Estimating bus passenger volume based on a Wi-Fi scanner survey” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100142] https://doi.org/10.1016/j.trip.2020.100142
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
15. “Impact of COVID-19 on transportation in Lagos, Nigeria” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100154] https://doi.org/10.1016/j.trip.2020.100154
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
16. “Rail factor and realism of the unconscious” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100144] https://doi.org/10.1016/j.trip.2020.100144
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
17. “How COVID-19 and the Dutch ‘intelligent lockdown’ change activities, work and travel behaviour: Evidence from longitudinal data in the Netherlands” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100150] https://doi.org/10.1016/j.trip.2020.100150
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
18. “Interprofessional collaboration to promote transportation equity for environmental justice populations: A mixed methods study of civil engineers, transportation planners, and social workers' perspectives” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100110] https://doi.org/10.1016/j.trip.2020.100110
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
19. “Framing systemic traffic violence: Media coverage of Dutch traffic crashes” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100109] https://doi.org/10.1016/j.trip.2020.100109
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
20. “Transit in flex: Examining service fragmentation of app-based, on-demand transit services in Texas” [Transportation Research Interdisciplinary Perspectives, 2019; Volume 5: 100060] https://doi.org/10.1016/j.trip.2019.100060
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
21. “COVID-19 and airline employment: Insights from historical uncertainty shocks to the industry” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 5: 100123] https://doi.org/10.1016/j.trip.2020.100123
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.
22. “Inflection point: The future of subcontracting in the petroleum industry” [Transportation Research Interdisciplinary Perspectives, 2020; Volume 6: 100159] https://doi.org/10.1016/j.trip.2020.100159
Declaration of competing interest: The authors were contacted after publication to request a Declaration of Interest statement.