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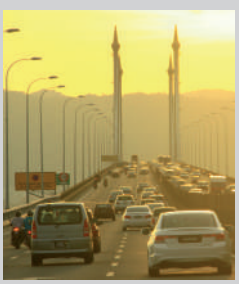

Research Report

Identifying Mobile Phone Use on Pedestrian "Crossing Behaviour" at Signalised and Unsignalised Crossing in Klang Valley

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Abstract

This observational study aims to determine mobile phone distraction among the pedestrians in Malaysia and the influence of mobile phones when crossing the road. The naturalistic observation was conducted at several selected signalised and unsignalised crossings around Klang Valley and the manner in which the pedestrians were using their mobile phone was observed along with their crossing behaviour. The findings of this study showed that 33% of all pedestrians observed at signalised and unsignalised crossing were using mobile phone with the majority observed were texting. All of the associations between the manner of mobile phone use and pedestrian behaviour with gender were significant. However, there were only a few significant associations between the manner of mobile phone use and pedestrian behaviour with age group and crossing type. The study found no significant influence of manner of mobile phone use on pedestrian crossing behaviour. Based on the findings, it is essential that there are an adequate number of road signs and campaigns centring on the dangers of distracted crossing in order to increase the awareness among pedestrians.

1. Introduction

Pedestrian injury is a major public health issue. As the roads throughout the country remain congested with motorcycles, motorcars and other larger vehicles, the presence of pedestrians are also noteworthy and their utmost safety must be accounted for. Based on the Royal Malaysian Police Statistical Report (2015), pedestrians are the third highest group reportedly died in a road accident after motorcyclist and motorist.

It is not a rare sight to see pedestrians using phones and other types of devices while walking and crossing the road. There could also be certain behaviours of these pedestrians that may be related to their use of the mobile phone or other devices, which can pose a safety concern. This could be one of the reasons for the fact that the most frequent pedestrian behaviour involved in pedestrian fatality was careless crossing where there were 300 deaths recorded (RMP, 2015).

In Malaysia as for presently, there are not many research on pedestrian using a mobile phone while crossing. Based on the Malaysian Communications and Multimedia Commission (MCMC) data in 2015, there were 43,248,000 registered mobile phone users in Malaysia and about 30.2% are from Klang Valleys. According to the Royal Malaysian Police (2015), 482 pedestrians died in 2015. The highest percentages of pedestrian injuries occurred on the driveway (50%) and were mostly due to careless crossing (62%), walking/playing at the roadside (31%) and not using pedestrian crossing (2.5%). After years of showing declining trend, pedestrian deaths have started to increase in 2014. Thus, this research is important to identify the behavioural change when people use their mobile phone while crossing.

This study aims to determine mobile phone distraction among the pedestrians in Malaysia and the influence of mobile phone use to behaviour when crossing the road.

1.1 Objectives of the Study

The general objective of this study is to determine the mobile phone use on pedestrian crossing behaviour at signalised and unsignalised crossing in Klang Valley. In specific, this study aims:

i. To identify the percentage of mobile phone use among pedestrian at signalised and unsignalised crossing in Klang Valley.
ii. To understand the association between the manner of mobile phone use and pedestrian crossing behaviour at signalised and unsignalised crossing with gender and age group.
iii. To understand the association of manner of mobile phone use and pedestrian behaviour with crossing type.
iv. To determine the influence of mobile phone use on pedestrian crossing behaviour at signalised and unsignalised crossing in Klang Valley.

1.2 Limitation of the Study

One of the limitations of this study is that the observation technique used is solely naturalistic observation. This is because the observations were conducted in public areas and thus confidentiality and privacy issues of the respondents who are unknowingly recorded on video recorder are a major issue.

2. Literature Review

Previous studies have found evidence that pedestrians paid less attention to the traffic before and during street crossing (Hatfield & Murphy, 2007). Research conducted by Nasar and Troyer (2013) showed that in 2005 in the US, 256 pedestrians had been hospitalised because of the injuries obtained due to using mobile phones. This number has constantly been increasing since then and in 2010 it was six (6) times bigger than in 2005. The research also pointed out that the risk of injuries due to distracted walking was significantly higher with young people and that both pedestrians and drivers had more injuries connected to mobile phone talking than to texting. Regarding pedestrians, mobile phone talking caused about 69% of the estimated injuries, while texting brought to 9.1% of the injuries (Nasar & Troyer, 2013).

Pesic, Antic, Glavic and Milenkovic (2016) showed that pedestrians who used mobile phones significantly more often did not look at traffic before crossing, did not wait for traffic to stop before crossing, did not look at traffic while crossing and did not finish crossing at the marked pedestrian crossing than pedestrians who did not use the mobile phone.

Distracted walking due to mobile phone use which leads to injuries was most common among women and those aged 40 and younger through a study found that the issue is impacting all age groups (Nasar, Hecht & Wener, 2008). The same study also found that the rate of unsafe behaviour was significantly higher among the users of mobile phones compared to users of iPod players, as well as than those who used neither mobile phones nor iPods.

A study by Thompson, Rivara, Ayyagari and Ebel (2013) found that pedestrian activities that could be distracting include talking on the phone, texting, listening to music, talking with others or coping with children or pets. Only one (1) in four (4) pedestrians observed

all the safety rules including looking both ways before crossing. People distracted by activities such as listening to music, texting and talking on the phone took almost a second and a half time longer to cross the road. Although listening to music quickened the time to cross the road, people were less likely to look both ways before crossing.

In US, the data by the Consumer Product Safety Commissions (CPSC, 2014) which estimates the number of injuries based on reports by 100 participating hospitals indicated that there were nearly 5,000 estimated cases of injuries caused by phones and phone accessories that occurred on roads or highways and in other public places (other than home) that were treated in hospital in the United States in 2013. The number of actual injuries caused by distracted walking is bound to be quite higher than this, as the data from the CPSC (2014) only looked at those injuries which resulted in medical treatment at a participating hospital, and minor injuries were likely treated at home or another medical treatment facility not included in the reporting data.

3. Methodology

3.1 Research Design

This study is a cross-sectional study of observational type. The method of scientific observation was adopted in this research where the observation was performed directly by observers instead of using any device such as a camera.

Observers were selected among research assistants with prior experience in doing research observations. In each location of pedestrian crossing selected for this study, two (2) observers were involved where one (1) was placed on each side of the road (one in one direction and one in the other direction) in order to capture behaviours of pedestrian coming from both sides of the road. Each of the observers recorded all the necessary details such as demographics, mobile phone usage and behaviours of the pedestrian in a form. Prior to on-the-field observation, all observers involved were sufficiently trained to do the observation and briefed on all possible issues, circumstances and cautionary measures.

The form used in the observation was designed to allow observation of gender, age group, the manner of how pedestrian used their mobile phone and behaviours of pedestrians while crossing.

3.2 Sampling and Location

Several signalised and unsignalised crossings were chosen around various districts in Klang Valley including Putrajaya, Kuala Lumpur, Petaling Jaya and Shah Alam. The criteria for selecting the locations were such that there should be a considerably high volume of

pedestrians crossing the roads and that there were inconspicuous locations whereby the research team can observe the pedestrians' behaviour. The suitability of each location was first checked using Street View application from Google Map. The shortlisted locations were then visited prior to actual observations by the research team to further examine the crossing, volume, and traffic and safety condition, to determine the availability of unobstructed spot to station the observers and to acknowledge the procedure to obtain approval for conducting the observations from the management or authority body if necessary.

There were two (2) teams of observers stationed at one (1) time to conduct simultaneous observation – Team A observed at a signalised crossing while Team B observed at an unsignalised crossing during a three-hour duration beginning at 12.00 pm until 3.00 pm. The observers observed the pedestrians as they approached and crossed the signalised/unsignalised crossing and noted the details and the pedestrians' use of a mobile device (talking on the phone, text messaging, or listening to music) while crossing the road.

3.3 Instrumentation

An observation form was designed which consisted of 12 items including basic demographic characteristics (gender, estimated age of the participants) and the items about the behaviour of the pedestrians who used mobile phones and those who did not use mobile phones while crossing the street. Researchers estimated the pedestrians' age and classified them into several different age groups (teenager, adult and elderly). Pedestrians who used headphones connected to but not talking using mobile phones were recognised as pedestrians who listened to music, which was determined by researchers' observation.

The following variables were the independent variables for this study: gender, age, the manner of mobile phone use (talking on the phone, texting or viewing content on the mobile phone, listening to music) and the type of the intersection. The gender variable

was categorised as a dichotomous variable, while the age variable was defined as the ordinal variable with three (3) groups.

The age of the subjects was assessed based on the observers' best judgement and categorised into three (3) groups (teenager, adult and elderly). Thus, the data about the pedestrians' age were based on the observers' subjective estimation of the pedestrians' age. Three variables were included to examine the manner of mobile phone use related to talking on the phone, texting or viewing content on a mobile phone and listening to music.

The dependent variables were on pedestrian behaviours while crossing. These behaviours were on whether the pedestrian looks to the left and right before crossing, looks at the traffic light before crossing, whether the pedestrian waits for traffic to stop before crossing, whether the pedestrian looks at incoming traffic while crossing and whether the pedestrian hits or bumps into anything/person during their crossing. Each of these variables was categorised as a dichotomous 'yes' or 'no' variable. Figure 1 illustrated the variables included for the observation of the pedestrian crossings for this study.

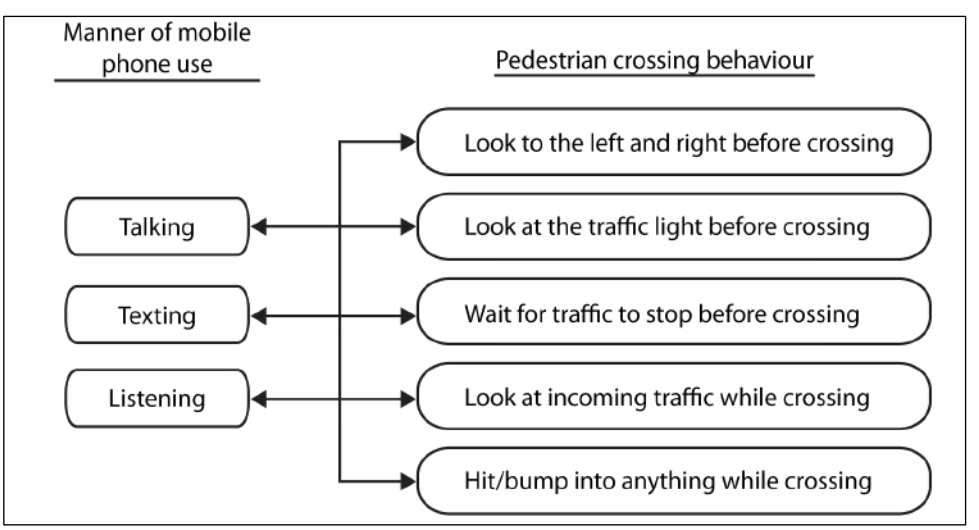

Figure 1 Variables included in the observation

3.4 Procedure

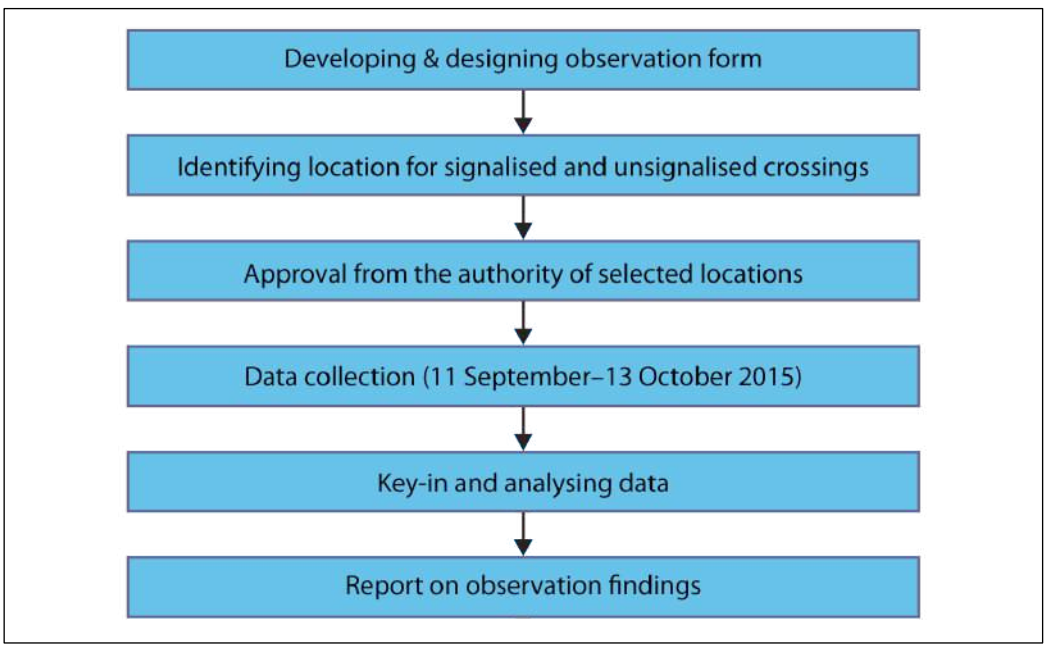

Figure 2 Methodology framework

The procedures involved in this study are shown in Figure 2 above. After developing and designing the observation form, the suitable locations for signalised and unsignalised crossings are identified and approval to conduct the observation is obtained from the local authorities. Data collection commenced for almost a month, after which the data was entered into the Statistical Package for Social Science (SPSS) for analysis.

3.5 Data Analysis

The observation data was keyed in Microsoft Office Excel V.2010 program. The data were analysed in the statistical software package IBM SPSS Statistics V. 20, and the standard methods of descriptive and analytic statistics were applied. Frequency and percentage were used for descriptive analysis. To examine any influence between the mobile phone use with the manner of use and behaviour, chi-square test and odd ratios were run using crosstab function.

4. Results and Discussion

4.1 Demographic Profile

A total of 1687 pedestrians were observed at various signalised and unsignalised crossings in Klang Valley. The pedestrians were almost equally divided in terms of gender with 50.5% of them being females and 49.5% being males as shown in Figure 3 below.

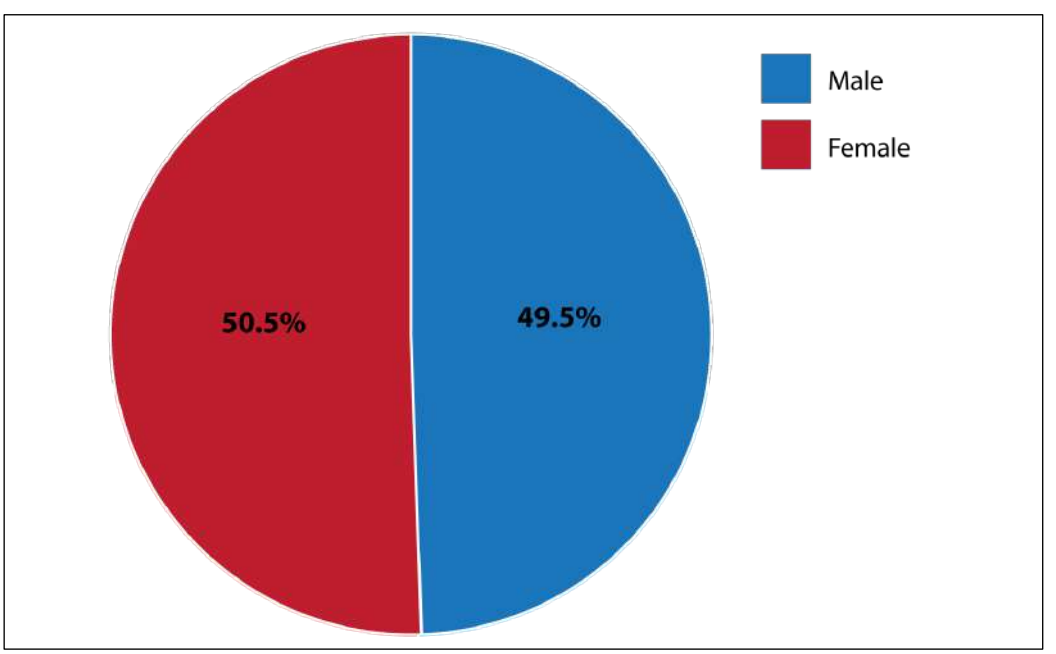

Figure 3 Gender of pedestrians

The general age group of the pedestrians observed is estimated as shown in Figure 4 below. The largest age group is the adults (82.5%), 9.4% are elderly pedestrians and 8.0% are youths.

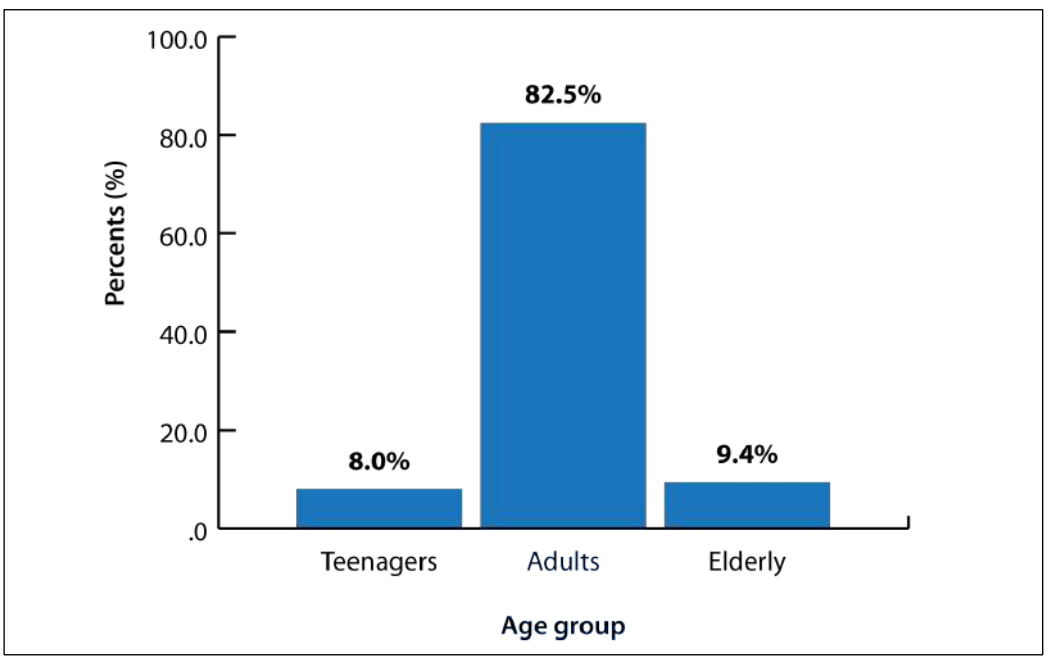

Figure 4 Age group of pedestrians

In terms of the usage of their mobile phone, it was observed that only 33.0% of the pedestrians were using their mobile phone while crossing the road whereas the remaining 67.0% of the pedestrians were simply holding their mobile phone as shown in Figure 5 below.

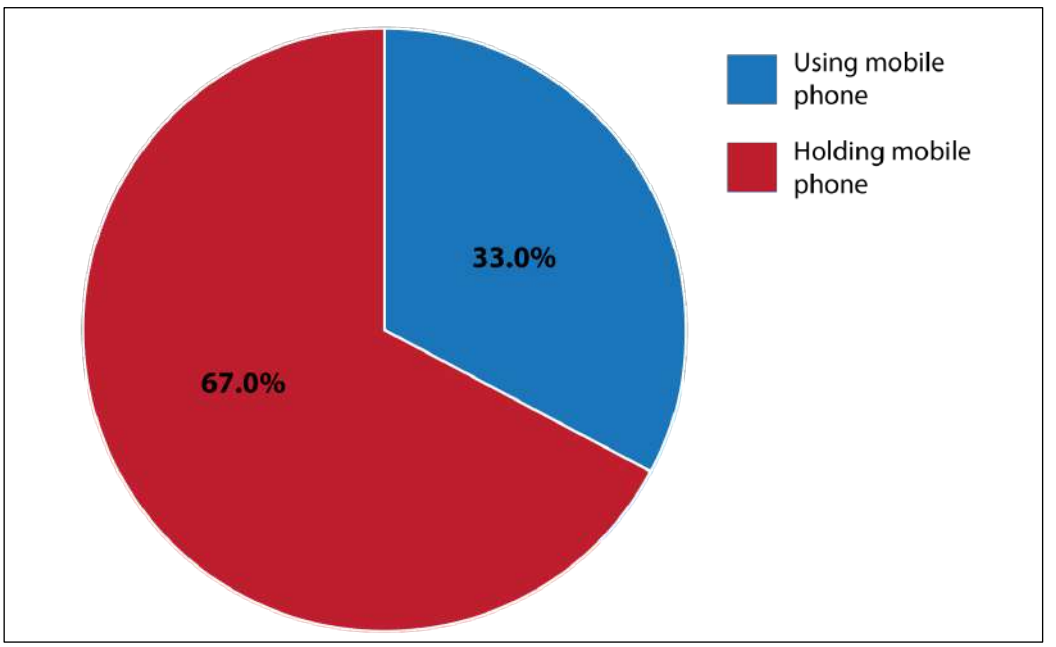

Figure 5 Mobile phone usage of the pedestrians

The pedestrians then were further observed in terms of the manner of mobile phone use that they were engaged in while crossing the road as shown in Figure 6 below. 67.0% of the pedestrians did not use their mobile phones while crossing the road, but 3.8% were listening to music using their mobile phone, 9.5% were calling and 19.7% were texting. This shows that most pedestrians use their mobile phones for texting compared to other usages (calling/talking or listening). It should be noted that texting is not just typing the short messages but may also include using applications in the mobile phone such as games, internet, shopping, e-book and social media among others.

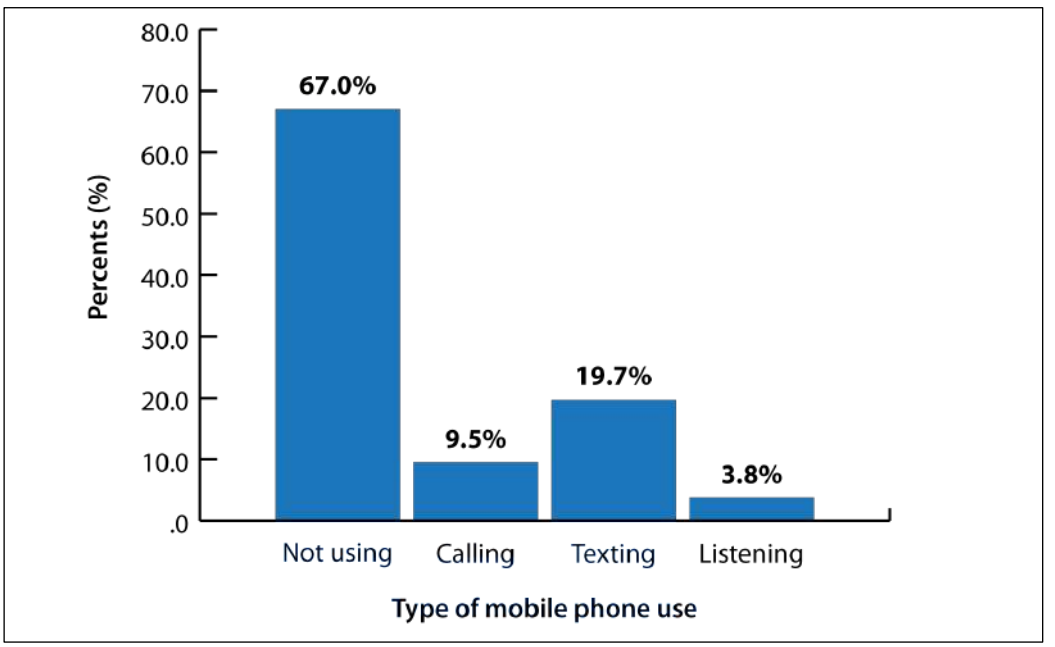

Figure 6 Manner of mobile phone use

Figure 7 shows the manner of mobile phone use engaged by the pedestrian while crossing at the two types of crossing – signalised and unsignalised. It should first be noted that slightly more pedestrians were observed throughout this study at unsignalised (52.8%) crossing compared to signalised (47.2%) crossings. In the graph below, there were more pedestrians who did not use their mobile phone at unsignalised crossing compared to signalised crossing. Those that use their phone were more prone to talk, text and listen to the mobile phone at signalised crossing. This may suggest that pedestrians may be more at ease to use their phone at signalised crossing since they could depend on the traffic light to stop the traffic before crossing.

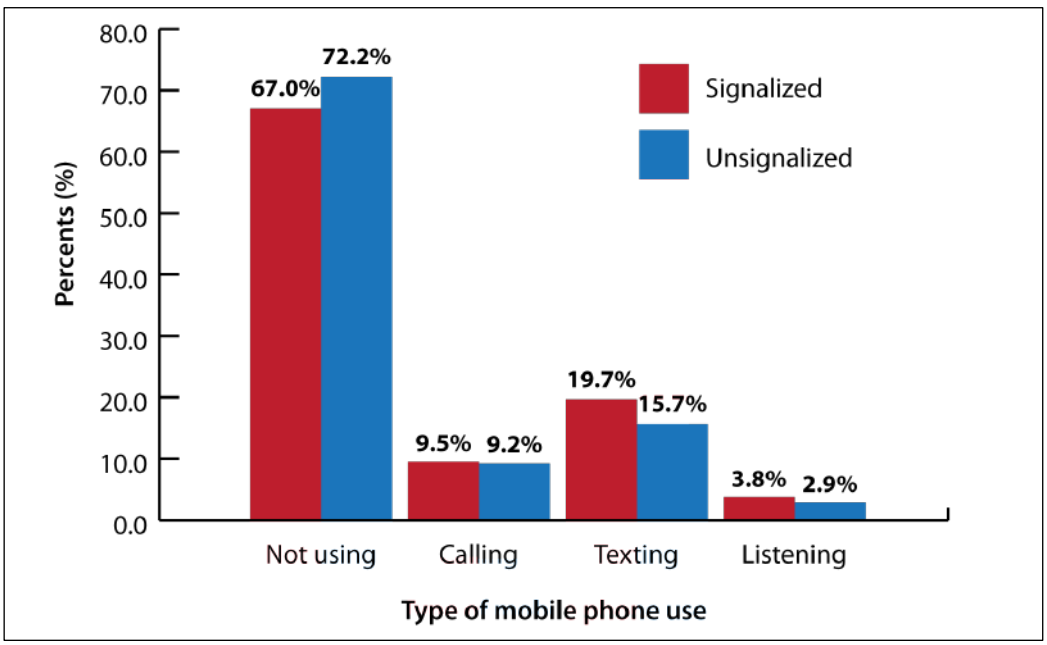

Figure 7 Manner of mobile phone use according to the type of crossing

4.2 Association between Manner of Mobile Phone Use and Pedestrian Crossing Behaviour at Signalised and Unsignalised Crossing with Gender and Age Group

Crosstab function in SPSS is used to examine the association between the variables using chi-square test. Table 1 lists the results of the chi-square test for variable gender with the manners and behaviours while crossing. All pairs of gender with manner of mobile phone use variables and crossing behaviour variables have significant association at $p<0.05$. This indicates that the manner of mobile phone use and behaviours by pedestrian at signalised and unsignalised crossing may be significantly different among male and female pedestrian.

Table 1 Chi-square test for association of manner of mobile phone use and pedestrian crossing behaviour at signalised and unsignalised crossing with gender

Variable	X^2	p-value
Gender (Male/Female) * Mobile phone use (Yes/No)	63.480	<0.001
Gender (Male/Female) * Calling (Yes/No)	6.600	0.010
Gender (Male/Female) * Texting (Yes/No)	33.884	<0.001
Gender (Male/Female) * Listening (Yes/No)	15.079	<0.001
Gender (Male/Female) * look to the left and right before crossing (Yes/No)	17.867	<0.001
Gender (Male/Female) * look at the traffic light before before crossing (Yes/No)	15.593	<0.001
Gender (Male/Female) * wait for vehicle to stop (Yes/No)	7.932	0.005
Gender (Male/Female) * look at incoming traffic (Yes/No)	5.379	0.020
Gender (Male/Female) * Bump into something while crossing (Yes/No)	4.092	0.043

The association between variables age group with manners and behaviours during crossing are shown in Table 2. Age group are found to be significantly ($p<0.05$) associated with all manner of mobile phone use and all observed behaviours except for 'texting' and 'bumping into something while crossing'. This shows that teens, adults and elderly pedestrians have a different way of using mobile phone and behaviours while crossing the road.

Table 2 Chi-square test for association of manner of mobile phone use and pedestrian crossing behaviour at signalised and unsignalised crossing with age group

Variable	X^2	p-value
Age (Teen/Adult/Elderly) * Mobile phone use (Yes/No)	17.667	<0.001
Age (Teen/Adult/Elderly* Calling (Yes/No)	6.967	0.031
Age (Teen/Adult/Elderly) * Texting (Yes/No)	2.766	0.251
Age (Teen/Adult/Elderly) * Listening (Yes/No)	66.680	<0.001
Age (Teen/Adult/Elderly) * Look to the left and right before crossing (Yes/No)	10.219	0.006

Age (Teen/Adult/Elderly) * Look at the traffic light before before crossing (Yes/No)	6.640	0.036
Age (Teen/Adult/Elderly) * Wait for vehicle to stop (Yes/No)	7.180	0.028
Age (Teen/Adult/Elderly) * Look at incoming traffic (Yes/No)	8.006	0.018
Age (Teen/Adult/Elderly) * Bump into something while crossing (Yes/No)	1.207	0.547

4.3 Association of Manner of Mobile Phone Use and Pedestrian Behaviour with Crossing Type

The association of manner of mobile phone use and pedestrian behaviour with crossing type is shown in Table 3. It should be noted that there are two (2) types of crossing observed in this study, which were signalised and unsignalised pedestrian crossing. The results showed that the crossing types have a significant association ($p<0.05$) with mobile phone use and all the behaviours while crossing observed except for 'calling', 'listening' and 'look at the traffic light before crossing'. This suggests that pedestrian's texting on the mobile phone and their behaviour may be affected differently at signalised and unsignalised crossings.

Table 3 Chi-square test for association of manner of mobile phone use and pedestrian behaviour with crossing type

Variable	X^2	p-value
Crossing type (Signalised/Unsignalised) * Mobile phone use (Yes/No)	5.397	0.020
Crossing type (Signalised/Unsignalised) * Calling (Yes/No)	0.059	0.808
Crossing type (Signalised/Unsignalised) * Texting (Yes/No)	4.663	0.031
Crossing type (Signalised/Unsignalised) * Listening (Yes/No)	0.948	0.330
Crossing type (Signalised/Unsignalised) * look to the left and right before crossing (Yes/No)	79.016	<0.001
Crossing type (Signalised/Unsignalised) * look at the traffic light before before crossing (Yes/No)	0.424	0.515
Crossing type (Signalised/Unsignalised) * wait for the vehicle to stop (Yes/No)	20.799	<0.001

Crossing type (Signalised/Unsignalised) * look at incoming traffic (Yes/No)	6.763	0.009
Crossing type (Signalised/Unsignalised) * Bump into something while crossing (Yes/No)	4.517	0.034

4.4 Influence of Mobile Phone Use on Pedestrian Crossing Behaviour at Signalised and Unsignalised Crossing

The crosstab function in SPSS was also used to run the Mantel-Haenszel Common Odd Ratio test for the likelihood of crossing behaviour in relation to the manner of mobile phone use. Table 4 shows the variable with odd ratios of more than one, which means the associated behaviour is more likely to be engaged. The odds ratios were tested for the pairing of variable 'mobile phone use' (yes=1, no=0), calling (yes=1, no=0), texting (yes=1, no=0) and listening (yes=1, no=0) to all the five (5) behaviours while crossing.

The odds ratios for crossing behaviour paired with mobile phone use, calling, texting and listening to the mobile phone were all less than one (1) except for 'listening' when paired with 'bump into something'. The odds ratio of 2.678 stated below suggests that compared to other manners of phone use, pedestrian listening to the mobile phone is almost three (3) times more likely to bump into something compared to other manners of mobile phone use (calling, texting or not using the phone). However, the p-value for this odds ratio is not significant ($p>0.05$) and thus the likelihood cannot be deemed valid.

Table 4 Analysis of odd ratio

Variable	Odd ratio	p-value
Listening (Yes/No) * bump into something while crossing (Yes/No)	2.678	0.350

4.5 Discussion

The first objective of this study was to identify the percentage of pedestrian's mobile phone use at crossing in Klang Valley. At least a third (33%) of all the respondents observed walking with visible mobile phone throughout this study were found to use their mobile phone while crossing the observed roads. The majority of those who use the mobile phones were texting rather than talking or listening using their mobile phone. This is quite a large number of people crossing under the distraction (using a mobile phone) especially if the finding is to be generalised to the whole population of people crossing the roads every day throughout the country.

The majority of the pedestrian observed using the mobile phone were texting. It should be noted that there is no way to ascertain that the pedestrians were using messaging applications or any other applications. As there are also smartphones available in the market which enables various kind of applications to be installed on the mobile phone, the pedestrian could have also been doing various things by clicking and tapping on their mobile phones. Statistics by MCMC (2014) shows that as of 2014, 53.4% of mobile phone users owned at least one smartphone and the rate of smartphone owners are increasing annually. Texting, therefore, includes all these possible actions of using the mobile phone where the pedestrians can be observed using their hands (working on devices attached to the phone such as pen), fingers and eyes all onto the mobile phone. This should be alarming because compared to talking or listening, texting requires the eyes shifted entirely to the mobile phone which could cause serious safety issues during road crossing.

Chi-square test found that all of the associations between the manner of mobile phone use and pedestrian behaviour with gender were significant. However, there were only a few significant associations between the manner of mobile phone use and pedestrian behaviour with age group and crossing type. This implies that male and female as well as those with different age group (teenager, adult, elderly) have different manners related to how they use their mobile phone and their behaviours while crossing the road.

Whether the crossings are signalised or without signal also play a certain role to how the pedestrian use the mobile phone and behave while crossing.

These findings on the other hand, also hinted that there may be other social factors that influence behaviour at the pedestrian crossing such as the purpose or destination of their walkabout, single or group walking and influence by other pedestrians as researched by Faria, Kraus and Krause (2010) which found that males tend to follow others while crossing the road. It would be best if these variables can be included in later research on pedestrian crossing behaviour.

On the other hand, the last specific objective of this study was to determine the influence of mobile phone use on pedestrian crossing behaviour at a crossing in Klang Valley. The influence of mobile phone use on crossing behaviours was determined using the analysis of odds ratio. The variable on whether the pedestrian uses the mobile phone was analysed followed by the three (3) types of mobile phone use which were talking, texting and listening. Odds ratio test did not found any significant likelihood between the use and manner of mobile phone use with crossing behaviours. Thus, there is no evidence to establish that mobile phone use may have influenced the way people behave on the road while crossing at signalised on unsignalised crossings. However, it should also be aware that the number of behaviours observed in this study is quite limited (there are only five crossing behaviours). There could be other kind of behaviours that may be related to mobile phone use, which is not included such as not crossing at the marked pedestrian crossing, which was studied by Pesic et al. (2016). Availability of companion such as friends, children and pets similar to study by Thompson et al. (2013) were also not captured. This lack of behaviour inclusion in the observation could be the reason why the influence cannot be established and this should be rectified in a future study.

The study focused only on the pedestrian with the visible presence of mobile/hand phone. Due to the limited number of research assistants and some technical issues during the observations, the volume of pedestrian crossing (with and without a mobile phone) could not be precisely recorded. It would be ideal to know the volume of each

pedestrian crossing to understand better the prevalence of people using a mobile phone while crossing the roads.

It would be more interesting if each of the locations to observe the pedestrian crossing in this study also has information on traffic volume, annual crashes, injuries and pedestrian fatalities. This would enable an examination of the possible influence of the hand phone use while crossing to crashes. The findings from this study would be a good indicator of why (if any) such crashes and fatalities involving pedestrian occurred and if any influence from mobile phone use was present.

5. Conclusion and Recommendations

In conclusion, there were quite a handful of pedestrians in Klang Valley who used the mobile phone especially texting while crossing the roads. The results of this study showed that there are significant associations between gender, age group and type of crossing (signalised or unsignalised) of the pedestrians with the manners of using mobile phone and crossing behaviours. The study also found no significant influence between the use and manner of mobile phone use with pedestrian crossing behaviour.

Based on the findings obtained from this study, it is recommended that:

i. The causes of mobile phone use while crossing the road should be further examined in a future study since observation alone is not sufficient to understand the causes.
ii. An in-depth study should be conducted to fully understand the influence of mobile phone use on pedestrians when crossing the road while taking into account other variables such as pedestrian volume regardless of mobile phone use, crash/injury/fatality statistics concerning the particular site and so on.
iii. Other variables should be included in the study such as the volume of pedestrians using the crossing during the duration of the observation and other behavioural factors such as walking in the company of others and following other people's behaviour while crossing. More variable on the behaviour while crossing should also be included.
iv. The government and related agencies should start looking into the rising pattern in pedestrian casualties and identify the causes in order to intervene with people's behaviour while walking and crossing the roads. Any initiative to curb problems arising from using a mobile phone while crossing must take into account the differences in gender, age group and the type of crossing.

v. There must be a sufficient amount of road signs and campaigns directed towards the awareness of how dangerous distracted crossing among pedestrian could be. Enforcement activities should also be strengthened and directed towards safer pedestrian behaviour while crossing. Similar to using a mobile phone while driving, punishment for those who use mobile phone while crossing the roads should be introduced and enforced.

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Research Report

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