Gender Aspects of Street Crossing Behaviour among Undergraduates: An Observational Study

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Abstract

This study examined the behaviour of pedestrians before and during street crossing in a Nigerian University. In total, 1438 pedestrians were observed in a natural setting at six zebra (820, 57%) and four non-zebra crossing locations (618, 43%) across the campus; 825 were male (57.3%) and 613 female (42.6%). A chi-square test revealed gender similarities and differences in street crossing behaviour of students. The majority of males (67.70%) and females (76.26%) crossed vertically at zebra crossings and the same proportion of males (69.01%) and females (71.38%) crossed diagonally at non-zebra locations. Most of the pedestrians looked to the right and left at the zebra and non-zebra sites before and during crossing. Significant gender differences in distractive activities were observed among users of zebra and non-zebra crossings. The study concluded that, contrary to general belief that male pedestrians take unnecessary risk at crossing sites, a larger majority of sampled males than females were compliant with traffic rules.

Keywords. Gender, Pedestrian, Students, Zebra crossing, Non-zebra crossing, Nigeria

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Introduction

Road traffic accidents involving pedestrians account for a significant amount of people injured and killed worldwide (Sullman et al., 2011). According to WHO (2015, ix), "49% of all road traffic deaths occur among pedestrians, cyclists and motorcyclists." In developing countries, of which Nigeria is one, pedestrians are among the most vulnerable road users, accounting for more than half of traffic-related injuries and fatalities (Peden et al., 2004, Seedat et al., 2006).

In Nigeria, youth aged 24 years and below account for 64% of the total population (NPC, 2003; Togonu-Bickersteth, 2014) and understanding street crossing behaviour of these youths becomes important in the country for several reasons. First, the absence of pedestrian walkways, inadequate zebra crossing sites and lack of traffic control officers on major roads in many cities expose pedestrians to traffic accidents. Second, students (17.5%) and young traders (14.7%) have been found to constitute the largest groups of road traffic accident induced trauma patients in some regions of the country (Adeolu et al., 2013). Third, studies have shown that both drivers and pedestrians in the country often ignore traffic regulations (Odeleye, 2002), a situation that further increases the likelihood of pedestrians being involved in road traffic accidents. Fourth, the influence of gender on street crossing behaviour is yet to be fully documented in the country when compared with other developing and developed countries.

Consequently, understanding pedestrians' street crossing behaviour with a view to reducing injury and death resulting from road traffic crashes in the country become essential for road safety policy formulation and implementation. The present study, therefore, focuses on street crossing behaviour of undergraduates in one Nigerian university: Obafemi Awolowo University, Ile-Ife. The main objective is to examine gender differences in crossing behaviour of students at zebra and non-zebra crossing sites.

This paper is written in six sections. The introduction and theoretical framework/literature review make up Sections 1 and 2 respectively. Section 3 is a description of the study area and methodology. The results of the study and their discussion are presented in sections 4 and 5 respectively. The last section is the conclusion.

Theoretical Framework and Literature Review

Theory of Planned Behaviour

Many theories in the field of social psychology seek answers to the fundamental question of why people behave the way they do. One of the numerous theoretical frameworks used to study and to make predictions of behaviours or behavioural intentions is the Theory of Planned Behaviour (TPB, Ajzen, 1991). The theory of planned behaviour (TPB), an extension of the Theory of Reasoned Action (TRA), maintains that all behaviours are planned, meaning that individuals consider the potential consequences of their activities before they decide to act (Ajzen's 1991, Gibbons et al. 2012). This decision process involves an assessment of the behaviour based on three relevant factors (attitudes, subjective norms and perceived behaviour control). The combination of these factors determines the intention to engage in a given behaviour.

Attitudes toward behaviour refer to beliefs that people hold that their behaviour will lead to positive or negative outcomes (Heirman & Walrave, 2012). They are essentially shaped by the expected consequences of a particular behaviour (Montano & Kasprzyk, 2008). Thus, a person who believes that a behaviour might have positive results develops positive attitudes toward such behaviour.

The subjective norm consists of perceived social pressure to perform or not perform the behaviour. Subjective norms are influenced by our perceptions of the beliefs of those around us: parents, friends, colleagues and partners, among others. According to the TPB, there is a sense or belief about whether or not these individuals and groups would approve or disapprove of the behaviour. But a person also have to factor in how motivated he or she is to comply with the views of others. This can vary from one situation to another. In terms of street crossing, subjective norms of street crossing behaviour refer to perceived influence of other pedestrians at the crossing site on the behaviour of a pedestrian. For example, such perceived influence could lead a pedestrian to engage in street crossing behaviour without adequate evaluation of the traffic situation at the crossing site (especially when crossing in group).

Perceived behavioural control (PBC) depends on beliefs about factors facilitating or impeding the targeted behaviour, and about the power of each such factor in a given situation. According to Palat et al (2017, 176), "the less people perceive such factors, and the less they think that

those factors are actually capable of having an impact on whether or not they adopt the targeted behaviour, the more they feel in control of it".

Previous studies on street crossing behaviour of pedestrians in risky situations provide support for this theoretical approach (Barton et al., 2016; Evans and Norman,1998; 2003; Diaz, 2002). For example, Evans and Norman (1998) found that subjective norms, perceived behavioural control (PBC) and attitudes accounted for 39 to 52% of the variance in intention to cross the roads in three risky situations, with PBC emerging as the most important predictor variable.

Literature Review

Many studies on the subject focused on the determinants of pedestrians' crossing behaviour using different variables. For instance, Ishaque and Noland (2008) identified some of these determinants as a pedestrian's age, gender, trip purpose, group size, physical disability, weather conditions, gaps available in traffic, type of crossing and signal phase. Other variables such as marital status, education, income and employment status have also been found to be related to pedestrians' crossing behaviour (Gueguen & Pichot, 2001).

Differences in street crossing behaviour between male and female pedestrians have been the focus of several previous investigations. Most of the findings have supported the notion that unsafe crossing characteristics vary between genders (Rosenbloom, 2003; Tiwari et al. 2007). For instance, Tiwari et al. (2007) observed pedestrians' behaviour at seven selected intersections in Delhi, India, using data collected from video cameras at zebra crossing sites and a survival analysis statistical method. They found out, among others, that the number of persons doing unsafe full crossings and safe half crossings was high; mean waiting time of females was 27% more than for males; the probability for a pedestrian to cross the road when it is unsafe varies with waiting time; people do not like waiting very long to cross streets; pedestrians get impatient and violate traffic signals as signal waiting time increases. Rosenbloom (2003) found that male pedestrians take greater risks in road crossing than do females, and younger pedestrians take more risks than older pedestrians.

Diaz (2002) used a questionnaire survey to examine the intention of two adult age groups, under and over 26 years, to perform illegal mid-block crossing. He found no effects of gender on crossing intention, but younger people were significantly more likely to intend to cross in the situation given. Diaz (2002) also found that younger people had a more positive attitude

towards crossing in such risky situations than the older group, perceived more acceptances from significant others and had a lower PBC.

The outcomes of many gender studies suggest that individual characteristics are determinants in the decision-making process. Obviously, men have different characteristics from women. For example, Parker, Manstead, Stradling, Reason, & Baxter (1992) argued that men are more competitive, optimistic, adventurous and overconfident compared to women. Indeed, studies have shown that male pedestrians expect less negative outcomes of traffic violations than females. They also tend to violate more rules than female pedestrians do (Rosenbloom, Nemrodov, & Barkan, 2004; Yagil, 2000).

Other studies have shown that distractions, such as the use of mobile phones, talking while crossing roads and listening to personal music devices (PMD) dominate crossing behaviour of pedestrians (Neider et al., 2010; 2011; Walker et al.,2012; Nasar & Troyer, 2013). For instance, Nasar et al. (2008) examined the effect of cell phones on pedestrian behaviour using naturalistic observations and found that pedestrians with cell phones exhibited the highest levels of unsafe behaviour. Walker et al. (2012) studied cautionary behaviour (e.g., looking before crossing a road) of pedestrians with or without personal music devices. The study found that male pedestrians listening to PMDs displayed more looking behaviour than those not listening to PMDs, while females showed no differences between the two conditions. They concluded that PMDs do not decrease the cautionary behaviour of pedestrians at crossing sites.

Pedestrian attitudes, perceptions and behaviour have also formed the focus of several other studies (Sisiopiku & Akin 2003; Tiwari et al., 2007; Huth et al. 2014). These studies were based on different data sources such as roadside observations, simulation, interviews and group discussion. For instance, Sisiopiku & Akin (2003) examined pedestrian behaviour and perceptions toward various pedestrian facilities at zebra crossings located next to a large university campus using observational and pedestrian user survey methods. A very high crossing compliance rate of pedestrians was revealed by the study. The study also revealed that the location of zebra crossing sites is the most influential factor for pedestrians' decision to cross at a designated location. Other factors such as vegetation and concrete barriers influenced the decision to cross of a significant number of pedestrians surveyed.

Zhuang and Wu (2011) used field observation of 254 pedestrians to study crossing behaviour at an unmarked roadway in China. The results show that 65.7% of pedestrians did not look for

vehicles after arriving at the kerb. During crossing, all pedestrians looked at oncoming vehicles, and when interacting with the vehicles, 31.9% of them ran and 11.4% stepped backwards. Pedestrians were found to prefer safe paths to short ones and to cross the

second half of the road with significantly higher speed.

Zhou et al (2009) investigated the effects of age, gender and conformity tendency on Chinese pedestrians' intention to cross the road in two different road crossing situations (Non-Conformity and Conformity). Using a sample of 426 respondents who completed two sets of questionnaire: a demographic questionnaire and another questionnaire based on the theory of planned behaviour (TPB), the study showed that pedestrians showed greater likelihood in crossing the road when other pedestrians were crossing the road. People who showed greater tendencies towards social conformity also had stronger road crossing intentions than low conformity people for both scenarios. The model explained 36% and 48% of the variance in the Non-Conformity and Conformity scenarios, respectively. Attitude, subjective norm, perceived behavioural control, and perceived risk emerged as the common predictors for both situations.

The present study extends theoretical and practical considerations related to TPB and other concepts identified in the literature reviewed to further our knowledge of gender aspects of street crossing behaviour among university students in Nigeria.

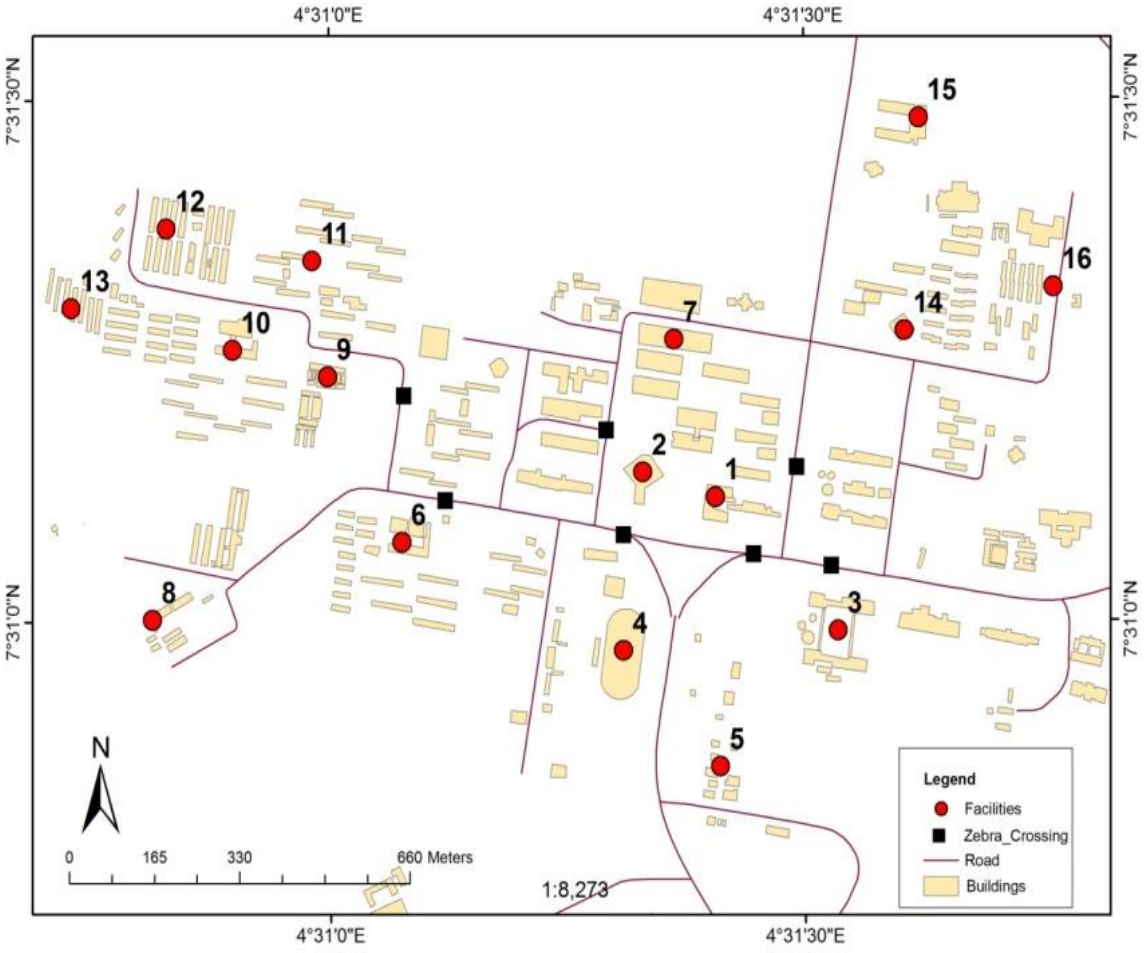
Study area and Methods

Study area

This study was carried out in Obafemi Awolowo University (OAU), Ile-Ife, Southwestern Nigeria. Obafemi Awolowo University is a comprehensive public institution established in 1962 as The University of Ife. In terms of its spatial extent, OAU is situated on a vast expanse of land totaling 11,861 hectares lying approximately within Longitudes 4^0 30'E and 4^0 34'E and Latitude 7^0 29'N and 7^0 33'N. The University falls within the margin of Koppen's Agroforest wet equatorial climate (Ogunfowokan et al., 2009)

The University comprises the central campus made up of the academic and administrative areas, the student residential area, the Staff Quarters and a Teaching and Research Farm. The academic and administrative areas contain the facilities for several departments that constitute 14 faculties. The student and staff residential areas are located on opposite sides of the core

campus. The students' residential area is made up of 10 undergraduate hostels and a postgraduate hall of residence. The 14 faculties in the central campus, the students', and staff residential areas are linked together by a road network (Figure 1). Students commute between the central campus and the halls of residence mainly by trekking or using commercial motorcycles (*Okada*). Commercial buses popularly known as 'Sabo-Lagere', used mainly to travel between OAU campus and the main town (*Ile-Ife*), are used occasionally by students to commute from their residential areas to the central campus. Several car parks, pedestrian walkways, pedestrian traffic lights and zebra crossing sites are common facilities available to



pedestrians and other road users. In addition, road safety awareness programmes are regular activities on campus mostly organized by Campus Marshalls, a body under the Federal Road Safety Commission of Nigeria (FRSC), the university security unit and the students' road safety club.

Key:

1. Senate Building
2. Oduduwa Hall
3. College of Health Sciences
4. Sport Arena
5. Banking Area
6. Fajuyi Hall
7. Faculties of Social Sciences, Law and Administration
8. New Market
9. Health Centre
10. Awolowo Hall
11. PG Hall
12. Mozambique Hall
13. Angola Hall
14. Ajose Lecture Hall
15. Faculty of Environmental Design and Management
16. Faculty of Technology

Figure 1. Map of OAU showing academic, administrative and students' residential areas

Methods

Procedure and Instrument

Data for the study were collected based on naturalistic observation of pedestrians' behaviour before and during street crossing at ten locations in the academic and hostel areas of Obafemi Awolowo University, Ile-Ife, Nigeria. The locations represent major crossing sites for students (Table 1). The naturalistic observation technique of data collection adopted is unique in that crossing behaviours were observed and manually recorded in situ into a pre-designed form. The form is designed with some modifications after Tom and Granié (2011). In this study, five trained assistants observed and collected information on the street crossing behaviour of students at the ten locations: six zebra crossing and four non-zebra crossing sites (Table 1). The observations were conducted in eight separate sessions of two hours each, starting from 0600 to 2200 Nigerian local standard time (LST). The observations took place daily from Monday, October 6 to Monday, October 19, 2014.

During the survey, four trained observers were stationed strategically under shade provided by trees, a common feature along roads on the campus, within a distance of 3 to 5 meters of the crossing sites. Each observer randomly selected a pedestrian within a marked distance of 5 meters of the crossing site, observed and recorded their behaviours at the kerb and during crossing. Recorded behaviour includes tempo of pedestrians, the number of pedestrians waiting to cross, head movement(s), style of crossing and other relevant issues. Finally, the gender of the observed pedestrians was also recorded as described by Rosenbloom (2011).

In the present study, the pace of pedestrians was determined in terms of observed walking tempo: regular (normal walking), running and stopping. Observations were made in the case of pedestrians' head movements towards four directions: (a) toward the traffic lights/warden (where available), (b)toward the left / right, (c) toward the other pedestrians, and (d) toward the ground formed (See Tom and Granié, 2011). This observation is important because the

head movement to the right and left at crossing site offers the pedestrians the opportunity to make a safer judgment of the traffic situation before crossing. Pedestrians stopping at the kerb before crossing the road also led to safer crossing behaviour.

Table 1. Characteristics of observers' locations

No	Locations	Zebra Crossing Sign	Pedestrian Walkway
1	Faculty of Health Sciences	Y	Y
2	Faculty of Pharmacy	N	Y
3	Opposite University Book Shop	Y	Y
4	Oduduwa Hall- Opposite Student Union Building	Y	Y
5	Faculties of Social Sciences and Education Junction	N	Y
6	Faculty of Science's White House building/ Amphi-Theater	Y	Y
7	Ajose Lecture Hall / Botanical Garden	N	N
8	Faculty of Arts, Opposite BOOC	Y	Y
9	Banking Area (First Bank, Skye, UBA and GTB)	N	N
10	Health Centre / Moremi Hall //Fajuyi Hall	Y	Y

Y = Available
N = Not available

Data analysis

Data collected were coded and captured electronically using Epidata software, an open source data entry software. The data were analysed using descriptive statistics with SPSS software for Windows (Ver. 15). Statistically significant differences between male and female samples at zebra and non-zebra crossing sites were based on a Chi-square test.

Limitation of the study

Unlike other studies that depend on advanced methods of observation and data collection such as the use of camera recording and simulation, this study used a form to record street crossing behaviour of students at zebra and non-zebra crossing locations. The disadvantages of this method are that certain integral parts of pedestrian street crossing behaviour cannot be captured effectively given the brief duration of observation associated with pedestrians' street crossing. In addition, due to the nature of the data collection method, sampled pedestrians were not subjected to interviews concerning their behaviour before and during street crossing. Issues that were not captured and not included in this study are gap acceptance for crossing by

pedestrians; and interactions between pedestrians and vehicles/motorcycles at the kerb and during crossing. The author is aware of these disadvantages and has tried to compensate for them by using a large sample.

Results

Characteristics of the samples and crossing sites

The sample for the study consisted of 1438 pedestrians. A high proportion of male (825) and female (613) pedestrians were observed at the ten crossing sites. In terms of crossing sites, slightly over half of the pedestrians 820 (57%) crossed at zebra crossings, while 618 (43%) crossed at non-zebra sites (Table 2). About 58.9% of males and females (41.1%) crossed at zebra crossing sites as compared to males (55.34%) and females (44.66%) that crossed at non-zebra crossing sites.

Pedestrians' behaviours while at the Kerb (0 to 0.5 meters)

Tempo of the participants

The pace of the pedestrians within 0 to 0.5 metres of crossing sites revealed that 35.74% walked, about 32.72% stopped in their track, while 28.23% of pedestrians walked slowly. Only 3.74% of the pedestrians were observed running (Table 2).

Pedestrians' activities

In terms of aggregate, as high as 55.29% of the sample were not involved in any activities at the kerb; 33.31% were engaged in conversation with other pedestrians. Talking on a mobile phone and wearing headphones accounted for 5.35% and 6.05% of pedestrians' activities.

However, at zebra crossing sites, 29.08% of females were engaged in conversation with other pedestrians, compared to 25.67% of males. About 6.42 % and 6.82% of males and females respectively wore headphones. Only 3.31% of males and 9.50% of females talked on a mobile phone. A similar distribution is also revealed about crossing at non-zebra sites (Table 2).

Total number of pedestrians waiting to cross (0 – 0.5 m)

The common crossing situation observed is a pedestrian crossing alone (38.18%); a group of 2 students accounted for 20.17% of the numbers of pedestrians observed. About 20.24% and 20.42% of the rest of the pedestrians observed were made up of a group of 3–5 and above 5 pedestrians respectively. When data were disaggregated by type of crossing sites, a significant gender difference was revealed in the number of pedestrians that crossed at non-zebra crossing

sites ($x^2(618) = 9.10$, $p < 0.05$): there were more male (37.72%) than female (28.62%) single pedestrians waiting at the kerb. Of the groups of over 5 pedestrians waiting to cross at the Kerb, males (26.32%) constituted a larger percentage than females (25%) (Table 3). At zebra sites, males exceeded females in the category of single pedestrian, while females exceeded males in all the remaining three groups of pedestrians waiting to cross at the kerb.

Starting position for crossing

The majority (74.69%) of the pedestrians stood on a sidewalk as compared to 25.31% that stood on the sidewalk before crossing. In terms of gender, more male (77.7%) than female (70.6%) pedestrians stood on a sidewalk, while 29.36% of females as compared to 22.3% of males stood on the road surface before crossing. Different patterns were revealed at zebra and non-zebra crossing sites (Table 2). At zebra crossing sites, no significant gender differences were revealed: a larger majority of male (80.54%) than female (75.96%) pedestrians stood on the sidewalk, while 19.46% of males and 24.04 % of females stood on the road surface ($x^2(820) = 2.47$, $p > 0.05$). At non-zebra crossing sites, 73.63% of male as compared to 64.13% of female pedestrians stood on the sidewalk, while 26.32% of males and 35.87 % of females stood on the road surface prior to their crossing ($x^2(618) = 6.56$, $p < 0.01$).

Head movement before crossing

It is common practice for pedestrians at the Kerb to look at different directions several times to assess traffic situations before crossing to avoid colliding with other pedestrians or moving vehicles. In this study, at times pedestrians even engaged with drivers or riders at crossing sites for permission to cross. Figure 2 presents the first two head movements of pedestrians towards five different directions while waiting to cross at the Kerb. In the first head movement, the majority (42.63%) looked to their right, 39.57% to their left, and 14.6% directly in front of them; a few looked at the traffic lights (1.04%), the ground (1.53%) and other pedestrians (0.63%). Analysis of the second head movement of the pedestrians revealed that their gaze to their left and right decreased slightly from those in the first head movement (Figure 2). The proportion of those that looked to their front was twice (28.23%) the size of those in the first head movement. The cases of engaging with drivers/riders at crossing sites were not significant and therefore not considered in this study.

Table 2. Pedestrians' behaviours at the Kerb **(0 – 0.5 m)**

Variable	Zebra crossing				Non-zebra crossing				Total (n= 1438)
	Male (n=483)		Female (n=337)		Male (n=342)		Female (n=276)		
	N	%	N	%	N	%	N	%	%
Tempo of the pedestrians									
Stops	119	24.64	129	38.28	121	35.38	102	36.96	32.75
Slows down	127	26.29	94	27.89	107	31.29	78	28.26	28.23
Runs	25	5.18	5	1.48	10	2.92	7	2.54	3.27
Regular walk	212	43.89	109	32.34	104	30.41	89	32.25	35.74
Activities of pedestrians									
None	312	64.60	184	54.60	191	55.85	108	39.13	55.29
Talking to other pedestrians	124	25.67	98	29.08	113	33.04	144	52.17	33.31
Talking on mobile	16	3.31	32	9.50	20	5.85	9	3.26	5.35
Headphone on	31	6.42	23	6.82	18	5.26	15	5.43	6.05
Starting position at crossing sites									
Sidewalk	389	80.54	256	75.96	252	73.68	177	64.13	74.69
Road surface	94	19.46	81	24.04	90	26.32	99	35.87	25.31
Number of pedestrians at crossing sites									
Single Pedestrian	212	43.89	129	38.28	129	37.72	79	28.62	38.18
Two Pedestrians	97	20.08	68	20.18	57	16.67	68	24.64	20.17
3 to 5 Pedestrians	87	18.01	78	23.15	66	19.30	60	21.74	20.24
Above 5 Pedestrians	87	18.01	62	18.40	90	26.32	69	25.00	21.42

Figure 2. Head movements at the Kerb

Pedestrians' behaviours during crossing

Crossing starting position

The observation of pedestrians' crossing behaviour revealed that the majority (51.04%) crossed at Zebra sign locations as compared to 44.91% of who crossed at non-Zebra locations. For pedestrians that crossed at zebra sites, as high as 87.78% of males and 91.99% of females crossed on the designated zebra crossing, while those that crossed at locations less than one meter away from the zebra sites were few: 12.22% male and 8.01% female (Table 3).

Crossing patterns

Table 3 also shows that vertical crossing patterns among the total sample accounted for 49.51% and 39.99% for diagonal crossing. Pedestrians observed crossing between vehicles parked on the sidewalk are 4.24% and those who crossed between moving vehicles were 6.26% (Table 3). In terms of crossing patterns among those that crossed at zebra locations, females (76.26%) more than males (67.70%) crossed vertically, while diagonal crossing accounted for19,05% of males and 14.84% of females. At non-zebra crossing sites, the majority of sampled males (69.01%) and females (71.38%) crossed the road diagonally. Those that crossed vertically were 20.18% male and 21.38% female.

Tempo of the participants during crossing

In aggregate, regular walking (68.9%) dominated the pace at which pedestrians crossed streets; 15.6% walked slowly while 15.4% ran while crossing. There were significant gender differences in the pace of the whole sample while crossing the streets ($x^2(1438) = 20.09$, $p < 0.05$). Table 3 shows the distribution of different pace of crossing at zebra and non-zebra sites. A greater majority of males than females at both zebra and non-zebra sites crossed walking.

Pedestrians' activities during crossing

Pedestrians' activities while crossing revealed that 63.35% were not involved in any distractive activities. During crossing, 28.3% were conversing among themselves while 4.38% and 3.96% used mobile phones and wore headphones respectively (Table 3). At Zebra crossing sites, fewer females (62.31%) than males (70.60%) were not involved in any activities; 22.57% of male as compared to 25.82% of female pedestrians were involved in conversation. About 2.90 % of males and 7.72% of females talked on a mobile phone. Only 3.93% male and 4.15% female wore headphones. At the non-zebra crossing sites, a majority of males (64.91%) as compared

to females (50%) were not involved in any activities, while more females (43.48%) compared to males (29.61%) were in discussion with other pedestrians (Table 3).

Head movement during crossing

Head movement of the pedestrians during crossing is as shown in Figure 3. In the first head movement, 34.35% of the pedestrians looked to their front, 31.99% turned their heads to the left-hand side, 31.22% looked towards their right-hand side, while 1.6% looked directly at the ground. A few 0.42% and 0.35% looked towards other pedestrians and traffic lights (where available) respectively. The proportion of those that looked to their front in the second head movement was 39.08%. Head movements to the right and left sides of the pedestrians were 29.76% and 24.69% respectively. About 3.55% and 2.16% looked towards the ground and at other pedestrians respectively. Very few pedestrians (0.76%) looked toward the traffic light during crossing.

End of crossing

Among the pedestrians that used Zebra crossings, the majority (87.16%) of males and (88.13%) of females ended their crossing in zebra zones (Table 3). The proportion of those that ended their crossing outside zebra zones was 12.84% male and 11.87% female. No significant gender difference was revealed in the kind of ending of crossing among those that used zebra crossing sites ($x^2(820) = 0.17$, $p > 0.05$).

Table 3. Pedestrians' behaviours during crossing

Variable	Zebra crossing				Non-zebra crossing				Total (n= 1438)
	Male (n=483)		Female (n=337)		Male (n=342)		Female (n=276)		
	N	%	N	%	N	%	N	%	%
Beginning of crossing									
zebra crossing	424	87.78	310	91.99	-	-	-	-	51.04
None zebra crossing	59	12.22	27	8.01	324	100.00	276	100.00	48.96
Type of crossing									
Diagonal crossing	92	19.05	50	14.84	236	69.01	197	71.38	39.99
Between stopped vehicles	38	7.87	16	4.75	7	2.05	0	0.00	4.24
Between moving vehicles	26	5.38	14	4.15	30	8.77	20	7.25	6.26
Straight line crossing	327	67.70	257	76.26	69	20.18	59	21.38	49.51
Tempo of the pedestrians									
Slows down	71	14.70	79	23.44	28	8.19	47	17.03	15.4

Runs	61	12.63	43	12.76	77	22.51	41	14.86	15.6
Regular Walk	351	72.67	215	63.80	237	69.30	188	68.12	68.9
Activities of pedestrians									
None	341	70.60	210	62.31	222	64.91	138	50.00	63.35
Talking to other pedestrians	109	22.57	87	25.82	91	26.61	120	43.48	28.3
Talking on mobile	14	2.90	26	7.72	16	4.68	7	2.54	4.38
Headphone on	19	3.93	14	4.15	13	3.80	11	3.99	3.96
Ending crossing in zebra crossing									
Yes	421	87.16	297	88.13	-	-	-	-	51.04
No	62	12.84	40	11.87	324	100.00	276	100.00	48.96

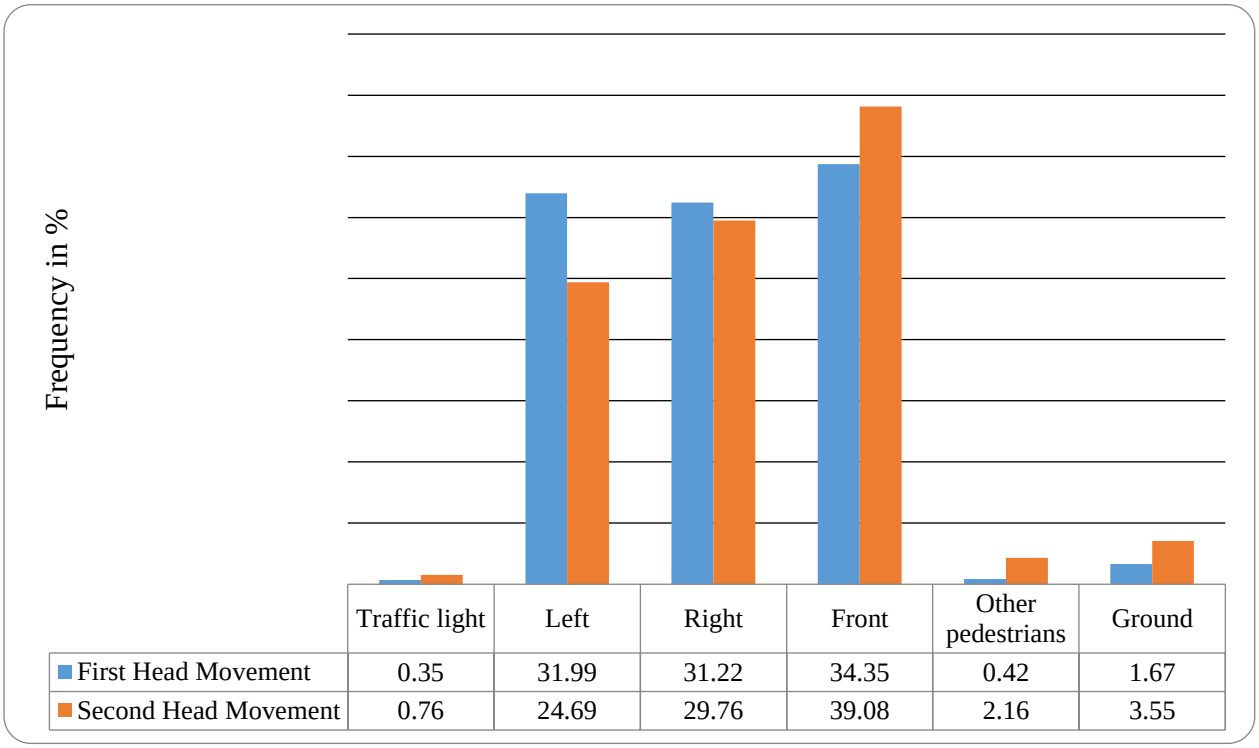


Figure 3. Head movements during crossing

Discussion

This study examined gender differences in street crossing behaviour of students at zebra and non-zebra crossing sites at Obafemi Awolowo University, Ile-Ife, Nigeria. The findings indicated strong support for the application of the TPB to street crossing behaviour of pedestrians. The usefulness of attitude (perception of the outcome of crossing decisions), subjective norm (crossing as group or individual), and perceived behavioral control as

predictors of street crossing intention in both male and female are reflected in the findings highlighted below.

The study revealed that more than 50% of the observed pedestrians crossed at zebra designated sites and more male than the female pedestrians made use of both zebra and non-zebra crossing sites. This is to be expected, as males constituted the majority of the sample. The results, however, show that for those that cross at zebra sites, males are more compliant with safe crossing rules than are females.

The high proportions of pedestrians crossing at zebra crossings as revealed by the study can be attributed to certain characteristics of the University such as strategic siting of zebra crossings at possible crossing locations and a high level of road safety awareness among different categories of road users. This is brought about by the activities of organizations such as the Campus FRSC Marshalls, the O.A.U. security unit and the students' road safety club.

The above finding is supported by studies confirming increase in the use of pedestrian facilities like the zebra crossing among pedestrians worldwide due to safety awareness programmes (Sisiopiku & Akin, 2003; Tiwari et al., 2007; Rosenbloom, 2009; Tom & Granié, 2011; Zhuang & Wu 2012; Kaparias et al,2012).The safety awareness level of pedestrians in a University environment as indicated by this study, however, may not be typical of the Nigerian context, especially in areas characterized by inadequate pedestrian facilities; high volumes of traffic; and poor traffic education among drivers and pedestrians. The results also indicate that male and female pedestrians differ in standing position at the Kerb before crossing. Before crossing, more males than females stood on the sidewalk at zebra and non- zebra crossing sites. This implies that male pedestrians are safety conscious and more compliant with crossing rules than females.

Furthermore, the results indicate that males and females differ in their head movement while assessing the traffic situation before and during crossing. Before crossing, the majority of pedestrians looked to either the right or the left in their first head movement. During the second head movement, the same direction also dominated pedestrians' gaze, but at a reduced rate. This confirms the findings of a study by Seipone et al. (2013) which reported that the majority of the pedestrians are likely to check both sides of the road before crossing.

In addition, the results indicate that there were differences in pace among males than females during crossing. During the crossing, gender differences in pedestrians' pace were found at

both zebra crossing sites and non-zebra crossing sites: more males than females crossed the streets walking. This finding differs from of Rosenbloom et al.'s (2008) which shows that running is a common behaviour at crosswalks and of Zhuang & Wu's (2011) which revealed that pedestrians survey traffic situations and walk quickly or run across the roadway to their destinations when satisfied that the roadway is safer. The high proportion of pedestrians who walked while crossing at both zebra and non-zebra sites suggests that safe roads crossing behaviour is exhibited by the observed students.

The finding that pedestrians make little or no eye contact with traffic lights at zebra crossing sites is not surprising, as most of the streets with zebra crossings in the study area lack traffic lights and where available, the devices are not functioning due to erratic supply of electricity. This finding confirms that of Odeleye (2002) on the lack of compliance with the use of road safety devices such as traffic light and zebra crossing among road users in Nigeria. However, it is in contrast with several findings in developed countries that show a high rate of compliance with the use of traffic lights at crossings points (Sisiopiku & Akin, 2003; Tom & Granié, 2011).

Findings on distractive activities that pedestrians engage in, namely the use of mobile phones, talking and wearing headphones before and during crossing, revealed significant gender variations among pedestrians. More males than females were observed talking, while more female pedestrians than male used mobile phones and headphones. This implies that both male and female are likely to be distracted while crossing streets due to different activities and are therefore at the risk of colliding with other pedestrians or being hit by moving vehicles. These findings are corroborated by several findings that established high risk among pedestrians talking, using a mobile phone or listening to a personal music device during street crossing (Pešic, et al, 2016; Nasar & Troyer, 2013; Neider et al., 2011;Nasar et al., 2008). Nasar et al. (2008) associated lower awareness among pedestrians regarding the traffic situation to distraction due to mobile phone use. Similarly, Pešic, et al. (2016) showed that many pedestrians used mobile phones while crossing the street and behaved less safely than those who did not use mobile phones while crossing the street.

Contrary to general belief that male pedestrians display unsafe street crossing behaviour at crossing sites, this study shows that the majority of male pedestrians in the study area are more

compliant with traffic rules than females. However, the rate of compliance with other street crossing rules was the same among male and female pedestrians.

Conclusion and policy recommendations

The importance of this research is that it has described in detail street crossing behaviour of pedestrians at the Kerb and at zebra and non zebra sites in a university environment in Nigeria. Based on the findings, the study recommends, among other things, that the university administration should make efforts to increase the number of zebra crossing sites on campus in order to increase their use; encourage the use of zebra crossings where available and promote safe street crossing behaviour among students by discouraging wearing of headphones and conversations on mobile phones while crossing streets on campus; and invest in and put in place solar powered traffic lights for pedestrians at major T-junctions on campus and at road intersections.

At the national level, the government is encouraged to create zebra crossing sites on major roads where necessary and install Zebra crossing signs at potential crossing sites in major cities in the country. These should be done with the aim of reducing' accidents associated with pedestrians' street crossing. In addition, an effective education programme on the use of pedestrian facilities should be put in place. Creating more awareness on the relevance of common pedestrian facilities such as pedestrian walkways, zebra crossings, pedestrians' bridges and traffic officers will contribute immensely towards pedestrians' safety in the country.

In conclusion, the study has brought to light a salient gender aspect of street crossing behaviours among university students through the use of a naturalistic observation method. The study methodology can be improved and applied to studying the different aspects of pedestrians' crossing behaviour such as waiting time at crossing sites, pedestrian-driver interactions and acceptable safe gaps, especially at non-zebra and at unsignalized road sections in other higher institutions and major cities in the country.

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