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High School Students' Psychometric Assessment of Pedestrian Safety and Risk Factors in Ile-Ife, Nigeria

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Abstract

With a specific focus on high school students as examples of vulnerable road users, this paper examines pedestrian safety and risk factors among, as well as the road safety strategies employed by, high school students in Ile-Ife, one of the largest cities in Osun State, Nigeria. Using a multistage sampling procedure, 115 high school students from three high schools were selected for the study. Descriptive statistics and variants of the Relative Importance Index (RII) were employed in the data analysis. It was found that high school students as pedestrians in Ile-Ife were exposed to several risks owing to a high level of pedestrian facility and infrastructure deficit and the largely unsafe pedestrian environment that characterized the city. Acknowledging the indispensability of walking as an important transport mode, the paper proffers policy recommendations that could engender a safer pedestrian environment in the city.

Keywords: *Pedestrian safety, Pedestrian risk factor, Ile-Ife*

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1. Introduction

More than one-fifth of the deaths resulting from road traffic crashes occur among pedestrians (WHO *et al.*, 2013). Further, Odero *et al.* (1997) and WHO (2004) stated that the largest group of road user fatalities are pedestrians hit by motorized vehicles. According to Sangowawa *et al.* (2012), child pedestrians are the most vulnerable road users, with an overwhelming majority (about 93%) occurring in developing countries (WHO, 2008). Also, a study carried out in South Asia asserted that children and adolescents, aged 0-19, represented an average of 13% of all road traffic injury deaths (Hyder *et al.*, 2006). FRSC (2010) was more detailed in its annual report, where it was explicitly stated that road traffic crashes are the leading cause of deaths among young people aged 10-24 years. Likewise, WHO (2008) reported that road traffic accident is the leading cause of death for young people aged 15-29 years.

Several factors have been identified as responsible for increasing susceptibility of young people to involvement in road crashes (Sangowawa *et al.*, 2012). These include defective road environment (including excessive traffic volumes), inefficient and unsafe public transport systems, inappropriate speed of vehicles,

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poor land use and networking, lack of separation of road users, and mixed land use where houses, schools, and commercial outlets are erected (Gibby and Ferrara, 2001; Kraus *et al.*, 1996; Rao *et al.*, 1997; Stevenson *et al.*, 1995; WHO, 2008). In the same vein, WHO (2008) reported that children are also vulnerable to pedestrian injury because they are active travellers.

Another strong factor for pedestrian risks, especially in many developing countries, is the lack of consideration for active travellers in road infrastructure and facility investment. In other words, there is hardly any conscientious commitment to non-motorized transport infrastructure investments and inclusive urban design in most developing cities, especially cities in Africa. As important as active transport is, studies have found that its facility investment is rarely accorded the top priority it deserves in many of the developing countries (Mogaji, 2020; Olojede *et al.*, 2017a; Olojede *et al.*, 2019; Olojede, 2021; Olojede and Oluborode, 2022).

There are valuable insights into pedestrian risks in developed countries, as a considerable amount of research has been undertaken since the 1970s (Tulu *et al.*, 2013). For instance, Agran *et al.* (1996) conducted a study on environmental risk factors in child pedestrian injuries. They found that most of the pedestrian-vehicle collisions involving children occurred within a short distance of the child's residence, frequently when the child darted into the street during play. Likewise, Roberts and Crombie (1995), Roberts and Lee-Joe (1993), and Schofer *et al.* (1995) carried out research works to examine the risk of children being injured by pedestrian collision, as a function of fast-moving traffic. They found a relationship among the quantity of traffic volume, posted speed limit, and rate of pedestrian injuries.

One common feature of all these studies is that they all focused pedestrian injury/risks and fatality analysis, as well as the provision of pedestrian facilities in developed countries where active transport infrastructure is prioritized in road infrastructure investments. Similar studies are hard to come by in developing countries. It was towards bridging this research gap that this study examined pedestrian safety and risk factors among high school students (one of the most vulnerable pedestrian groups) in Ile-Ife, a medium-size traditional city in Nigeria. The objectives of the study were to examine the socioeconomic characteristics of the high school students, identify and examine the condition of transport facilities and infrastructure in the study area, examine the students' level of awareness of pedestrian safety practice, identify and examine the factors that influence pedestrian safety, and identify and examine the perceived risk factors for pedestrians in the city.

2. Study Area

Ile-Ife, an ancient city in Osun State, Nigeria, is located between Latitudes 7°28'N and 7°45'N and Longitudes 4°30'E and 4°34'E. It is about 218 km northeast of Lagos. The city houses two local government areas namely, Ife Central and Ife East Local Government Areas. However, part of Ife East Local Government Area falls within a neighbouring town, Modakeke. According to the information obtained from the Osun State Ministry of Education, Science and Technology, there are nine public high schools within the city of Ile-Ife. Although Ile-Ife is highly urbanized using most of the indicators for urbanity, it suffers a serious setback in terms of infrastructure development; transportation facilities form a significant part of this. Like what obtains in cities of comparable status, especially Ilesa (Olojede *et al.*, 2017a; 2017b) and Osogbo (2019a), Ile-Ife has a poor road network that is devoid of pedestrian facilities. The only part of the city with pedestrian facilities is the Obafemi Awolowo University campus. This necessarily implies that school-age children and teenagers in the city are at a huge risk of falling victims of pedestrian accidents.

3. Research Methodology

Primary data for the study were obtained from selected high school students in Ile-Ife. In selecting the students, the list of all the nine public schools located within Ile-Ife was obtained from the Osun State Ministry of Education, Science and Technology, Osogbo. Systematic and simple random sampling techniques were employed in selecting three (one out of every three). Questionnaire was then administered on students in the selected three public high schools. Using availability sampling techniques, 42, 50 and 23 high school students were selected from Seventh-Day Adventist High School, St David's High School, and Ife Anglican High School respectively. In all, 115 students were sampled.

Data collected were analysed using simple descriptive statistics and variants of the Relative Importance Index (RII). The Likert Scale pioneered by Likert (1932) was employed in the survey for variables that were measured on a psychometric scale. For instance, a 5-point scale was adopted with the weights 5, 4, 3, 2 and 1 for Strongly Agree, Agree, Undecided, Disagree, and Strongly Disagree respectively. Similarly, a 5-point scale

was also adopted with the weights 5, 4, 3, 2 and 1 for Very Good, Good, Fair, Poor, and Very Poor respectively. Scoring was done to arrive at the Total Weight Value (TWV) for each variable through the summation of the product of the number of responses for each rating and the respective weight value. This is mathematically expressed as:

$$TWV = \sum_{i=1}^5 (N_i \times W_i) \quad \dots(1)$$

where

N_i = The number of respondents rating a particular variable; and

W_i = The average weight value assigned to the variable by the respondents.

Following the computation of the TWV, the RII of each variable (denoted as TCPI, PSFI and RUI in this paper) was determined by dividing the TWV by the total of the number of respondents rating the variable. This is mathematically expressed as:

$$RII = \frac{TWV}{\sum_{i=1}^5 N_i} \quad \dots(2)$$

The closer the RII (TCPI, PSFI or RUI) value of a variable is to 5, the stronger the respondents' rating of such a variable in their perception, and the farther it is from 5 the weaker the rating of the respondents of such a variable. In addition, since 2.5 is 50% of 5, any score below 2.5 for any given variable indicates a poor rating in that regard. Examples of similar uses of the RII are found in such studies as Afon (2000, 2006), Akinosun (2022), Olojede *et al.* (2017a, 2017b) Olojede (2019a, 2019b), and Olojede *et al.* (2019), among others.

4. Research Findings and Discussion

Findings from this study are presented under four headings: socioeconomic characteristics of respondents, state of existing transport facilities, respondents' level of awareness of pedestrian safety, factors influencing respondents' safety, and respondents' responses to the risk factors of walking as a mode in the study area.

4.1. Socioeconomic Characteristics of the Respondents

Socioeconomic characteristics of the respondents are presented in Table 1.

The gender distribution of the respondents shows that 40.9% and 59.1% were male and female students respectively, while their ages ranged specifically from 14 to 22. The modal age group was 16-18 years. The largest proportion (45.2%) of the students were in SSS1 (or Grade 10), which implies that they had spent a minimum of 10 years in acquiring formal education; 15.7% were in SSS2 (or Grade 11) while 39.1% were in SSS3 (or Grade 12). Given the age and educational background of the respondents, it could be expected that they would know the importance of their transport safety. Further analysis reveals that the distance covered by the students in their daily commute to school ranged from less than 1 km to over 2 km, with 77.4% of the students travelling some 2 km from home to school. In the study area, it is a usual practice for parents to give some money to schoolchildren when going to school every day. Usually, this money is meant for buying snacks as an in-between meal. A survey of the snacks allowance received by the students daily shows that 2.6% did not receive any daily snacks allowance, 17.4% received less than 50 naira, 77.4% received between 50 and 100 naira while 2.6% got over 100 naira daily.

In addition, analysis reveals that 77.4% of the students did not have any privately-owned vehicles in their household, 15.7% had motorcycles, 4.3% had cars, while 2.6% had unspecified vehicle types in their households. Furthermore, it was found that most (79.1%) of the students walked to school, 11.3% took motorcycles, 7.0% took minibuses, and the remaining 2.6% took unspecified modes. The evening commute features a somewhat different pattern as an overwhelming majority (90.4%) of the students chose walking as their homeward trip choice, 2.6% took motorcycles. The difference in the morning and afternoon modal choice patterns can be attributed to the need for reduced travel time. Whereas in the morning the choice mode of the students would be significantly influenced by the need to get to school early enough, the afternoon homeward trip would not necessarily require any urgency. A closer examination shows that walking as a homeward trip mode choice gained an additional 11.3% of the students. Indeed, every other mode lost some percentages to walking during the afternoon trip. Another important deduction on the school mode choice of the students is that it must have

Table 1: Socioeconomic Characteristics of the Respondents			
Characteristic	Class	Frequency	%
Gender	Male	47	40.9
	Female	68	59.1
Age	<16	47	40.9
	16-18	67	58.3
	>18	1	0.9
Class/Grade	10	52	45.2
	11	18	15.7
	12	45	39.1
Home-School Distance	≤1 km	17	14.8
	2 km	89	77.4
	>2 km	9	7.8
Average Daily Allowance (₦)	0	3	2.6
	<50	20	17.4
	50-100	89	77.4
	≥100	3	2.6
Household Vehicle Type	None	89	77.4
	Motorcycle	18	15.7
	Car	5	4.3
	Other	3	2.6
Morning Mode	Walking	91	79.1
	Motorcycle	13	11.3
	Minibus	8	7.0
	Other	3	2.6
Afternoon Mode	Walking	104	90.4
	Motorcycle	3	2.6
	Minibus	6	5.2
	Other	2	1.8

been significantly influenced by their respective households' income and vehicle ownership. Unfortunately, this study could not cover the aspect of the students' household income as most of the students could not supply accurate data needed for analysis: they did not know how much their parents were making. This was not unexpected in the study area.

4.2. Condition of Transport Facilities and Infrastructure in Ile-Ife

The respondents were asked to assess the condition of transport facilities and infrastructure in the study area. A summary of their overall assessment is presented in Table 2.

S. No.	Facility/Infrastructure/Service	VG	G	F	P	VP	TWV	TCPI	Rank
1.	Roads	8	34	7	60	6	323	2.8	6
2.	Sidewalks and walkways	0	0	7	9	99	138	1.2	12
3.	Bus Stops	12	42	13	20	28	335	2.9	5
4.	Bus/minibus terminals	5	26	14	60	10	301	2.6	7
5.	Okada* parks	16	68	9	17	5	418	3.6	4
6.	Zebra crossings	0	0	11	23	81	160	1.4	10
7.	Signalized pedestrian crossings	0	0	2	7	108	128	1.1	13
8.	Pedestrian bridges	1	4	3	41	66	178	1.5	9
9.	Speed bumps	78	33	4	0	0	534	4.6	1
10.	Traffic islands	2	2	11	8	92	159	1.4	10
11.	Traffic lights	0	1	0	1	113	119	1.0	14
12.	Road signage	0	3	17	33	62	191	1.7	8
13.	CCTV	0	0	0	0	115	115	1.0	14
14.	Traffic wardens/road safety officers	51	32	17	9	6	458	4.0	2
15.	Lollipop men/ladies	35	39	17	21	3	427	3.7	3

Note: VG: Very Good, G: Good, F: Fair, P: Poor, VP: Very Poor; * The name by which a commercial motorcycle is known in many parts of Nigeria; and * *Okada* is the name by which a commercial motorcycle is known in many parts of Nigeria.

According to Table 2, analyses reveal that speed bumps, the presence of traffic wardens/road safety officers as well as lollipop men/ladies, *okada* parks, and bus stops topped the list of the available transport facilities, infrastructure and services in the study area in terms of condition and/or performance. They were followed by roads, bus/minibus terminals, road signage, pedestrian bridges, traffic islands and zebra crossings. Sidewalks and walkways, signalized pedestrian crossings, traffic lights, and CCTV ranked lowest.

A careful consideration of the assessment of these variables indicates a high level of pedestrian facility and infrastructure deficit. This is because the facilities and infrastructure that matter most for pedestrian safety rated low according to the respondents. In a city where such important facilities and infrastructure as road signage, pedestrian bridges, zebra crossings, traffic islands, sidewalks and walkways, signalized pedestrian crossings, traffic lights, and CCTV are not in a good condition, pedestrians would be at a high risk and their safety would be significantly undermined. This clearly indicates a high level of danger to high school students as a good example of vulnerable road users.

4.3. Students' Level of Awareness of Pedestrian Safety Practice

An awareness of road safety measures is an important way of enhancing the safety of pedestrians as they move about the city. Consequently, the respondents were asked to rate level of awareness of 10 selected pedestrian safety measures. A summary of their personal assessment is presented in Table 3.

According to Table 3, an overwhelming majority (96.5%) of the students were aware of the danger associated with the crime of jaywalking. Also, 72.2% and 70.4% knew the importance of watching out for vehicles and the

Table 3: High School Students' Awareness of Pedestrian Safety Measures

S. No.	Safety Measure	Aware	%	Unaware	%
1.	Make eye contact with drivers to ensure they see you	26	22.6	89	77.4
2.	Watch out for vehicles	83	72.2	32	27.8
3.	Face oncoming vehicles when walking by the road	56	48.7	59	51.3
4.	Stop on the sidewalk and find a safe area to use the phone	62	53.9	53	46.1
5.	Remove headphones before crossing the road	77	67.0	38	33.0
6.	Guard against distraction	9	7.8	106	92.2
7.	Wear reflective clothes at night	18	15.7	97	84.3
8.	Use signalized pedestrian crossing/zebra crossings	22	19.1	93	80.9
9.	Use the pedestrian bridge	81	70.4	34	29.6
10.	Avoid jaywalking	111	96.5	4	3.5

use of pedestrian bridges respectively. Awareness was also found to be comparatively high for removing headphones before crossing the road (67.0%) and stopping on the sidewalk and finding a safe area to use the phone (53.9%). However, their level of awareness was found to be quite low for facing oncoming vehicles when walking by the road (48.7%). In addition, it was revealed that the students' level of awareness was unacceptably low for making eye contact with drivers to ensure that they were seen (22.6%), using signalized pedestrian crossings and zebra crossings (19.1%), wearing reflective clothes at night (15.7%), and guard against distraction (7.8%). Overall, these indices can be said to be relatively low for this category of pedestrians.

4.4. Factors Influencing the Safety of Pedestrians in Ile-Ife

Factors that influence the safety of pedestrians abound in the extant literature. However, just 10 of these factors deemed relevant to the category of pedestrians covered by this study were selected for assessment. Table 4

Table 4: Factors Influencing Pedestrian Safety in Ile-Ife

S. No.	Safety Factor	SA	A	I	D	SD	TWV	PSFI	Rank
1.	Good condition of roads	23	19	6	31	36	307	2.7	8
2.	Familiarity with the environment	92	15	4	1	3	537	4.7	1
3.	Traffic control and management	51	34	11	10	9	453	3.9	3
4.	Age	78	14	10	11	2	500	4.3	2
5.	Education	35	36	31	8	5	433	3.8	4
6.	Peer influence	13	24	8	43	27	298	2.6	9
7.	Safe road crossings	17	31	16	26	25	334	2.9	7
8.	Mass media enlightenment	38	32	15	18	12	411	3.6	6
9.	Road safety education	43	41	2	16	13	430	3.7	5
10.	Pedestrian facilities	11	12	23	45	24	286	2.5	10

Note: SA: Strongly Agree, A: Agree, I: Indifferent, D: Disagree, SD: Strongly Disagree

gives a summary of the perception of the high school students in Ile-Ife on how strongly these factors influenced the safety of pedestrians in the study area.

In the opinion of the high school students, according to Table 4, familiarity of the pedestrian with the environment, the pedestrian's age, and traffic control and management were the most significant pedestrian safety influencing factors in the study area. Next to these were the pedestrian's educational status, the pedestrian's road safety education, and enlightenment from the mass media. Rated low on this scale were good condition of roads, peer influence, and the availability of pedestrian facilities.

4.5. Perceived Risk Factors for Pedestrians in Ile-Ife

Arguably, road safety risk perception differs for individuals owing to various factors including their background and most other socioeconomic attributes. A summary of the assessment of eighteen selected risk factors for pedestrians in the study area as perceived by the respondents is presented in Table 5.

S. No.	Risk Factor	SA	A	I	D	SD	TWV	RUI	Rank
1.	Bad condition of roads	64	15	6	18	12	446	3.9	3
2.	High traffic volume	40	25	15	18	17	398	3.5	7
3.	Inadequate pedestrian facilities	73	31	5	4	2	514	4.5	2
4.	Lack of traffic lights	43	27	24	12	9	428	3.7	5
5.	Illiteracy	15	19	17	34	30	300	2.6	15
6.	Inadequate road crossings	34	31	21	14	15	400	3.5	7
7.	Bad streetlighting	58	17	21	8	11	448	3.9	3
8.	Bad weather condition	8	16	14	39	38	262	2.3	17
9.	Illegal on-street parking	39	27	17	11	21	397	3.5	7
10.	Narrow roads	13	22	16	28	36	293	2.5	16
11.	Inadequate road facilities	38	31	14	13	19	401	3.5	7
12.	Recklessness of four-wheelers' drivers	19	27	21	25	23	339	2.9	14
13.	Recklessness of <i>okada</i> riders	89	17	5	3	1	535	4.7	1
14.	Poor traffic control and management	2	11	7	38	57	208	1.8	18
15.	Speeding	40	25	19	17	14	405	3.5	7
16.	Jaywalking	35	26	13	19	22	378	3.3	12
17.	Distracted walking	42	29	14	17	13	415	3.6	6
18.	Poor road safety education	27	22	14	34	18	351	3.1	13

Note: SA: Strongly Agree, A: Agree, I: Indifferent, D: Disagree, SD: Strongly Disagree.

According to Table 5, the recklessness of *okada* riders topped the list of pedestrian risk factors in Ile-Ife. It was followed by inadequate pedestrian facilities, bad condition of roads, bad streetlighting, lack of traffic lights, and distracted walking which manifested mostly in the study area in the form of mobile phone use and/or headphones while walking. A tie was found among high traffic volume, inadequate road crossings, illegal on-street parking, inadequate road facilities, and speeding. Next to these were jaywalking, poor road safety education, recklessness of four-wheelers' drivers, and illiteracy on the part of the pedestrian. Other

pedestrian risk factors were narrow roads, bad weather condition, as well as poor traffic control and management.

5. Conclusion and Recommendations

This study examined pedestrian safety and risk factors in Ile-Ife with a specific focus on high school students as examples of vulnerable road users. It was found that, generally, pedestrians in the study area were exposed to several risks owing to a high level of pedestrian facility and infrastructure deficit and the largely unsafe pedestrian environment that characterised the city. Walking is an important transport mode that must be encouraged as much as possible in the city as it cuts across different categories of the residents. In addition, it is the main school trip mode among most high school students in the city. Consequently, pedestrian safety should be accorded a top priority in the city.

Based on the findings of the study, the following policy recommendations are proffered. First, towards enhancing the safety of pedestrians as well as other road users, the existing transport facilities in Ile-Ife should be upgraded. This should take the form of intentional and holistic transport infrastructure retrofitting and reengineering. Specifically, such crucial pedestrian infrastructure and facilities as sidewalks, signalized pedestrian crossings, pelican crossings, and traffic lights should be installed. In addition, traffic calming devices and measures like speed bumps, zebra crossing and road signs should be put in place where they are needed but not available.

Furthermore, while not underemphasizing the need for pedestrians to take responsibility for their safety when using the road, traffic rules should be strictly enforced to instil discipline, road sense as well as pedestrian-conscious and responsible behaviors in motorized vehicle drivers. Special emphasis should be placed on *okada* riders who have been observed to be generally reckless. Moreover, sensitisation and enlightenment campaigns on road safety practices should be organized for both active and passive travellers from time to time on various media to raise awareness on the risks inherent in reckless and irresponsible road use.

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