Proceedings of the Eastern Asia Society for Transportation Studies, Vol. 5, pp. 120 - 125, 2005

MOTORISTS AND PEDESTRIAN INTERACTION AT UNSIGNALISED PEDESTRIAN CROSSING

Nik Ibtishamiah IBRAHIM
Researcher
Center for Transportation Research
Faculty of Engineering
University of Malaya
50603 Kuala Lumpur, Malaysia
Fax: +603-79552182
E-mail: tssm@time.net.my

Farhan Ahmad KIDWAI
Lecturer
Department of Civil Engineering
University of Malaya
50603 Kuala Lumpur
Malaysia
Fax: +60-3-7967-5318
E-mail: farhan@um.edu.my

Mohamed Rehan KARIM
Professor & Deputy Dean
Faculty of Engineering
University of Malaya
50603 Kuala Lumpur
Malaysia
Fax: +603-79675201
E-mail: rehan@um.edu.my

Abstract: Pedestrians are vulnerable road user. In developing countries the drivers' attitude towards pedestrians is quite different than from developed ones. In this research we present the findings of interaction between motorists and pedestrians at unsignalised zebra crossing facilities in a University Campus in Malaysia. It has been observed that the pedestrians have great difficulty in crossing as most of the drivers don't care for the waiting pedestrians. The pedestrians have to wait for a significantly long time before finding someone who is willing to stop for them to allow them to cross or wait until there are no more vehicles close enough (large headways). This phenomenon may probably be due to the misunderstanding on the rule of the right of way in such a situation or it could also be due to the attitude of the motorists themselves that they are not willing to stop because they would be losing travel time whereas the pedestrian can afford to wait.

Key Words: Unsignalised Crossing, Pedestrian, Motorist

1. INTRODUCTION

Pedestrians form an integral part of the urban transportation system and probably will remain as one of the most important mode of transport in the urban environment. Moving on foot will continue to be the feeder mode between any particular trip origin and final destination. Very short trip lengths within the urban environment would be more appropriate by walking as compared to taking a taxi or a bus so long as the facilities are being provided. Provisions of adequate and safe pedestrian facilities in the urban setting would arguably encourage more

people to walk, thus increasing the pedestrian traffic. The pedestrian is often the most vulnerable of all transportation system user, and frequently the most overlooked. Accidents between pedestrians and vehicles are examined in terms of minimizing conflict between the two modes, not necessarily maximizing access for either. Despite this growing literature which highlights the impact interventions into the traffic environment on pedestrian behavior, there is still a lack of knowledge surrounding the relationships between traffic conditions and pedestrian behavior that determine the extent of the barrier effects experience by pedestrians (Hine and Russell, 1993).

Most of the pedestrian safety depends to a large extent on vehicular speeds. At a collision speed of 50km/h the risk of fatal injury for a pedestrian is almost eight times higher compared to a speed of 30km/h (Pasanen, 1992). Himanen and Kulmala (1988) found most of the important explanatory variables including drivers' behavior, pedestrian distance from the curb, size of the city, number of pedestrian simultaneously crossing, vehicle speed and vehicle platoon size. Persson (1988) review on communication between road-users, found that the likelihood of a driver giving precedence increases if information of the pedestrian's intention is increased by way of combination of various forms of signs. In developed countries the level of research for pedestrian and vehicular behavior is quite advanced but in ASIAN countries like Malaysia the studies are still in preliminary stages. The driver and pedestrian behavior differs to great extent from country to country therefore findings of one place can't be applied to others. The objective of present study is to understand the fundamentals of interaction between pedestrian and vehicles at zebra crossing. The driver's attitude towards pedestrians and pedestrian characteristics are also explored.

2. METHODOLOGY AND DATA COLLECTION

The first ever experiments using the uncontrolled pedestrian crossing or unsignalised pedestrian crossing was initiated in London in 1927. A zebra crossing is simply an unsignalised portion of the carriageway where the pedestrian has legal priority over the motor vehicle. The cross strip is outlined by parallel lines of studs and marked with alternate black and white thermoplastic strips parallel to the centerline of the road, the beginning and the end of each crossing are marked by flashing yellow beacons.

The site selected for this research is inside the University of Malaya Campus where most of the pedestrians are students. The zebra crossing is located in a slow speed zone just after an uncontrolled junction where motorists can be seen approaching from 3 different directions about 100 m away from the zebra crossing. As a result of merging traffic and sharp 90 degree turns, traffic is relatively slow, achieving speeds in the range of 30-40 km/h. There are no warning signs prior to the zebra crossing but the road markings are clearly visible from far because of bright alternate pink and white thermoplastic strips. Pedestrians waiting to cross can be seen clearly but the drivers may still be concentrating on the merging traffic in order to take appropriate measures when approaching the crossing. The width of the road is 7 m and the road is one-way carriageway. Height of the curb/side walk is 20 cm above carriageway. Video recording technique is used for data collection in order to obtain a more detailed description of the interaction between the vehicle and pedestrians. The camera is focused at the zebra crossing in such a way that entire length of zebra crossing, the waiting islands at the either side of zebra

crossing and roadway approach 100 m before the zebra crossing are visible on the screen. The data is collected for 3 hours on working day between 10.00 am to 01.00 pm. In describing the behavior of drivers at zebra crossing, we have studied the situation when the pedestrian is present at the zebra crossing and waiting for the drivers to stop to give way. There are three situations: first the pedestrian is waiting at zebra crossing and none of the approaching vehicle stops, second the vehicle stops and gives way to pedestrian and third the pedestrian crosses the zebra crossing in spite of approaching vehicle and forces the vehicle to stop. For describing the pedestrian behavior the data is collected for the pedestrians who use the zebra crossing and those who cross the road from very close to the zebra crossing (less than 5.0m) but do not use the zebra crossing. Data is also collected for the speed of crossing pedestrians and comparison is made between male and female. A questionnaire survey is also conducted in order to check what the drivers and pedestrians think and what they actually do on road. A total of 150 questionnaires were distributed to the drivers at three different locations asking them what they would do when approaching a zebra crossing with pedestrian(s) waiting to cross. A total of 50 questionnaires where distributed to pedestrians to know their attitude about zebra crossing.

3. ANALYSES AND RESULTS

In this section the interaction of pedestrian with drivers at zebra crossing is analyzed and reported. The speed of different groups of pedestrians is analyzed and waiting time of pedestrians at zebra crossing is reported. The results of questionnaire survey are also presented.

3.1 Drivers Behavior at Zebra Crossing

For the study of driver's attitude towards pedestrian total vehicles are counted which do not give way to pedestrian while s/he is waiting at zebra crossing to cross. Then the vehicle which stops (if any) to give way to pedestrian is also recorded. In the 3 hours data there are 96 instances when the pedestrian is present at zebra crossing (on side curb) and the vehicle is approaching. In 13 instances pedestrian is waiting at zebra crossing (on the carriageway) and the vehicle is approaching. If a vehicle is at a distance of 30m or less from the zebra crossing while the pedestrian reaches the crossing point, this vehicle is not expected to stop for safety reasons. Therefore when the pedestrian reaches the crossing point; the vehicles beyond 30m from the zebra crossing are counted. Out of 96 instances of pedestrian crossing, the vehicles stopped (or slowed down to scrawl) only in 6 cases to give way to pedestrian. In all these 6 cases the first vehicle did not stop. In the first case 12^{th} vehicle, in second case 6^{th}, in third case 2^{nd}, in fourth case 9^{th}, in fifth case 3^{rd}, and in last case 3^{rd} vehicle stopped to give way. Moreover in two cases pedestrian was half way on zebra crossing and forced the drivers to stop. During these 96 cycles 254 cars, 133 motorbikes and 7 other types of vehicles did not stop while the pedestrian was waiting at zebra crossing or was half way through. In all six cases of vehicle stopping, only cars stooped. The probability for the car to stop is 0.023 (6/260), while it is zero for motorbike any other types of vehicle. The cumulative probability of vehicles stopping for pedestrian is 0.015 (6/400).

For the pedestrian waiting at carriageway case, out of 13 instances, only in one cycle one car and one motorbike stopped. In this case these vehicles stopped only after passage of 4 cars and 2

motorbikes. During these 13 cycles 58 cars, 25 motorbikes and one other types of vehicles did not stop while the pedestrian was waiting on carriageway at the end of zebra crossing. The cumulative probability of vehicles stopping for pedestrian in this situation is 0.024 (2/84).

In questionnaire survey for the drivers, 150 respondents answers are as follows: 20% would stop, 32% won't stop while 52% would slow down so that the pedestrian can cross without them needing to stop at the crossing. This shows a wide gap between what the people think and what they do while drive. The results are alarming and need urgent attention of relevant authorities/agencies to improve the situation, before the zebra crossing becomes a safety hazard.

3.2 Pedestrian Behavior at Zebra Crossing

For the understanding of pedestrian attitude towards zebra crossing, first the study is conducted to check the usage of zebra crossing. In the one hour data, out of 337 pedestrians crossing the road only 56 used the zebra crossing. The other 281 crossed the road from a distance less than 10m from zebra crossing. Two reasons may be attributed to this behavior; either pedestrian do not realize the importance of crossing the road at zebra or the wrong placement of zebra crossing. In the questionnaire survey out of 50 respondents 45% indicated that they feel safe at zebra crossing, 17% feel that any convenient place along the road will do while 21% feel safe at both places and remainder do not feel safe crossing at either place. This again shows a wide gap between what the people think and what they do while cross the road.

The crossing speed is also compared between the genders. The speed shows approximately normal distribution for both genders as shown in Figure 1.

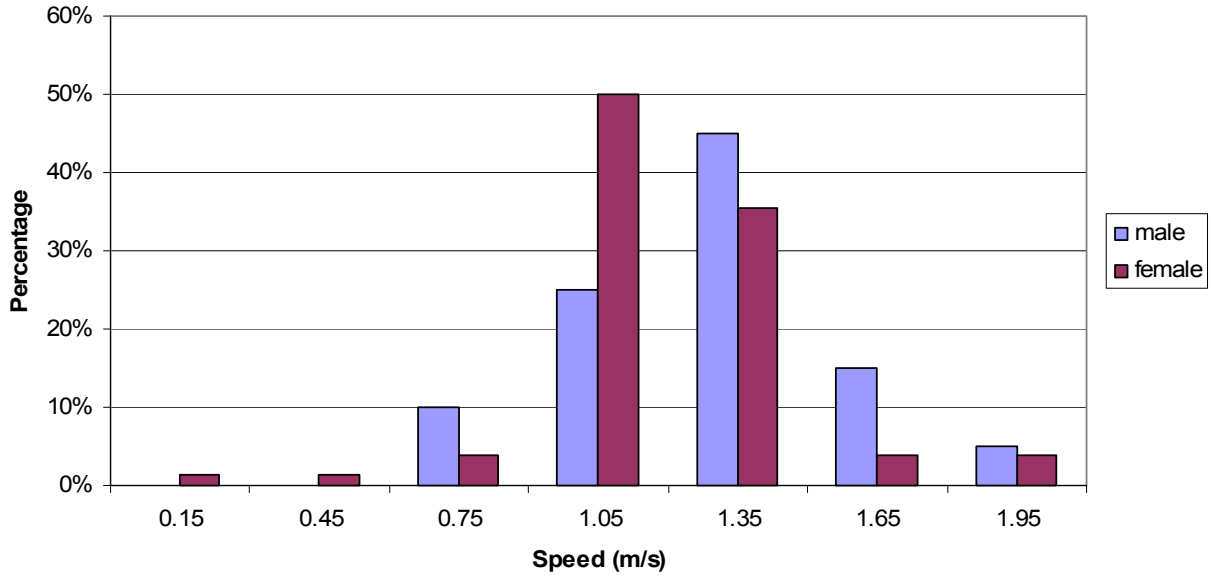

Figure 1: Speed distribution of males and females

Figure 2 shows the cumulative frequency distribution for both males and females. The male speeds are towards higher side. The 50th percentile speed for male is 1.3 m/s while for female is

1.15 m/s. The male speed is closer to the US Highway Capacity Manual 2000, values for Level of Service 'A' while the female speed is in the range of Level of Service 'D'.

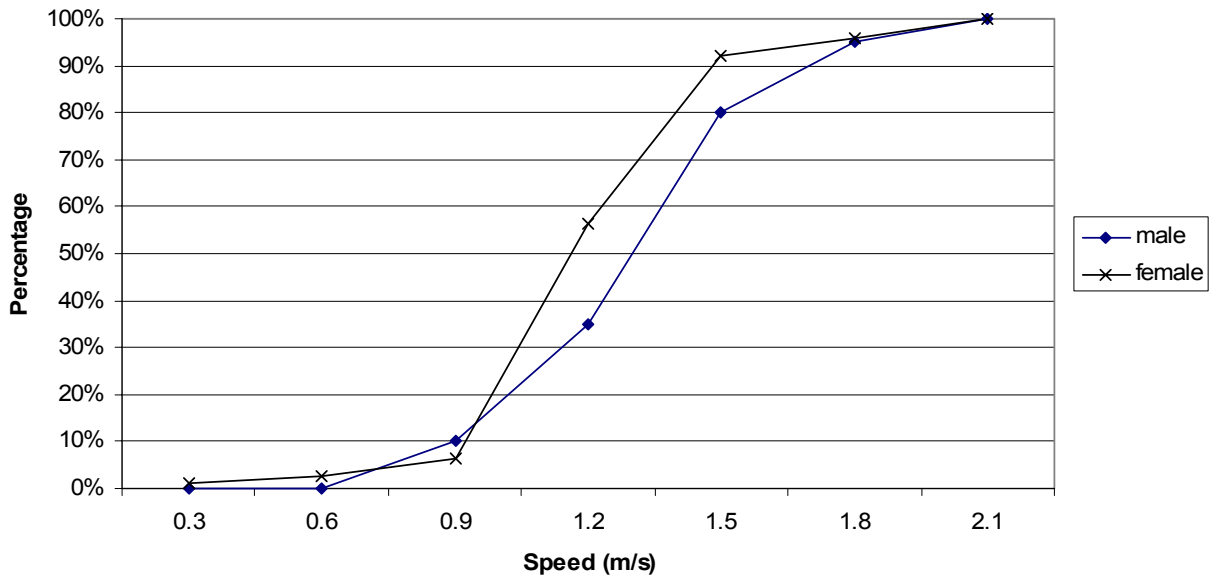

Figure 2: Cumulative speed comparison between the genders

The waiting time distribution for pedestrians is shown in Figure 3. The waiting time, is the time elapsed between the pedestrian reaches the zebra crossing and the point when s/he starts crossing. More then 80% of the pedestrians have to wait for less than 7 seconds. Because vehicles move in platoons and there is less willingness to give way to pedestrians, some pedestrians have to wait as long as 23 seconds.

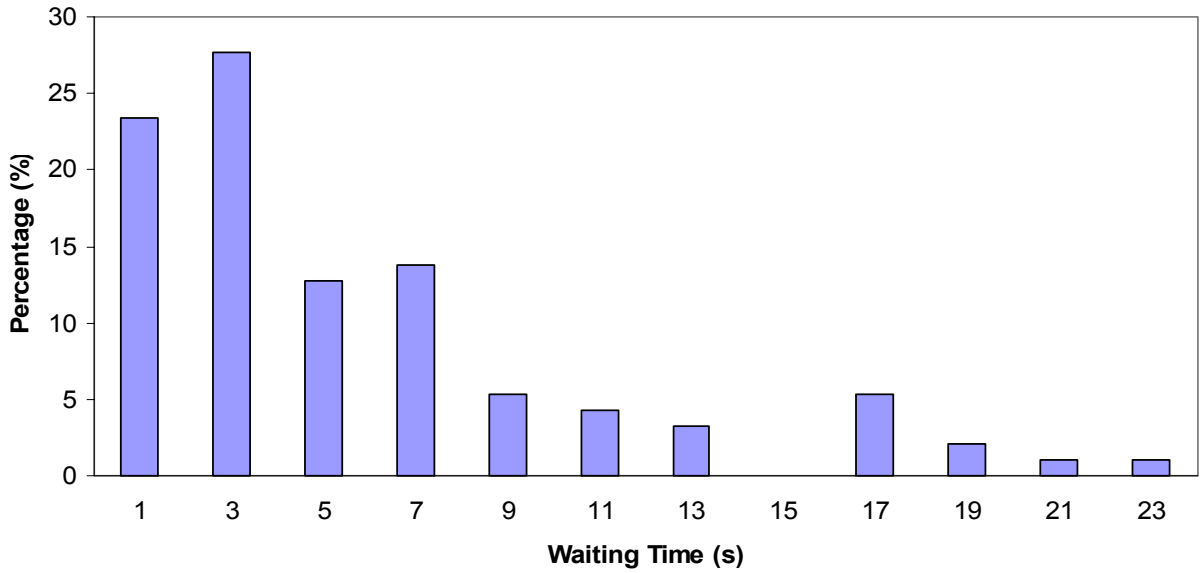

Figure 3: Waiting time distribution for the pedestrians at zebra crossing

4. CONCLUSIONS

Traditionally, the essence of zebra crossing on the road is primarily to maintain a peaceful and safe interaction between pedestrian and vehicular traffic, since it has not been possible to maintain a perfect and complete segregation between these two important road users. Following conclusions can be drawn from present study:

1. The willingness of drivers to give way to pedestrians at zebra crossing is very low.
2. The motorbike riders are not willing at all to give way to pedestrians.
3. What the drivers and pedestrians claim to do is quite different from what they actually do.
4. There is a significant different between the speeds of male and female.
5. The waiting time for most of the crossing pedestrians is quite low (less than 5 seconds) but for some it is as high as 23seconds.
6. The results of this study are alarming and needs urgent attention of authorities and the government agencies to look into the vulnerable pedestrian safety problem.

The emerging direction for further studies is: How to educate the road users and design the preventive measures for improving the safety of pedestrians at zebra crossing.

REFERENCES

a) Books and books chapters

Austroads (1995). **Guide to Traffic Engineering Practice**. Part 13, Pedestrians (Austroads Sydney).

b) Journal papers

Himanen, V. and Kulmala, R., (1988). An Application of Logit Models in Analysisng the Behaviour of Pedestrians and Car Drivers On Pedestrian Crossings. **Accident Analysis and Prevention** 203, pp.187-197 Abstract.

c) Other documents

Highway Capacity Manual 2000. **Transportation Research Board**, Washington D.C.

Pasanen, E. (1992) Driving Speeds and Pedestrian Safety; A Mathematical Model. **(Publication 77)**.: Helsinki University of Technology, Transportation Engineering, Otaniemi, Finland.

Persson, H. (1988). Communication Between Pedestrian and Car Drivers. Lund University, Lund, Sweden.

Trafikkontoret (1994). Do Car Drivers Give Priority to Pedestrians at Unsignalised Zebra Crossing? A Study on Safety and Bahaviour. Report No. 10. Trafiknamnden, Gotoborg, Sweden.

Westra, E.J. and Rothengatter, J.A. (1993) Behaviour-Conflict-Safety Relations for Pedestrians. Traffic Research Center, University of Groningen, The Netherlands.