UNDERSTANDING TRAFFIC CONTROL DEVICES BY URBAN DRIVERS IN LAGOS, NIGERIA

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ABSTRACT

Traffic devices provide road users with information and an environment that helps control and regulate traffic by giving them all the necessary conditions to create safety. The paper will shed light on how traffic control devices play the role of a safety measure in managing traffic issues with accident occurrences. The study aimed to explore the degree of understanding of traffic signal systems by drivers in the city of Lagos. It examines how well drivers in Lagos understand traffic signal systems, considering their demographic components (age, gender, educational level, marital status, etc.). It was found that from the total 32 symbols used in traffic, 8 warning, 10 regulating, and 6 informant sign symbols, the focus of the examination was on five specific road markings and three types of traffic signals. The survey revealed limited understanding among the drivers about the traffic signaling devices. This report analyzes the overall average percentage of drivers who correctly interpreted and responded to the studied traffic control devices, which was 64.5%.

According to research, the level of a person's education plays a very important role in how he or she uses traffic devices. Gender and age do not play any role here, whether they understand this. Statistically speaking, the analysis of confidence levels in a 5% range of significance reveals that education is a prerequisite to comprehending traffic control devices.

INTRODUCTION

Road safety is now a worldwide crisis that is stemming from the huge number of deaths and the expensive repair costs. The road safety regulations have not only concentrated on general precautions but also have divided different sections of the traffic system into smaller segments to make them safer, Al-Gadhi et al. (1994). Global road crashes are a major factor in fatal and non-fatal deaths. However, statistics show that an estimated 1.29 million lives are claimed on roads every year, which means approximately 3,490 people die every day or 140 deaths every hour (WHO 2008), as per Rubayat and Sultana (2013). The number of cars on the roads is going up nowadays because of technological and economic development. However, no one is happy about the fact that there are more and more traffic crashes and resulting deaths.

According to data from the Federal Road Safety Corps (FRSC), in 2011, 4,765 road incidents were documented, which was followed by 4372 deaths and 17464 injuries (FRSC report, 2011). The major reason for the majority of traffic crashes is attributed to the driver's errors and traffic violations are the key contributors. Apart from that, there is one thing that determines safe driving, and this is the drivers' understanding of the device specificity used for traffic control.

The effectiveness of traffic control devices as safety measures has received significant research attention in the past few decades. The research investigated is wide-ranging, and it includes, among others, safety, absorbance, and design. Such studies have been published and reported in different places like Turkey, Qatar, the USA, the UK, and Bahrain. However, little or no work has been done so far to examine drivers' ability to read the traffic control devices in Nigeria. Only a few drivers in the city can be said to adhere to the traffic control devices, as found out in the research of Okafor et al. (2013), and this is seen to be the reason for a lot of road crashes. This study examines Lagos drivers' comprehension of selected traffic control devices, aiming to improve road safety in the city.

LITERATURE REVIEW

Traffic control devices pass on information to road users about the road and the surrounding environment through which they are driving, and this is a notion shared by Makinde and Opeyemi (2012). The core of traffic signalization, such as traffic signs, pavement markings and traffic signals, is the idea of safe road operations (Razzak and Hasan 2010). As essential communication tools on the road, traffic control devices provide drivers, especially those pressed for time, with clear instructions to navigate safely. The devices can communicate by forming shape, colours, symbols, and/or words to relay the information to the users. However, the effectiveness of traffic control devices hinges on clear comprehension of their messages by drivers and other road users. The amount of traffic has grown over the last 80 years in many countries. Traffic devices have been re-designed to be pictorial or otherwise simplify and standardize rules that help international travel where language barriers may pose a problem. Generally, traffic signs that use pictograms and images are more eye-catching than signs whose information is in text form.

Traffic control devices and their impact on driver behavior have remained a critical area of research for decades. Zhang and Chan (2018) said that academic research into traffic sign understanding started in 1966. The initial studies were only dedicated to understanding the users' comprehension level of local traffic signs. On the contrary, the majority of the studies did not yield a positive result, as their findings were that the overall understanding score was quite low. Multiple studies highlight that user characteristics like age, gender, driving experience, and education level significantly influence their comprehension of traffic control devices. These studies cover the subject related to comprehensibility Kirmizioglu and Tuydes-Yaman (2012), Al-Madani and Al-Janahi (2002a&b), understanding Razzak and Hasan, (2019), Makinde and Opeyemi (2020).

Al-Madani and Al-Janahi (2002a) investigated the influence of various demographic factors on traffic sign comprehension. Their research found that some, like marital status, were insignificant,

while age, gender, education, and income played a significant role. Similar to Makinde and Opeyemi (2012), they emphasized the importance of factors like age, education, and driving experience for traffic sign comprehension (Makinde and Opeyemi, 2012). Another researcher pointed out that drivers' understanding of road signs concerning their personal and social characteristics in UAE may not relate to accident rates (Al-Madani and AlJanahi, 2002b).

In recent years, there has been an observable trend towards increased complexity among researchers. This shift extends to cognitive attributes such as sign visibility Ghali and Kline (1990), design characteristics Ng and Chan (2007), perception, and recall Al-Gadhi et al. (1994) with respect to the level of familiarity, degree of concreteness, level of simplicity, degree of meaningfulness, and semantic distance.

It is not always the fault of a message's success or failure when it comes to the efficiency of traffic sign messages, and the key lies in the level of the message provided (Ng and Chan, 2007). It explored how road sign design factors like recognizability, clarity, conciseness, ease of interpretation, and the symbol's direct relation to its meaning influence driver comprehension of 120 Mainland China traffic signs. The examinations show that cognitive design elements have a significant impact on the process of creating user-friendly road signs that convey clear information about road conditions to road users on time. According to Zhang and Chan (2013), most drivers are insufficiently aware of what traffic signs mean, which makes them vulnerable to road hazards. Among many troubles, we are going to talk about the problem of driving on different roads around the world. Partially to the effect of unidentifiable characters of the traffic signaling devices as well.

Dissanayake and Lu (2001) aimed to explore the factors influencing traffic control comprehension in both domestic and global contexts within the USA. Specifically, their study focused on understanding how individuals perceive and interpret traffic signs, markings, and signal

indications. Through data analysis, the study revealed a significant disparity between the comprehension levels of international drivers and domestic drivers within the USA regarding these traffic control devices." The final result of the research revealed that personal features, certain design elements, and cultural factors can be considered as the key factors affecting the capacity of understanding.

METHODOLOGY

This research was conducted using a survey method where the questionnaire was administered to drivers in the Lagos town area, the population of interest for this study. The research team used 150 randomly distributed questionnaires to the drivers in the private and commercial sectors. Only 142(94.67%) of the questionnaires that were given were returned. The questionnaire was structured into three sections. The initial segment comprised short-answer inquiries designed to gather detailed demographic data about drivers, including age, gender, marital status, educational background, and other relevant factors.

The subsequent section aimed to collect information regarding driving-related characteristics, such as occupation and driving experience. In the following test, the examiner ensured that drivers were able to promptly understand the traffic control devices. It was divided into (1) road signs, (2) traffic signals, and (3) road markings. This group took a 24-question test on traffic signs, which included ten regulatory signs and eight warning signs, and 6 informatory signs.

The second experimental task in which three of the different meanings of traffic light was tested. The outcomes of the third group of test subjects were also similar, with five different road markings being repeated. The chi-square test, which is a statistical tool, was used to assess whether the hypotheses regarding driver characteristics were true or not. The following null and alternative hypotheses were formulated.

Ho - The comprehension of traffic control devices and the characteristic comprehension are independent of each other.

Hi: - Contrary to Ho (null hypothesis not true). Chi-square (test chi-square) is one of the most widely used measures of the goodness-of-fit, employed for comparing the expected frequencies of cells with their observed counterparts.

FINDINGS PRESENTATION

Personal Characteristics of Drivers

Table 1 provides a general summary of the personal traits of the respondents who participated in the survey, which were 142 in number, the majority of whom were male (137). In contrast, others were female (5). The age distribution shows a high number of young people who are below the age of 36 (69%) as compared to the other group of people who are over the age of 35 (31%). The table revealed that among drivers, NCE/OND qualifications are the most common (42.5%), followed by WAEC (27.9%), HND (16.2%), and B.Sc. (13.4%).

Table 1: Personal Characteristics of Drivers

Characteristics		Sample No	Percentage %
Gender	Male	137	96.5
	Female	5	3.5
Age (years)	20 – 25	34	23.9
	26 – 30	35	24.7
	31 – 35	29	20.4
	36 – 40	24	16.9
	41 and above	20	14.1
Marital Status	Single	44	31
	Married	95	66.9
	Divorced	3	2.1
Educational background	WAEC	68	47.9
	NCE/OND	32	22.5
	HND	23	16.2
	B.Sc.	19	13.4

Driver Comprehension of Warning Signs

Table 2 is an evaluation of driver comprehension for eight warning signs, revealing an average correct answer rate of 56.1%, indicating a need for improvement. Drivers could recognize what

the different signs were for, “Roundabout” 90%, “T-Junction” 71.8%, and “Four-way junction” 82.9%. Locate the sentence that has the same meaning or the word. This could be attributed to the fact that many students who drink in college are aged between 18 to 21 years.

The visual aids of the self-explanatory graphics are applied to the signages. The signs that were most misinterpreted were the dangerous double bend (34.5%), the narrow bridge (33.8%), and the two-way traffic (37.3%).

Table 2: Understanding of Warning Signs

Signs	Meaning of Sign	Percentage %
	Roundabout	90
	T – Junction	71.8
	Dangerous Double Bend	34.5
	Two Way Traffic	37.3
	Narrow Bridge	33.8
	Four Way Junction	82.9
	Road Hump / Uneven Road	48.6
	Pedestrian Crossing	50

Comprehension of Regulatory Signs

Table 3 shows that the experiment was made of 10 regulatory signs that were examined. An average score of 60.3% indicated that student performance fell below expectations and demonstrated the highest comprehension for signs indicating speed limit (83.1%), no parking (79.6%), no right turn (75.4%), and no left turn (66.9%). Conversely, the 'no horn' (35.8%) sign

had the lowest understanding. The answers that are mostly correct could be attributed to the visualization characteristic of this module.

Table 3: Comprehension of Regulatory Signs

Signs	Meaning of Sign	Percentage %
	No Right Turn	75.4
	No Parking	79.6
	No Left Turn	66.6
	No U-Turn	44.9
	No Overtaking	42.3
	No Horn	35.8
	No Pedestrian Crossing	71.1
	Speed Limit	83.1
	No Stopping	47.2
	No Waiting	38.7

Driver Comprehension of Informational Road Signs

Table 4 presents the results of the six informational signs that were evaluated. The average comprehension of informational signs reached 64.6%, falling short of the benchmark. The two indications which were comprehended by more than 90% were “Airport,” 91.5%, and “Hospital,” 73.2%, and finally, the third sign was understood by more than two-thirds of the participants, “Filling station,” 67.6%.

Table 4: Driver Comprehension of Informational Road Signs

Sign	Meaning of sign	Percentage %
	Parking	50.7
	Hospital	73.2
	Church	43.7
	Telephone	61
	Filling Station	67.6
	Airport	91.5

Driver Interpretation of Road Markings

An evaluation of five road markings revealed that those who got the correct answers stood at 59%, which was very low. The Centre line and Warning line are the most intelligible items of road markings, with 81.7% and 65.5% comprehensibility, respectively. This relatively big figure is the result of the high participation rate in voting. The existence of such road markings on roads clears any doubts about what they are used for. The least understood ones were "The Fork" 43%, "The Enter" 48.6%, and "The Zebra Crossing" 56.3%.

Table 5: Driver Interpretation of Road Markings

Sign	Meaning of sign	Percentage %
	No Crossing	43
	Zebra Crossing	56.3
	Warning Line	65.5
	Center Line	81.7
	Do not enter the Marked Area	48.6

Drivers' Knowledge of Traffic Signal

The survey specifically focused on driver comprehension of the three primary traffic light signals, yellow, green, and red, which was presented in Table 6, regarding comprehension levels of the three signal indications. The average score on each of the three signal indications was 85%, which is higher than the average, so they understand the subject well. Traffic lights with red, yellow, and green have been used to ensure that all drivers understand traffic signals. The bulk of the 350,000 vehicles at this point operates on traffic signal control.

Table 6: Drivers' Knowledge of Traffic Signal

Signal	Meaning	Percentage %
Red	Danger / Stop	95.8
Yellow	Ready to stop/move	85.9
Green	Safe to move	73.2

Cross-examination of Individual Traits and Understanding of Traffic Control Devices

The qualitative research method was used to study seven signs selected depending on the association of traffic device comprehension and the individual features of drivers. Thus, age and gender are not the main elements that influence but education level is what mainly influences traffic control devices' comprehension. Unlike the other factors, car ownership is the only one that is not included in this study. In this study, marital status and driving experience were not tested.

CONCLUSION

Finally, it can be inferred that driver familiarity with traffic control devices is one of the main causes of the rising safety level on the roads. This investigation proves that drivers, in general, are somehow not so acquainted with various traffic control devices.

Drivers' behavior is affected by their understanding of the topic, which in turn is determined by their educational background, and that has been demonstrated by the means of statistical methods that education is one of the most significant factors in understanding traffic control devices. The outcome coincides with another researcher's finding, which hints that those drivers face a problem in understanding traffic control devices.

The goal of this strategy is to also extend the attention to those with low educational levels. This would be done by providing more information on traffic signs and control devices. Ensuring the roads' safety must be the first and foremost issue of any governmental agency in charge of this job. They should be provided with more tools, such as leaflets and posters, to launch the campaign with the utilization of broadcast media (radio and television), organizing seminars, and hosting talk shows.

Healthy and reasonable road safety laws that are meant to prevent accidents should be appreciated and applied strictly by all drivers at all levels by the authority in charge.

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AUTHOR CONTRIBUTIONS

Wasiu Adenekan oversaw the design, implementation, data collection, analysis, and interpretation of the study, as well as final approval and revision of the manuscript. Kia Eyo Essien provided the drafting of the manuscript.

REFERENCES

Al-Gadhi, S., Naqvi, A., & Abdul-Jabbar, A. (n.d.). *Driver Factors Affecting Traffic Sign Detection and Recall*. Retrieved April 1, 2024, from https://onlinepubs.trb.org/Onlinepubs/trr/1994/1464/1464-005.pdf

Annual Reports – FRSC Official Website. (n.d.). https://frsc.gov.ng/annual-reports/

Bh, R. (n.d.). Kothari Research Methodology Methods and Techniques. https://www.academia.edu/22328603/Kothari_Research_Methodology_Methods_andTechniques

Dissanayake, S., & Lu, J. J. (2001). TRAFFIC CONTROL DEVICE COMPREHENSION: DIFFERENCES BETWEEN DOMESTIC AND INTERNATIONAL DRIVERS IN USA. *IATSS Research*, *25*(2). https://trid.trb.org/view/714962

Kline, T. J. B., Ghali, L. M., Kline, D. W., & Brown, S. (1990). Visibility Distance of Highway Signs among Young, Middle-Aged, and Older Observers: Icons Are Better than Text. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *32*(5), 609–619. https://doi.org/10.1177/001872089003200508

Kline, T. J. B., Ghali, L. M., Kline, D. W., & Brown, S. (1990). Visibility Distance of Highway Signs among Young, Middle-Aged, and Older Observers: Icons Are Better than Text. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *32*(5), 609–619. https://doi.org/10.1177/001872089003200508

Kline, T. J. B., Ghali, L. M., Kline, D. W., & Brown, S. (1990). Visibility Distance of Highway Signs among Young, Middle-Aged, and Older Observers: Icons Are Better than Text. *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *32*(5), 609–619. https://doi.org/10.1177/001872089003200508

Ng, A. W. Y., & Chan, A. H. S. (2008). The effects of driver factors and sign design features on the comprehensibility of traffic signs. *Journal of Safety Research*, *39*(3), 321. https://www.academia.edu/19797265/The_effects_of_driver_factors_and_sign_design_features_on_the_comprehensibility_of_traffic_signs

Oluyemisi, O. (2012). *ARPN Journal of Science and Technology: Understanding of Traffic Signs by Drivers – A Case of Akure City, Ondo State, Nigeria*. Www.semanticscholar.org. https://www.semanticscholar.org/paper/ARPN-Journal-of-Science-and-of-Traffic-Signs-by-%E2%80%93-A-Oluyemisi/6e9b8a734bcc7a60f9e8ec52468361f5fc85593f