
Calling on all Smombies and Pedtextrians

Adrian Garcia and Richie Fraser, AECOM

1 Introduction

Einstein remarked, "*It has become appallingly obvious that our technology has exceeded our humanity*". This sentiment holds true in the context of smartphones with little question that we are increasingly becoming slaves of such devices.

Recent reports show that Smartphone penetration in the UK is reaching a peak with smartphone ownership increasing from 52% to 81% of the population between 2012 and 2016. On a daily basis, evidence of people using their smartphones while on the move - oblivious to their surroundings - is apparent and yet little is known on the road safety implications of distracted walking.

This paper presents the results from an extensive literature review and web-based research into the implications of the 'smartphone oblivion' on road safety, and in particular the dangers associated with 'distracted walking' focusing on:

- the rise of smartphone/mobile technology and its impacts on road safety;
- the dangers of distracted walking via a review of case studies from across the world; and
- a look to the future; how traditional approaches to transport planning may be shaped by a new transport user - the distracted pedestrian.

The paper also considers how results could be applied in a Scottish context and implemented as part of a local awareness campaign; an issue that is the subject of current discussions with road safety organisations across Scotland.

2 Background

Despite the rise of the smartphone and its pedestrian safety implications, little is known on this topic with historic research focused on the dangers of in-vehicle distractions, particularly the dangers of using mobile phones while driving. Inattentive pedestrian behaviour can manifest itself in various forms; ranging in severity from eliciting the scorn of other people who are bumped into through to potentially fatal incidents such as walking into the path of cars and trains.

The AA recently reported a 12% increase in UK pedestrian fatalities between 2013 and 2014 and suggested distracted walking may be a factor. Wider research also suggests distracted pedestrians – or '*smombies*' and '*pedtextrians*' – are more likely to walk slower, change directions more frequently, and are less likely to acknowledge other people, exposing them to a greater risk of having an accident.

Distraction is defined as "something that turns your attention away from something you want to concentrate on."¹ A recent research study (Schwebel et al., 2011) concluded that:

Pedestrian behaviour requires a complex set of cognitive skills including attentional processes, visual and aural perceptual processes, information processing, decision-making and motor initiation.

Using a mobile or smartphone while walking compromises each of these skills by adding a level of complexity to the walking task, and this is where risk is introduced due to inattentiveness.

¹ Collins English Dictionary

3 Approach

To explore the implications of the 'smartphone oblivion', an extensive literature review has been undertaken of academic studies into the subject of pedestrian distraction. This has comprised a review of online academic journals and published reports; a bibliography is provided as part of this paper.

Additionally, a web-based review has been carried out of campaigns and initiatives that have been implemented across the world to highlight the dangers of distractions associated with smartphones. Using a case study approach, campaigns implemented by national, regional and local government bodies, and others with a vested interest in road safety, such as mobile phone and insurance companies, have been considered.

4 Literature Review

This section presents key findings of a literature review into the subject of pedestrian distraction (including experimental, observational and survey-based studies) focusing on the impacts of smartphones and technology on safety behaviours when walking and crossing a street or road.

4.1 Effects of Technology on Cautionary Behaviours

Historically, research has focused on the effects of technology and attentional distractions amongst drivers. Strayer and Johnston (2001) observed that the cognitive demands associated with talking on a mobile phone while driving has a significant detrimental effect in driving. Dividing attention amongst multiple concurrent stimuli or tasks generally compromises performance on the whole suggesting attentional capacity limitations (e.g. Duncan, 1980 and Pashler, 1998). This is particularly relevant in today's complex world, where people cope not only with the distracting qualities of the environment but also with the attentional demands imposed by technology (Neider et al., 2010).

Over the last decade attentional distraction related to mobile phone use has been the subject of greater attention. Initially, research investigating the effect of pedestrian distraction on cautionary behaviour grouped personal music devices and mobile phones together (Bungum et al., 2005) and concluded that distracted pedestrians demonstrated fewer cautionary behaviours compared to those not distracted. Subsequent studies (Hatfield and Murphy, 2007) have argued that specific types of distractions must be differentiated in order to develop appropriately targeted accident prevention methods. A cognitive or attentional distraction is one that takes attentional resources away from the task at hand, and as each distraction influences cautionary behaviours in qualitatively different ways, identifying the type of distraction is critical for developing effective accident prevention strategies.

Hatfield and Murphy (2007) observed that pedestrians talking on mobile phones while crossing a road exhibited less safe behaviours than those not on a phone. The significant difference between pedestrians using mobile phones and those not was whether or not that pedestrian looked before crossing the street, arguing that this deficiency in cautionary behaviour displayed by pedestrians on their mobile phone was linked to the attentional demands placed on their conversations.

Strayer and Johnston (2001) found that listening to the radio whilst driving had no detrimental effects on driving, and it is likely that there is less of an attentional demand in simply listening to music. However, as Hatfield and Murphy (2007) observed, driving may rely less on auditory input, whereas pedestrians heavily rely on such information, especially when attempting to cross a busy intersection.

Previous research also found that divided attention interferes with walking and therefore pedestrians talking on mobile phones are less likely to notice unexpected objects (or novel stimuli) along their route than those not conversing (Bungum et al., 2005; Hatfield and Murphy, 2007; Nasar et al., 2008).

Hyman et al. (2009) investigated how mobile phones can lead to inattentive or perceptual blindness. Using a brightly coloured unicycling clown to the side of a primary walking path, individuals were observed as they walked a defined route. The surveys found that those people who used a mobile phone displayed a higher level of inattentive blindness compared to others (e.g. using music players, walking in a pair or individuals with no electronic devices). This suggests that mobile phone users

experience difficulty recognising and using information needed to navigate a complex and changing environment.

4.2 Impacts of Technology on Walking and Crossing Behaviours

Hyman et al. (2009) examined the effects of divided attention during walking and established that the effects of distracted walking are higher amongst mobile phone users and people walking in pairs, who tend to walk at slower pace, compared to other pedestrians. In addition, it was observed that people engaging in conversation showed (1) a higher percentage of direction changes whilst walking; (2) displayed more weaving; and (3) were less likely to explicitly acknowledge other people. These effects, therefore, could lead to problems of slowing other people down in more congested areas.

Another observational study, undertaken by Thompson et al. (2012) to understand the impact of technology on pedestrian crossing behaviour and crossing times, showed that approximately 30% of the people surveyed performed a distracting activity while crossing (e.g. listening to music, text messaging, using a handheld phone). Longer crossing times were observed amongst users' text messaging, using their mobile phone or talking; notably crossing times were 18% higher amongst people texting compared to undistracted pedestrians. This study also identified that texting pedestrians were four times more likely than an undistracted pedestrian to display at least one of the following unsafe crossing behaviours: disobeying lights, crossing mid-intersection or failing to look both ways.

Other studies undertaken in virtual environments (Neider et al., 2009) demonstrate similar results, where pedestrians involved in a conversation were less likely to successfully cross the road on time compared to those users listening to music. People engaging in a conversation on their mobile tended to take longer to initiate crossing and walked at slower pace. Additionally, when conversing on a mobile phone, pedestrians are less likely to identify and act on crossing opportunities.

4.3 The Rise of Smartphones and Road Safety Implications

Deloitte's 2016 mobile consumer survey ("There's no place like phone") reported that smartphone penetration in the UK has increased from 52% to 81% since 2012, and continues to grow. It estimated that around 91% of 18 to 44 year olds owned a smartphone. Accordingly, smartphone penetration appears to be reaching a peak, although its impact on user behaviours is expected to continue growing over the coming years.

Deloitte's study also outlined the extent to which smartphones have an intrusive impact on people's abilities to carry out other daily activities. Figure 1 indicates that using a mobile phone while driving was considered to be the most intrusive activity. Notably, however, activities which have historically generated less research and media attention, such as walking or crossing the road while using a smartphone, were identified as having not too dissimilar intrusiveness ratings.

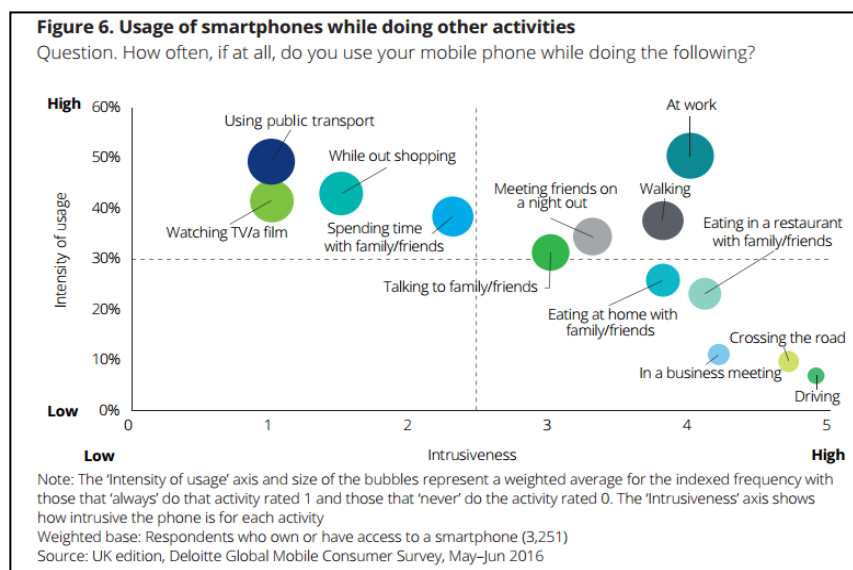


Figure 1: Smartphone Usage and Intrusiveness (Deloitte, 2016)

In 2013, insurance firm AXA undertook research amongst 1,000 school pupils aged 8 to 18 to examine smartphone penetration and its road safety implications. Results suggested that 75% of 12 year olds take a mobile phone to school every day, with this figure rising to 95% amongst 16 year olds. The report also highlighted that children aged 11 to 12 are most at risk of road incidents, accounting for over 30% of all child pedestrians Killed or Seriously Injured (KSI) casualties during school run times. Approximately one quarter of pupils admitted to being distracted when crossing a road on their route to school (with 20% of children crossing five or more roads every day while on their way to school).

Figure 2 illustrates the top ten “mobile phone” tasks undertaken by UK school children who use their phone on their way to school.

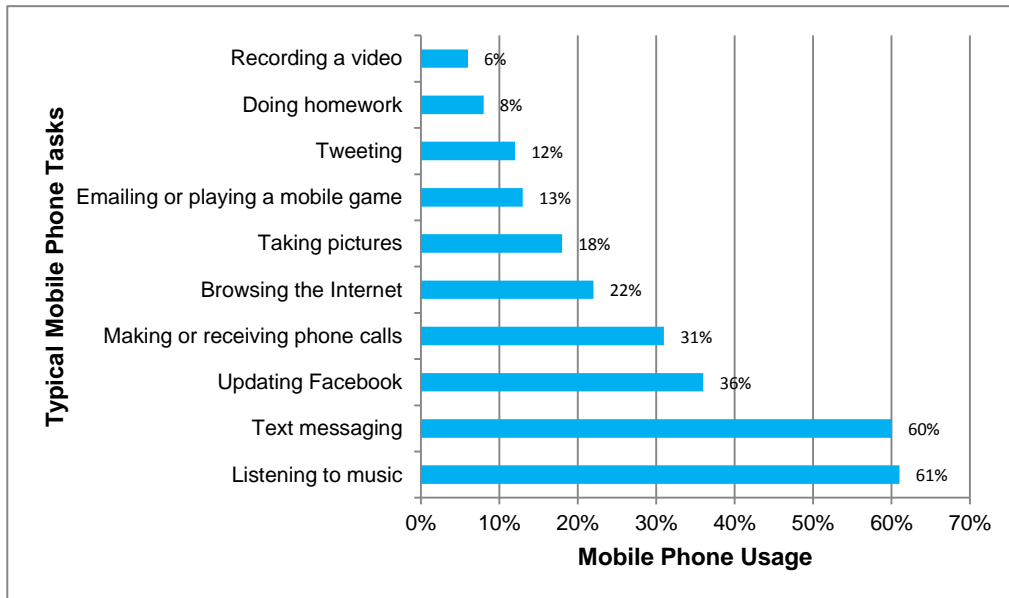


Figure 2: Smartphone Usage amongst teenagers (AXA, 2012)

In France, insurance company GMF undertook a survey in 2016 looking into behaviours and type of incidents related to smartphone use by pedestrians. This revealed:

- 92% of those surveyed owned a mobile phone; 52% of these being smartphones.
- 35% admitted that they had crossed a street whilst speaking or texting on their phone and 25% admitted that they had used headphones to call someone/listen to music whilst walking;
- Results showed that behaviour is heavily correlated with age, with people under 34 demonstrating the highest levels of unsafe behaviours;
- 78% of those surveyed acknowledged the risks associated with using a mobile phone whilst walking. 18 to 25 year olds perceived phone use while walking to be less of a risk compared to older age groups; and
- 79% of those surveyed agreed that a campaign would be useful to raise awareness of the risks associated with using a mobile phone whilst walking, with 69% considering that a campaign could help reduce risks.

Figure 3 **Error! Reference source not found.** shows the type and frequency of incidents reported by those who generally used their phone while walking from the survey.

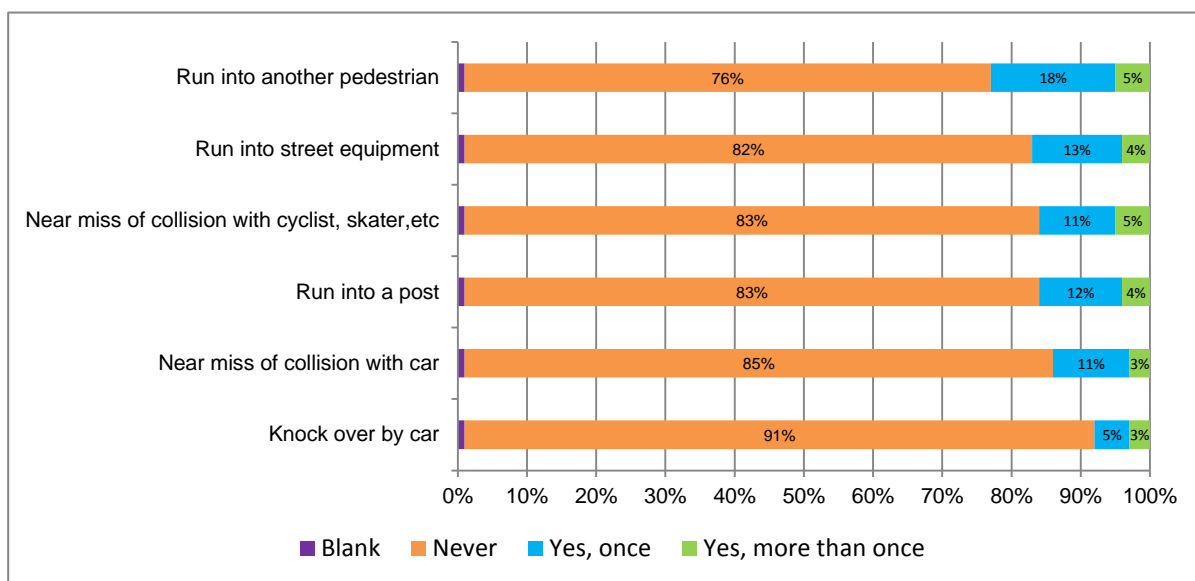


Figure 3: Incidents linked to Smartphones (GMF, 2016)

Beside survey results, evidence of the rise in distracted walking trends can be seen through the introduction of phrases into popular culture and urban dictionaries, namely ‘pedtextrians’ and ‘Smombies’ (Smartphone Zombies) – that latter of which won Germany’s 2015 youth word of the year!

In April 2016, the AA highlighted the growing phenomenon of what it termed the ‘Smartphone Oblivion’. A poll of over 24,000 AA members showed that over 70% reported to have witnessed ‘smartphone zombies’, who appeared to be oblivious to traffic around them as they crossed busy roads. The report went on to suggest that pedestrian inattentiveness could be a factor amongst the 450 pedestrian deaths registered 2014 (a 12% increase on 2013 UK pedestrian fatality figures). Interestingly the study also identified a specific concern related to motorists using mobile phones on hard shoulders. Within the report, AA President, Edmund King stated “*we can’t stop the march of technology, but we need to halt the pedestrian, cycle and driver zombies*”. In line with this, the AA’s research suggests:

...this problem is growing so we all need to use common sense to ensure that technological cocooning doesn’t endanger our lives or the lives of other.

5 Responses to the Smartphone Oblivion

This section outlines the results from a high level case study review into the approaches that have been implemented across the world to raise awareness of the dangers of distracted walking across the realms of Education and Engagement (publicity campaigns), Enforcement and Engineering measures.

5.1 Education and Engagement

As observed by Mwakalonge et al. (2015), preventive strategies for safe walking are essential to address distracted walking issues. Table 1 includes various publicity campaigns which aim to educate and raise awareness of the dangers of distracted walking. The remainder of this section discusses several of these in more detail.

Table 1: Distracted Walking Public Awareness Campaigns

Title	Organisation (Country)	Year	Description
‘Stop. Look. Listen’	San Francisco Municipal Transportation Agency (USA)	2008	Multimedia campaign comprising posters, radio and television adverts to remind pedestrians about the dangers of using earphones when walking around traffic.

Title	Organisation (Country)	Year	Description
'Lambs to the slaughter-wait for the green'	Pedestrian Council of Australia (Australia)	2010	Safety campaign which highlights the dangers of pedestrians using their phones while crossing the road.
'Stop. Think. Live'	Transport for London (UK)	2012	Education campaign which used a variety of strong messages including at bus stops to remind teenagers to take care when using their phones on the road.
DumbWays2Die	Melbourne Metro (Australia)	2012	Viral social media campaign which highlights the risks to pedestrians around trains and platforms.
'You Only Live Once' (YOLO)	Montgomery Council (USA)	2014	Education campaign consisting of powerful images to raise awareness of the dangers of distracted walking after the death of a student in 2012 when walking to school.
'Look Up'	Delaware – Office of Highway Safety (USA)	2014	Posters encouraging pedestrians to 'Look Up. Drivers aren't always looking for you.' placed at busy junctions.
'Pick your head up'	City of Philadelphia Mayor's Office of Transportation & Utilities (USA)	2015	In support of "It's Road Safety, Not Rocket science" campaign, pedestrian-driver safety reminders were installed across the city's public transport network.
'The Magic Trick'	Lausanne Police and Swiss Council for Accident Prevention (Switzerland)	2015	A hard-hitting film launched to highlight the dangers of distraction when crossing roads.
'Samurai Smartphone Parade'	NTT Docomo (Japan)	2015	Comical video advert where samurais represent some of the most typical incidents related to distracted walking.
'Every Step Counts'	Dublin County Council (Ireland)	2016	Safety campaign run largely through social media highlighting key messages used in other campaigns.

In the UK, there is limited information available on campaigns specifically designed to highlight the dangers of distracted walking. However, in 2012, Transport for London (TfL) launched its **'Stop. Think. Live.'** campaign which used hard-hitting posters (Figure 4) to remind teenagers to take care when using their phones on the road. The campaign posters were displayed across the capital, such as at bus stops, designed to capture teenager's attention and encourages them to 'look out for their mates'. Alongside the posters and short safety messages by high profile campaign supporters, an online game was released, which challenged teenagers to navigate safely through London's streets. During the game, players pick up friends along their route and have to cope with distractions such as text messages, music and shopping interruptions.



Figure 4: 'Stop. Think. Live' Campaign (TfL, 2012)

Elsewhere in Europe, in 2015, the hard-hitting graphic advert, “The Magic Trick”, was developed by Swiss authorities to encourage pedestrians to think twice before taking out phones, particularly when crossing roads. The video introduces a pedestrian, who performs a ‘disappearing act’ as he attempts to cross the road, looking at his phone rather than his surroundings.

In the US, following the death of a student (Christina) walking to school, Montgomery Council launched the **YOLO #Walksafe** campaign which uses powerful messages to raise awareness of the dangers of using phones while crossing the road. At the time of her death, Christina, was using her earphones and was distracted by her mobile phone. An emotive video message from Christina’s mother is also played in schools as part of the campaign to encourage school communities to promote safe pedestrian behaviours. During the launch of this campaign, it was highlighted that 50% of all underage pedestrians’ fatalities in the Montgomery County happened to teens between the ages of 15 and 19. In line with this, according to Safe Kids Worldwide, 1 in 5 high school teens cross the street while distracted.



Figure 5: YOLO campaign (Montgomery Council, 2015)

In Japan, mobile phone company operator NTT Docomo developed the “**Smartphone Samurais**” advert to highlight in a comical manner the dangers of smartphone use while walking. During the video, a series of key statistics are displayed in conjunction with comical situations that try to replicate daily incidents experienced by mobile phone users in Japan, including:

- 66% of Japan’s population has bumped into other people while walking using their phone
- 4% have fallen from a platform when texting while walking
- 18% have tripped while using their smartphone while walking
- 77% have used their phone while walking
- 99% of Japanese think using a smartphone while walking is dangerous.



Figure 6: Samurai Smartphone Parade Screenshot (NTT Docomo, 2015)

In Australia, introduced by Melbourne Metro in 2012, the multi-award winning **DumbWays2Die** campaign also uses dark humour to promote safety messages focused on reckless behaviour around trains and at platforms. This animated safety message has become a viral sensation, with over 140

million views on YouTube. Within just four months of its launch, Melbourne Metro had recorded a 21% reduction in accidents and deaths compared to the same time during the previous year.

In addition to education campaigns, in recent years, several cities around the world have introduced temporary infrastructure measures to raise awareness of the dangers associated with distracted walking. In 2008, LivingStreets undertook a **'padded-post-pilot'** trial in Brick Lane in London (see Figure 7). While results could not be established, the trial had a positive impact in terms of publicity benefits. In Antwerp, Belgium, a **text walking lane** – similar in idea to a cycle lane – was introduced through a busy high street by a mobile phone operator such that distracted pedestrians do not bump into other route users. Similar examples of this approach as a PR stunt can be found in other cities around the world, including the USA and China.



Figure 7: Example of Padded Post Pilot and Dedicated Lanes for Smartphone Users

In Japan, other education campaigns have sought to specifically target rail commuters, following several incidents involving people falling off platforms while using their phones. In 2013, adverts were placed in the staircase at Shinjuku Station (Figure 10) to warn station users about the dangers of walking while using a smartphone.



Figure 8: Advertisements at Shinjuku Station

Finally, in 2013, a fake 'seeing-eye person' program was launched in New York in collaboration with BuzzFeed whereby practical jokers claimed to be Department of Transport workers to guide pedestrians fixated on their mobile phones on leashes as they walked through the city. By its absurdity, and as a metaphor for the ridiculousness of the rising number of pedestrian casualties caused by inattentiveness owing to smartphones, the PR stunt generated significant media attention to the subject of distracted walking.

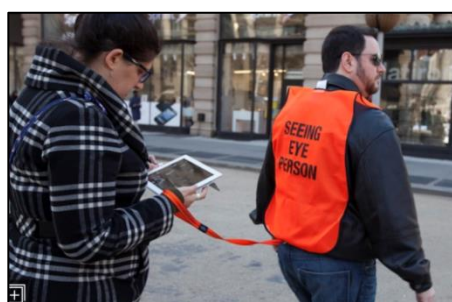


Figure 9: 'Seeing Eye Person'

5.2 Enforcement: Penalising “Risky Behaviour”

In the USA, the potential to introduce legislation to penalise pedestrians caught using their mobile phones while crossing the road has generated considerable media attention. A number of states have sought to bring forward legislation which would lead to fines/prison; for example, a Bill pending in Hawaii proposed fines of up to \$250 for anyone operating an electronic device while crossing the street, while in New Jersey a fine of up to \$50 or 15 days imprisonment has been mentioned. None of these measures have been introduced – with it being acknowledged that policing such offences would be very difficult – these measures have generated considerable media attention having been picked up in global press, thereby serving a public service announcement function according to some commentators.

5.3 Engineering Measures: Infrastructure and Signalisation

Increasingly, a number of engineering based approaches to raise awareness of distracted walking issues have been considered. In Seoul, for example, in response to a study that showed collisions between pedestrians and vehicles in South Korea more than doubled in five years and accounted for approximately 1,000 recorded incidents in 2014, the Heads Up campaign was launched to highlight the dangers of pedestrian smartphone use. As part of the campaign, 300 **warning signs** were introduced in five localities across Seoul designed to prevent distracted pedestrians from walking into roads with busy traffic. Of the 300 signs, 250 were placed on pavements, as ‘smartphone zombies’ are more likely to be looking down when using smartphones.

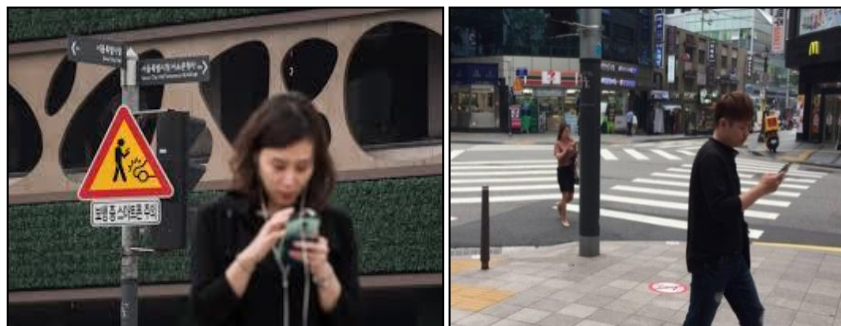


Figure 10: Example of Smartphone Use Warning Signs

In Augsburg, Germany, following a series of accidents caused by pedestrians using their smartphones, ground level traffic lights were installed at two tram crossings in 2016 (see Figure 11)

6 Potential Research Applications

While the research undertaken has shown that distracted pedestrian behaviour is a subject that has attracted increased levels of attention in recent years, with smartphone penetration reaching a peak it is considered that there is further work required to highlight the risks associated with distracted pedestrian behaviour and smartphones.

Linked to this, there is a requirement to better develop and understand data around distracted walking incidents. Currently, accident data is not captured in a suitable manner for such incidents and it is difficult to both quantify and understand the exact details or causes behind accidents involving distracted pedestrians. Discussions with road safety professionals carried out as part of this research confirmed the view that accidents involving distracted pedestrians is currently ill-defined in accident reporting procedures and would perhaps only be picked up as a factor if the distracted pedestrian was directly observed using their phone at the time of incident. It is also considered that accidents or ‘near misses’ involving distracted pedestrians is likely to be an underreported area due to the ‘embarrassment factor’ with people failing to report the real reason of incidents. It is therefore important to identify suitable and accessible data that will help to further research on the safety

implications of distracted walking. Developing awareness levels and the evidence base around distracted walking, both amongst the general public and those with a responsibility for accident reporting, should also assist.

In Scotland specifically, limited research has been undertaken and it is considered that, drawing on lessons learned from a number of the case studies reviewed, there is the potential to introduce a campaign to raise awareness of the dangers of distracted walking locally and increase responsible pedestrian behaviour.

From the case study review detailed in Section 5, any campaign introduced should seek to deploy a range of methods and use social media as the principal form of engagement, given its reach and relevance amongst smartphone users. Opportunities for direct engagement with specific target groups should also be considered. From the research undertaken, it is notable that a number of campaigns highlight train/subway users. Besides the obvious safety hazards associated with distracted walking around platforms, it is considered that these groups are relevant for direct engagement given that poor signal quality on the train often means that users reach for their smartphone immediately as they depart stations. Youth groups, particularly school children and young adults, should also form a key target group with many research studies establishing that the 16 to 30 years old group display higher levels of unsafe behaviours. In terms of campaign content, this should be pitched to the appropriate group using a range of education and awareness measures, potentially ranging from hard-hitting posters and videos that provide poignant reminders of pedestrian vulnerability caused by simple everyday distractions to more comical or staged promotions which by their absurdity attract the media attention required to bring the issue to the fore.

Besides road safety, a number of campaigns have also played up the negative impact of distraction caused by smartphones on the breakdown of personal relationships by eroding everyday face-to-face communication and interaction.

The literature review has also shown that insurance companies and mobile phone operators were responsible for a number of the surveys and initiatives discussed in this paper. This suggests that should a campaign be developed, opportunities should be explored to secure sponsorship from such groups given their vested interests and social responsibilities.

To support this research in a Scottish context, at the time of writing, pedestrian surveys are being carried out at a busy junction in Glasgow city centre to identify distracted walking behaviours and inform the potential targeting of campaign messages. It is hoped that the findings of this work will form the basis of future research papers on this subject.

While research to date has focussed principally on the road safety implications associated with distracted walking, the research has also identified that the rising prominence of this trend is arguably introducing a new transport user group which historically has not been considered in traditional transport planning: the distracted pedestrian. In Tokyo's Shibuya's junction, for example, a simulation of the stereotypical behaviours of pedestrians using smartphones while crossing a busy junction suggests that smartphone use would impact pedestrian crossing times and undermine the junction's performance. Further opportunities for transport planning to respond to this new user – which displays a slower pace, a higher tendency to change direction and a greater exposure to road safety risk – will be developed, such as pedestrian modelling, in order to cater for this new demand and behaviours in the future.

7 Summary & Conclusions

Historically the focus of research into distraction has been centred on distracted driving and in-vehicle mobile phone use. However, as this paper has demonstrated, there is a growing body of literature and research around the dangers of distracted walking. As smartphone penetration reaches a peak, this subject is expected to generate increased attention, and there will be a requirement for greater

response. This paper has presented the results of this response, drawing on case study examples across the world, and proposed opportunities to further research in a Scottish context.

) to remind pedestrians to look both ways before crossing. Similarly, LED pavement lights which change with the traffic signal, were recently installed on a trial basis at a pedestrian crossing near three schools in the town of Bodegraven, Netherlands, to help pedestrians cross the road safely. As the trials are still in their infancy, results have not been ascertained although many commentators have highlighted concerns that such measures reward poor pedestrian behaviour as they do not necessarily discourage smartphone users to look up from their handsets and look before crossing.



Figure 11: Examples of Ground Level Traffic Lights

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References

- AXA, 2013. Road Safe Schools Report, Facts about road accidents and children. <http://www.axa.co.uk/roadsafeschools/news/mobile-phone-use-threatens-childrens-road-safety/> [Accessed 11/2016]
- BBC news, German city puts traffic lights on pavements for smartphone users, 2016. <http://www.bbc.co.uk/newsbeat/article/36153741/german-city-puts-traffic-lights-on-pavements-for-smartphone-users> [Accessed 11/2016]
- BBC news, Pavement lights guide 'smartphone zombies' 2017. <http://www.bbc.com/news/technology-38992653> [Accessed 02/2017]
- Bungum, T.J., Day, C., Henry, L.J., 2005. The association of distraction and caution displayed by pedestrians at a lighted crosswalk. *J. Commun. Health* 30 (4), 269-279.
- BuzzFeed, Joyce Chen, 2013, LOLstep: Text and walk at the same time with “seeing eye people”, <http://news.buzzbuzzhome.com/2013/05/seeing-eye-people.html> [Accessed 11/2016]
- Daily Mail, Brick Lane made Britain's first 'Safe Text' street with padded lampposts to prevent mobile phone injuries, 2008. <http://www.dailymail.co.uk/news/article-525785/Brick-Lane-Britains-Safe-Text-street-padded-lampposts-prevent-mobile-phone-injuries.html#ixzz4bVrbgSkM> [Accessed 10/2016]
- Deloitte, 2016. There's no place like phone. Consumer usage patterns in the era of peak smartphone.
- Dublin County Council, “Every Step, Every Turn” campaign, https://www.facebook.com/pg/everystepeveryturn/posts/?ref=page_internal [Accessed 11/2016]
- Duncan, J., 1980. The demonstration of capacity limitation. *Cognitive Psychology* 12, 75-96.
- Eltis, Christiaens, J., 2014. TfL's teen road safety campaign “Stop.Think. Live” engages with new stars (United Kingdom) <http://www.eltis.org/discover/news/tfls-teen-road-safety-campaign-stopthink-live-engages-new-stars-united-kingdom-0> [Accessed 11/2016]
- Global Mobile Consumer Survey 2016: UK Cut. <https://www.deloitte.co.uk/mobileuk/assets/pdf/Deloitte-Mobile-Consumer-2016-There-is-no-place-like-phone.pdf> [Accessed 11/2016]
- GMF & OpinionWay, 2016. Les piétons et le téléphone en ville, <https://www.opinion-way.com/fr/sondage-d-opinion/sondages-publies/societe/gmf-les-pietons-et-le-telephone-en-ville-avril-2016.html> [Accessed 11/2016]
- Hatfield, J., Murphy, S., 2007. The effects of mobile phone use on pedestrian crossing behaviour at signalized and unsignalized intersections. *Accid. Anal. Prevent.* 39 (1), 197-205
- Hyman, I.E, Boss, S.M, Wise, B.M, McKenzie, K.E, Caggiano, J.M, 2009. Did you see the unicycling clown? Inattentive Blindness while walking and talking on a cell phone, *App. Cognitive Psychology.* 24: 597-607
- Kotaku.co.uk, Ashcraft, B., 2013, ‘Don’t use smartphones while walking’, warns Tokyo staircase, <http://kotaku.com/dont-use-smartphones-while-walking-warns-tokyo-stairc-1051073052> [Accessed 11/2016]
- London, Transport for London (TfL), ‘Stop. Think. Live’ campaign, Transport for London urges teenagers not to get distracted on the roads, <https://tfl.gov.uk/info-for/media/press-releases/2012/march/stop-think-live--transport-for-london-urges-teenagers-not-to-get--distracted-on-the-roads> [Accessed 11/2016]
- 016]Mirror, O’ Neill, K., 2015. “Hard-hitting ad show man’s ‘disappearing act’ after being hit by car as he uses smartphone in the street”, <http://www.mirror.co.uk/news/world-news/hard-hitting-ad-show-mans-disappearing-5677851> [Accessed 11/2

Mwakalonge, J., Siuhi, S., White, J., 2015. Distracted walking: Examining the extent to pedestrian safety problems.

Nasar, J., Hecht, P., Wener, R., 2008. Mobile telephones, distracted attention, and pedestrian safety. *Accident Analysis and Prevention*, 40, 69-75.

Neider, M.B, McCarley, J.S., Crowell J.A, Kaczmariski, H., Kramer, A.F., 2010. Pedestrians, vehicles, and cell phones. *Accid. Anal.* 42:589-94

Pashler, H.E., 1998. *The Psychology of Attention*. MIT Press, Cambridge, MA.

PR Newswire, NTT DOCOMO, INC., "Samurai Smartphone Parade" Video: Walking While Looking at Smartphone Displays is Dangerous Even in the Age of the Samurai, <http://www.prnewswire.com/news-releases/samurai-smartphone-parade-video-walking-while-looking-at-smartphone-displays-is-dangerous-even-in-the-age-of-the-samurai-300187470.html> [Accessed 11/2016]

Safe Kids Worldwide, Teenagers and distractions, An In-Depth Look at Teens' Walking Behaviors 2013, <https://www.safekids.org/research-report/research-report-teens-and-distraction-august-2013> [Accessed 11/2016]

School Training Solutions, 2015. YOLO Walk Safe Program Promotes Pedestrian Safety Among High School Students, <http://www.schooltrainingsolutions.com/blog/yolo-walk-safe-program-promotes-pedestrian-safety-among-high-school-students/> [Accessed 11/2016]

Schwebel, D.C., Stavrinou, D., Byington, K.W., Davis, T., O'Neal, E.E., 2011. Distraction and pedestrian safety: How talking on the phone, texting, and listening to music impact crossing the street. Elsevier LTD.

Strayer, D.L., Johnson, W.A., 2001. Driven to distraction: dual-task studies of simulated driving and conversing on cellular telephone. *Psych. Sci.* 12, 462-466.

[The Guardian, Benedictus, L., Chinese city opens 'phone lane' for texting pedestrians, 2014.](https://www.theguardian.com/world/shortcuts/2014/sep/15/china-mobile-phone-lane-distracted-walking-pedestrians) <https://www.theguardian.com/world/shortcuts/2014/sep/15/china-mobile-phone-lane-distracted-walking-pedestrians> [Accessed 11/2016]

The Japan Times, Simulation of texting at Shibuya crossing goes viral, 2014. <http://www.japantimes.co.jp/news/2014/04/10/national/simulation-of-texting-at-shibuya-crossing-goes-viral/#.WMrRNWdXV1M> [Accessed 11/2016]

The Straits Times, Chang May Choon, Seoul puts up road safety signs to warn 'smartphone zombies', 2016. <http://www.straitstimes.com/asia/east-asia/seoul-puts-up-road-safety-signs-to-warn-smartphone-zombies> [Accessed 11/2016]

The Telegraph, David Chazan, Antwerp introduces 'text walking lanes' for pedestrians using mobile phones, 2015. <http://www.telegraph.co.uk/news/worldnews/europe/belgium/11674215/Antwerp-introduces-text-walking-lanes-for-pedestrians-using-mobile-phones.html> [Accessed 11/2016]

Thompson, L.L, Rivara, F.P, Ayyagari, R.C., Ebel, B.E., 2012, Impact of social and technological distraction on pedestrian crossing behaviour an observational study. BMJ Publishing Group LTD.

TransportXTRA, Patrick McDonnell, 2016. Beware the march of the "Smombies" [Accessed 11/2016]

Walker, E.J., Lanthier.,S.N., Risko, E.F, Kingstone, A., 2011. The effects of personal music devices on pedestrian behaviour.

Wikipedia, Dumb ways to Die campaign, https://en.wikipedia.org/wiki/Dumb_Ways_to_Die. [Accessed 11/2016]