Prevalence of distracted pedestrians while crossing: a study of Malaysia's situation

Mohd Syazwan S.[1,2,*], *Baba* Md. Deros[2], *Nur Zarifah* H.[1] , *Aqbal Hafeez* A.[1], and *Noor Faradila* P.[1,2]

[1]Crash Safety Engineering Unit, Vehicle safety and Biomechanics Research Centre Malaysian Institute of Road Safety Research, Kajang, Selangor, Malaysia
[2]Faculty of Engineering, Department of Mechanical and Materials Engineering, National University of Malaysia, Bangi, Selangor DE, Malaysia

Abstract. Pedestrian's crashes account for approximately 7% of road death in Malaysia. Even though the percentage is smaller compared to motorcycle-related crashes, amount of road crashes involving pedestrians in Malaysia is a serious concern. The objective of this study is to establish the common type of distraction for Malaysian. Crashes among pedestrians usually highly recorded at straight road followed by inter-section road type. For that, study focusing on the type of distraction among pedestrians while crossing the road by using video recording method. Two type of road were selected observational field survey – signalized and non-signalized intersection. A video recording method was used to analyse the behaviour of pedestrians crossing with or without distraction. Approximately 375 samples were observed while crossing with various type of distraction such as eating, texting, mobile phone talking and others. The study found the highest distraction type observed among pedestrians is usage of electronic equipment-mobile phone with 84.8% followed by other type of distraction – smoking and talking with more that 5%. Mobile phone distraction cause a significant effect in term of time to cross which average time to cross was 14.77 second. The overall results provide a prevalence information that is useful in the development of countermeasures aimed at improving pedestrians' safety.

1 Introduction

Globally, pedestrians constitute 22% of all road deaths, and in some countries this proportion is as high as two thirds [1]. In ASEAN country alone the magnitude of pedestrian fatalities was rather high especially in Myanmar, Philippines, and Singapore with more than 15 percent, whereas Malaysia, Thailand, Indonesia, Cambodia, Brunei and Indonesia had the rate in between 8 to 13 percent. It is noted that Lao DPR, Vietnam and Timor-Leste data are unavailable might due to insufficient accident data. It is noted that if compared with motorcyclist fatalities, pedestrian deaths are considered low for each country.

* Corresponding author: syazwan@miros.gov.my

In Malaysia, road injuries and fatalities are major issues, with more than 6,000 involved in fatal accident and over 10,000 in minor and major incident yearly. Pedestrian fatalities are averaging approximately more than 500 deaths each year. Records consistently have shown that fatal road traffic injuries among elder (<60 years old) are increasing from 24.4% (2006) to 44.2% (2013) of the total pedestrian's fatalities. In term of incident occurred, it is statistically shown that straight road contributed more than 60% fatalities followed by junction-type of road [2]. Since the number of pedestrian's fatalities in Malaysia create media attention, this issue need to be addressed. Table 1 describes the fatalities involving pedestrian in the Southeast Asia countries in the year of 2015, as reported by the World Health Organization (WHO) [3].

Table 1. Vehicles, population, road traffic deaths and proportion of pedestrian casualties by country in Southeast Asia, 2015.

Southeast Asia Country	Registered Vehicles (Count)	Population for 2015 (Count)	Reported Road Traffic Fatalities (Count)	Deaths by Pedestrian Category (Proportion)[1]
Laos DPR	1,439.481	6,769,727	910	10%
Malaysia	**23,819,256**	**269,716,965**	**6,915**	**7 %**
Myanmar	4,310,112	53,259,018	3612	26%
Philippines	7,690,038	98,393,574	1,513	19%
Singapore	974,170	5,411,737	159	27 %
Thailand	32,476,977	67,010,502	14,059	8 %
Vietnam	40,790,841	91,679,733	9,156	-
Cambodia	2,457,569	15,135,169	1950	13%
Brunei	304,432	390,056	54	9.2 %
Indonesia	104,211,132	249,865,610	26,460	21 %
Timor-Leste[2]	63,553	1,132,979	74	-

Note:
- Data Not Available
[1] Proportion of pedestrian deaths per reported road traffic fatalities
[2] Not ASEAN country
Source: WHO, 2015 [3]

1.1 Factors related to pedestrians-vehicle accident

There are many factors associated with pedestrians-vehicle accident as discussed in literatures available worldwide. This paper primarily reviewed Zegeer et al. [4]'s key factors that were derived from nearly 200 pedestrian safety studies from 2000 to 2010, including national and international articles published in Transportation Research Records, Accident Analysis and Prevention, and other transportation-related journals. The authors classified the pedestrian crash factors into five categories: (1) Driver factors; (2) Pedestrians factors; (3) Vehicle factors; (4) Roadway/ Environmental factors; and (5) Demographic/Social/Policy factors. For this study, the focus is on the pedestrian factors specifically on pedestrian's distraction [4]. Figure 1 provides an overview of factors associated with pedestrian crash risk and/or severity.

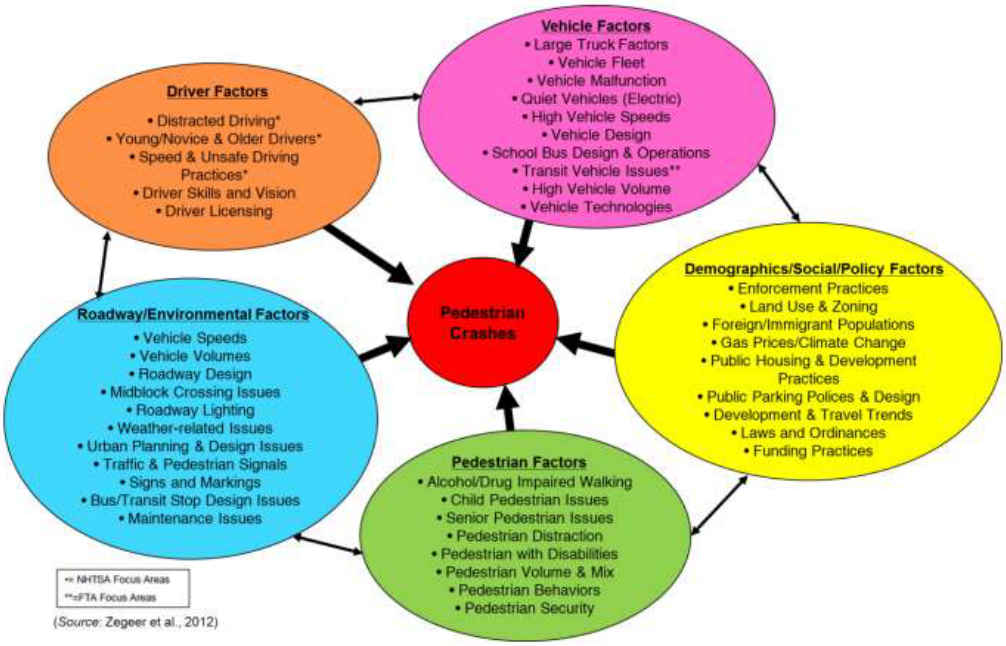

Fig. 1. Illustration of factors associated with pedestrian crash risk and/or severity [4].

1.2 Pedestrian distraction

Pedestrian distraction is not new issue in road safety. Study by Bungum et. al, [5] revealed that 15% of pedestrian's accident occurred because they lacked attention. Distraction has negative effects on traffic behavior. Most studies estimate that distraction plays a role in the occurrence of about 5-25% of the car crashes [6]. Pedestrian's distraction can be defined as those wearing headphones, talking on a cell phone, eating, drinking, smoking, or talking with another pedestrians as they crossed the street [7]. Those examples potentially increase due to lift up of lifestyle and itis aligned with advance telecommunication. Distracted pedestrians usually at high risk during crossing which the process needs cognitive (e.g., road user focuses more on phone conversation rather than walking activity), cautionary behavior (e.g., looking before crossing a road), auditory (e.g., road user listens to the music via headphone) and motor coordination judgment to minimize the risk [8].

Due to distractions, it is shown that it can significantly affect crossing speed, increase conflict, less attention to environment and many more errors which possibly end up with accident [9-12]. Pedestrian's distraction while crossing is a major issue in developed countries and those countries proactively take this issue and come out with various intervention that suit to their cultures and laws.

To date, with the best knowledge of author, there is no research being conducted in this area to present the situation of distracted pedestrians while crossing in Malaysia. This study aims to determine the type of distraction among Malaysian pedestrian's distraction while crossing for both signalised and non-signalised crosswalks. Moreover, this study wants to establish the common type of distraction for Malaysian. For that, an observational study is proposed for this study.

2 Methodology

This short, cross-sectional study was conducted for a month and a sampling was carried out in Capital of Malaysia, Kuala Lumpur. This study, based on observation survey was conducted to determine the characteristics of pedestrians crossing. The four selected areas (Central Market and Puduraya – non-signalised; Bukit Bintang and Sogo – signalised) were selected to represent the two type of crosswalks; signalized and non-signalized. Kuala Lumpur is selected due to high density of population and also high capacity of pedestrians walking activity.

Data collection in every area was carried out by an assigned team member at pre-determined fixed observation points with high pedestrians walking volume. For this observation method, a video recording by using video recorder was used and it was set-up at the strategic location on site which enabled to capture the best view of pedestrian activities. Pilot testing was done prior to the actual data collection at the Kajang Train Station to ensure this method is correct and the data is sufficient to be analyzed. In term of crossing time, the data collected using time embedded in recorded video.

This study used stratified random sampling technique for field observation data collection. Targeted sample include all pedestrians who crossing the area while doing other activity such as eating, texting, listen to music, mobile phone talking and other type of distraction which passed through the observation points. All variables from the observed samples were recorded in the video and transferred all variable needed into observational form for analysis. The observations were conducted during daytime - two interval time (7am – 9am and 12pm – 2pm) on weekdays. This observation lased for a week. The reason to select in the particular interval time is due to high volume of pedestrians. For this study, a certain pedestrians behavior not take into account such as disabled, running and large group.

Fig. 2. Example of signalized (left) and non-signalized (right) pedestrians crossing.

3 Results and discussion

In average, 1,455 pedestrians were observed crossing the junctions per period during a week data collection. From that, a total of 375 samples were collected both at signalized and non-signalized control type. Out of these, 275 samples were collected at signalized crosswalk, while the rest, 103 samples were observed at non-signalized crosswalk. A sample of 375 pedestrians in this study consisted 226 (60.3%) males and 149 (39.7%) females. In term of estimated age of the sample, it shows that distracted crossing pedestrians are made of 191 (50.9%) for 21 to 30 year olds, 155(41.3%) for 31 to 40 year olds, 24(6.4%) for 41 to 50 year olds and 5(1.3%) for more than 51 year olds. Table 2 shows distracted pedestrian characteristics. Furthermore, 68.3% distracted pedestrians were observed using designated area to cross. During the observation period, it was revealed that 84.8% pedestrians were distracted with mobile phone usage followed by others type of distraction. The lowest type of distraction recorded was drinking and eating with 4.5%.

Table 2. Pedestrians characteristics.

Characteristics	n	%
Estimated age group		
21 -30 years	191	50.9
31-40 years	155	41.3
41-50 years	24	6.4
>50 years	5	1.3
Gender		
Male	226	60.3
Female	149	39.7
Type of distraction		
Drinking/eating	17	4.5
Mobile phone usage	318	84.8
Reading	18	4.8
Other –e.g. Smoking, talking	22	5.9
Crossing at Designated crossing(zebra cross)		
Yes	256	68.3
No	119	31.7

In term of gender distribution, it shows that use of mobile phone is among males is higher as compared to females with 59.7% and 40.3%, respectively (Table 3). For female, they were more distracted by reading with 66.7%.

Table 3. Distribution of pedestrian's distraction according to gender.

Pedestrians distraction	Male	Female
Mobile phone usage	190 (59.7%)	128
Drinking/eating	8 (47%)	9
Reading	6 (33.3%)	12
Others – smoking, talking	22 (100%)	0

In this study, six type of pedestrian behaviours were recorded for analysis. The behaviours accounted for pedestrians waiting before crossing until arrived on the other side of road. For mobile phone distraction, it shows that pedestrians often crossing the road before car completely stopped – 55.1% and the distracted pedestrians while using mobile phone revealed that almost half of them walking not in straight path with 49.7%. In addition, for eating/drinking distraction among pedestrians, the most typical behaviour that was observed is crossing while vehicle still in moving with 82.3%. Table 4 gives a summary of the pedestrian behaviours according to type of distractions.

Several types of pedestrian's distraction are also associated with risk of their behaviour. Form the analysis, it shows that only three type of behaviours were associated with the type of distractions observed. The analysis revealed that pedestrians drinking/eating (OR=6.375, 95% CI 0.835 to 48.69), reading (OR=0.221, 95% CI 0.083 to 0.587) and other type of distractions (OR=8.534, 95% CI 1.133 to 64.283) aresignificant as these pedestrians were observed not looking left and right prior to crossing. Furthermore, pedestrians crossing while using mobile phone (OR=1.975, 95% CI 1.092 to 3.573) and drinking/eating (OR=4.413, 95% CI 1.247 to 15.612) were significantly not walking straight during crossing. Table 5 shows the result of odd insecure pedestrian behaviour by type of distractions.

Time to cross

Table 6 shows the distracted pedestrian's crossing time. The mean crossing time for all type distraction is 14.55 seconds across the 3-lane road. In term of average time, mobile phone usage recorded the highest time with 14.55 second followed by other type of

distractions with 14.0 second. The lowest average time recorded in this study is pedestrians with reading distraction with 12.77 second.

Table 4: Pedestrians behaviour according to type of distraction

Pedestrians behaviour		**Mobile phone usage**	**Eating/drinking**	**Reading**	**Others e.g smoking, talking**
Crossing at designated area	Yes	218	11	15	12
	No	100 (31%)	6 (35.3%)	3 (16.6%)	10 (45.4%)
Observe right and left prior to crossing	Yes	228	16	7	21
	No	90 (28.3%)	1(5.8%)	11 (61.1%)	1 (9%)
Look left or right during crossing	Yes	171	9	9	16
	No	147 (46.2%)	8 (47%)	9 (50%)	6 (27.2%)
Crossing after car complete stop	Yes	149	3	14	4
	No	169 (53.1%)	14(82.3%)	4 (22.2%)	18 (81.8%)
Walk straight during crossing	Yes	160	14	9	15
	No	158(49.7%)	3 (17.6%)	9(50%)	7 (31.8%)

This study aims to establish type of pedestrian's distraction in capital of Malaysia-Kuala Lumpur. The result discovered that the most common type of distraction among pedestrians is using the electronic device – mobile phone which accounted for 84.8%. While other type of distractions only accounted less than 6 percent. This finding similar with study by Liberty Mutual Insurance [13] whereby most of pedestrians distracted by mobile electronic device activity such as taking on the phone, texting/hand operate or listening to music. From this observational study, it seems that growth of mobile technology suggested influencing human walking behavior. Statistics shows that up to end of 2015 there are 27.8 million mobile phone users in Malaysia [14]. This statistics shows that will increase potential risk to road user if there is no action taken by government or other related parties. Previous study by Nasar J.L et al. [8] found that distracted walking injuries in the United States are rising fast, with 1,506 recorded in the US emergency rooms in 2010, up from 256 in 2005. The teenagers were especially likely to be affected. Other countries also reported the same significant findings whereby increment of injuries among pedestrians due to mobile phone distraction [8].

Furthermore, in term of pedestrian's behavior while crossing, it is discovered that most of distracted mobile phone users were crossing the road even the vehicles were not completely stop with 53.1% followed by diagonal crossing with 49.7%. The result is consistent with the findings of Bungum et. al, [5] whereby mobile phone distraction may cause less pay attention to traffic both before and during crossing. As the result using talking on the phone – auditory distracted, it can cause pedestrians to miss significant objects in their environment and appear to exhibit unsafe behavior (failure to look right and left, wait on curb for light turn to green before cross [15].

Table 5: Insecure pedestrian behaviour by type of distractions

Insecure Pedestrians behaviour			
	OR	**95% CI**	**p_value**
Not Crossing at designated area:			
Phone usage	0.917	0.504 to 1.671	0.778
Drinking/eating	0.847	0.305 to 2.344	0.747
Reading	2.407	0.683 to 8.478	0.159
Others – e.g smoking, talking	0.838	0.275 to 2.551	0.755
Not Observe right and left prior to crossing:			
Phone usage	1.336	0.687 to 2.598	0.392
Drinking/eating	**6.375**	**0.835 to 48.69**	**0.041**
Reading	**0.221**	**0.083 to 0.587**	**0.001**
Others – e.g smoking, talking	**8.534**	**1.133 to 64.283**	**0.013**
Not Look left or right during crossing:			
Phone usage	1.271	0.716 to 2.254	0.412
Drinking/eating	0.93	0.351 to 2.465	0.884
Reading	0.821	0.319 to 2.118	0.684
Others – e.g smoking, talking	2.314	0.885 to6.051	0.079
Not crossing after car complete stop:			
Phone usage	0.662	0.37 to 1.183	0.162
Drinking/eating	**0.245**	**0.069 to 0.868**	**0.019**
Reading	**4.510**	**1.456 to 13.970**	**0.005**
Others – e.g smoking, talking	**0.25**	**0.083 to 0.755**	**0.008**
Not Walk straight during crossing :			
Mobile phone usage	**1.975**	**1.092 to 3.573**	**0.023**
Drinking/eating	**4.413**	**1.247 to 15.612**	**0.012**
Reading	0.889	0.345 to 2.292	0.807
Others – e.g smoking, talking	1.991	0.792 to 5.001	0.136
*Note: Bold p-values are significant at 0.05 level			

One of the main reason pedestrian's accident while crossing is due to long time to cross safely. In other studies, it was found that, distracted pedestrians was associated with the slower crossing speed [8, 10]. In our study, the mean speed for males are slower as compared to females. It is might be due to uneven samples distribution. Previous research on pedestrian injuries due to mobile phone usage shows that crossing with low speed and changing lane will increase exposure to risk [10]. Additionally, for other road users such as driver, distraction also has a big issue which it potentially poses hazard to other road users. Study by Dzubak, C. M [16] has identified that brain researchers have identified "reaction-time switching costs which is a measurable time when the brain is switching its attention and focusing from one task to another. Research studying the impact of talking on cell

phones while driving has identified slowed reaction time to potential hazards are tangible, measurable and risky.

This paper provides valuable insight on the safety impacts of pedestrian's distraction, the severity and demographics of pedestrian's distraction problems, and potential causes of distracted crossing. The findings from this study are recommended to be used for developing proper countermeasures and educational campaigns to alleviate the traffic safety problems caused by distracted crossing, especially for young populations.

Table 6: Average crossing time for type of distraction

Pedestrians behaviour	**Average time to cross (second)**	**p_value**
Distraction		
Mobile phone usage	14.77	**0.000**
Drinking/eating	12.83	0.924
Reading	12.77	0.296
Others – e.g smoking, talking	14.0	**0.000**
*Note: Bold p-values are significant at 0.05 level		

4 Conclusions

Pedestrian distractions such as mobile phone usage, eating or drinking, reading and others seem to impair with some behaviors while crossing the road. This study shows that mobile phone usage is the highest percentage in term of type of distraction in accordance with advance technology. While this study only focuses on one area in Malaysia, the findings could be an indicator of a similar problem occurring in other areas throughout the country. However, the method need to be strengthen and it is suggested that further studies covering not for intersection crossing only. Since the usage of mobile phone is the highest numbers of distracted recorded, it is also suggested the further analysis need to be done - focus on electronic device distraction. To highlight this kind of problem, the relevant parties should conduct an intervention which highlight the danger of any kind of distractions while crossing.

The authors would like to appreciate the special support provided by The Malaysian Institute of Road Safety Research (MIROS) and National University of Malaysia (UKM). Special thanks also due to Zulyahikem Zakaria, Azhar Hamzah, Zulhaidi Jawi and Mohd Hafzi Isa for their assistance in this project.

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