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Assessment of Visual Acuity and Visual field and their Relationship with Road Traffic Crashes among Commercial Drivers in North-Central, Nigeria (Case study of Plateau State)

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ABSTRACT

Driving is an intensive visual task that involved good vision. In Nigeria and other countries most people rely on commercial drivers for transporting themselves. In driving, visual acuity plays a vital role in detecting and responding to hazards, navigating the roads and avoiding collisions (Bruce et al., 2023). This study aimed to assess visual acuity, visual field and their relationship with road traffic crashes among commercial drivers in Plateau state North-central, Nigeria. A descriptive cross-sectional study design was used and data were collected for 50 commercial drivers in some selected motor parks in Plateau state. Participant were randomly selected at the motor parks. The study instruments included: Snellen chart letters, measuring tape and a structured questionnaire. The data were analyzed using the Microsoft Excell version 2021. The analysis indicated that, 35(70%) and 36(72%) of the commercial drivers in the selected motor parks in Plateau have adequate visual acuities in Right and Left eyes with 7(14%) and 6(12%) having partial visual acuity of 6/9 in both eyes and 8(16%) have visual acuity defects in both eyes. The results show that out of the participated commercial drivers in Plateau, whose visual field (Peripheral and central visual field) were tested, 43(86%) have normal peripheral visual filed with defects of 7(14%) and 45(90%) have normal Central visual field with defects of 5(10%) in the Right Eye R(E). While 42(84%) have normal peripheral visual filed with defects of 8(16%) and 44(88%) have normal Central Visual filed with defects of 6(12%) in the left eye. The results indicated that, the defects are mostly as a result of the driver's negligence. These defects are associated with Road Traffic Crashes.

Keywords:
Driving,
Commercial drivers,
Visual acuity,
Visual field,
Road traffic crashes.

INTRODUCTION

Visual acuity and visual field are some factors of visual perception that play a crucial role in the performance of commercial drivers as they help to navigate complex roadways and changing traffic conditions (Edwards et al., 2003). Visual acuity in terms of driving, is the ability to see an interprets an object that is a distance away from the driver. It is the reciprocal of the visual angle subtended by the eye expressed in minutes (Dairo et al., 2019).

Visual acuity is a measure of the ability of the eye to distinguish fine or shape and details of an object at a given distance i.e the resolution ability of the eye to see the objects in details.

On the hand, visual field is that space in which objects are simultaneously visible to the steady fixating eye (Murdoch et al., 1997). This according to him is more than a half of a hallow sphere, situated before and around each eye of the observer within which objects are perceive with the eye being fixed at a stationary point.

(Murdoch et al., 1997) pictured visual field as an island field of vision surrounded by sea of blindness with its peak at the fovea. A full and unimpaired visual field is necessary for scanning the road, detecting hazards from the sides, and being aware of surrounding traffic. Any restrictions in the visual field, such as blind spots or limited peripheral vision, can lead to missed road hazards and increase the risk of collisions, particularly when changing lanes or maneuvering in congested traffic.

According to (Oluwaseyi and Kolawole., 2017) Road traffic crash (RTC) constitutes a major public health problem globally, which claims about 1.25 million lives each year and leaves over 50 million people injured. RTCs are responsible for 25% of all deaths globally.

However, road safety awareness receives very little attention (Adegbehingbe et al., 2007).

Driving is the preferred mode of travel worldwide (Aderamo, & Magaji, 2010) and RTCs are an undesirable result of driving. The causes of RTCs could be mechanical, human or environmental. Mechanical causes could include machinery failure, while human causes could be poor driving behaviours, poor driving skills, drunken driving or visual dysfunction (Ojabo et al., 2020).

Visual skills have been found to be among the most important physical abilities that assist motor vehicle drivers to drive safely. It is important to assess the visual abilities of a driver in order to determine the causes of RTCs. To assess driver fitness to drive, visual acuity and visual field have been identified as the important visual functions (Ovenseri-Ogomo & Adofo, 2011).

MATERIALS AND METHODS

Materials

The materials used for this research work include: Snellen chart, measuring tape to measure distance for visual perception, two red cardboard Paper and a red target to test the visual fields and statistical tool: Microsoft Excel version 2021 used for the analysis.

Method:

Research Design

The research design for this study was a Quantitative method to address the objectives of the research. The data collection tool was a questionnaire to assess the biographical data of the drivers about their driving history, importance of good vision, safe driving, and present driving conditions.

Questionnaires

The questionnaires as showed in the appendix A were administered to the participant to assess and gather information on the driver's visual perception habits, Visual acuity, Visual field, Binocular vision, Colour vision and Contrast sensitivity.

Population and Sample Selection

The population of the participated drivers used for this study was 100 commercial drivers in some selected motor park area randomly selected.

Procedure

This research work was done under normal lighting condition in the selected motor park area of all the study area in Plateau state North-Central Nigeria. The assessment of the visual perception was done in two stages: First, the visual acuity, second: the visual field. To be sure of the assessment, the researcher makes sure all participants identified numbers 0, 1, 2…9 before the test was done.

Visual Acuity Assessment

The test was done in a well illuminated sunlight background in the motor park area using the Snellen chart. The Snellen chart was placed at 6m away from the subject using the measuring tape. The subjects occluded the left eye and identify optotypes on the Snellen chart from top to bottom. The points at which the drivers were unable to correctly identify the optotype determine their acuity. After this, the right eye was occluded and driver read from top to bottom until driver could no longer identify correctly the optotype. In this article, 6/6 numeral 7 was taken or considered normal visual acuity while any eye with a fraction less than 1 was considered abnormal.

Visual Field Assessment

The confrontation method was used to test the visual field in order to assess the peripheral visual defect with a red target in the four visual quadrants while the central visual field defect was tested using the two red cardboard paper. In testing the peripheral visual defects, drivers sit at a distance of 1m from the researcher whose visual field has been tested and found normal. The driver occludes the left eye while the researcher occludes the right eye. The driver then fixates on the open eye of the researcher that is not occluded. The researcher brings a red target from the outward direction kept equidistant between researcher and the participant towards the central field of vision.

The participants fixate on the researcher's eye throughout the exam and indicate when target is first sighted with the node of the head. To test the central field defect, the drivers occlude the left eye and fixate on the researcher's nose.

Two red targets are presented to the nasal and peripheral field. If the nasal red target appears pale in color or colourless, the field is defective. The right eye is also tested in the same way. In this work, the normal visual field is represented with numeral 1 and the abnormal visual field is represented with numeral 2.

RESULTS AND DISCUSSION

Table 1 and Figure 1 show that 14(28%) of the commercial drivers have normal visual acuity of 6/6 in the Right (R) eye, 21(42%) have above normal visual acuity of 6/5, 7(14%) have partial visual acuity of 6/9, and 8(16%) have visual acuity defects (6/36, 6/24, 6/18, 6/12) in the Right (R) eye.

In table 1 and Figure 2 show that 13(26%) of the commercial drivers have normal visual acuity of 6/6, 23(46%) have above normal visual acuity of 6/5, 6(12%) have partial visual acuity of 6/9 and 8(16%) have visual acuity defects (6/36, 6/24, 6/18, 6/12) in their left eyes.

The analysis indicated that, 35(70%) and 36(72%) of the commercial drivers in some selected motor parks in Plateau have adequate visual acuities in Right and Left

eyes with 7(14%) and 6(12%) having partial visual acuity of 6/9 in both eyes and 8(16%) have visual acuity defects in both eyes.

Table 2 and Figure 3 shows that, the commercial drivers in Plateau, whose visual field (Peripheral and central visual field) that were tested, 43(86%) and 45(90%) have normal Visual Field with field defects of 7(14%) Peripheral visual field and 5(10%) Central Visual Filed in the Right Eye R(E).

Table 2 and Figure 4 shows that, 42(84%) and 44(88%) have normal Visual Field with defects of 8(16%) and 6(12%). These indicated a total defect of 15(30%) and 11(22%) detected in Right and Left Eye of the Commercial Drivers in Plateau. These defects are mostly as a result of Glaucoma which is associated with the Road Traffic Crashes.

Comparing the result of this study which showed that there is a relationship between the visual perception of 24 (48%) drivers and Road Traffic crashes with research by Ojabo et al. (2020) in a study assessment of visual acuity of commercial vehicle drivers in Makurdi, Benue State, North-Central Nigeria to investigate the visual acuity and the relationship between visual acuity and rate of road traffic accident (RTAs) among commercial vehicle drivers in Makurdi, North Central Nigeria and found out that there was no correlation between visual acuity of the drivers and the number of road traffic accident. The researcher conclude that the prevalence of visual impairment in the study was low and that there was poor relationship between visual acuity and road traffic accident. The result of the research by Ojobo et al. (2020) shows that, 25% of drivers had subnormal visual acuity (<6/12), 15% had uncorrected refractive errors. The results also show that, one hundred and twenty-two (122) commercial vehicle drivers were enrolled for the study with a mean age of 33.8 + 0.81 years. 98.4% (n=120) of the drivers had normal visual acuity in both eyes. The analysis showed that there was no correlation between visual acuity of the drivers and the number of road traffic accident.

Comparing the result of the study which shows a total defect of 15(30%) and 11(22%) was detected in Right and Left Eye of the Commercial Drivers in Plateau with research by Vofo et al. (2021) in a study Visual assessment of commercial drivers in the South West Region of Cameroon. The results of the study showed that, the visual acuity in the better-seeing eye of participants was less than 6/9 and 6/12 in 14.1% and 10.6% of commercial drivers respectively. Seventy-five percent of commercial drivers with self-reported poor vision and 95% of CDs with VA < 0.5 had a history of RTCs compared to 55.8% of CDs with self-reported good vision and 55.7% of CDs with VA ≥ 0.5 ($p < 0.05$). The authors concluded that injuries from RTCs were more common in commercial drivers with poor vision (81.1%) and in those with VA < 0.5 (90.5%) compared to CDs who have good vision (55.8%).

Table 1: Percentage of Visual Acuity in Plateau.

S L R (E)	Frequency	Percentage	S L L(E)	Frequency	Percentage
6/24	0	0	6/24	3	6
6/18	4	8	6/18	1	2
6/12	4	8	6/12	4	8
6/9	7	14	6/9	6	12
6/6	14	28	6/6	13	26
6/5	21	42	6/5	23	46
TOTAL	50	100	Total	50	100

Key: SL Snellen letters; RE Right eye; LE Left e 6/5 Visual acuity value

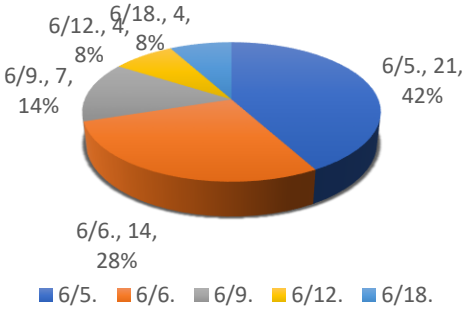

Figure 1: Percentage of visual acuity of commercial drivers' right eye of in Plateau

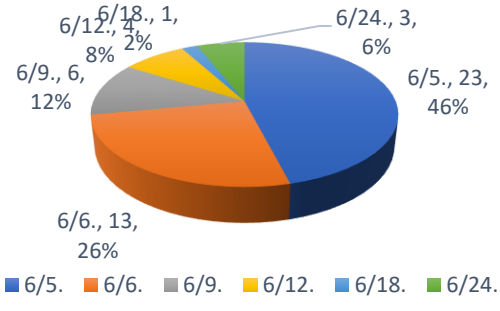

Figure 2: Percentage of visual acuity of commercial drivers left eye of in Plateau

Table 2: Visual Field in some selected motor park areas in Plateau.

Left Eye			Right Eye		
	Frequency	**Percentage**		**Frequency**	**Percentage**
PFNVF (1)	43	86	PFVFN (1)	42	84
AB (2)	7	14	AB (2)	8	16
CFVN (1)	45	90	CFVN (1)	44	88
AB (2)	5	10	AB (2)	6	12

Key: Peripheral visual field (V); Central visual field (CVF); Abnormal visual field (AB); Normal Visual field (NVF)

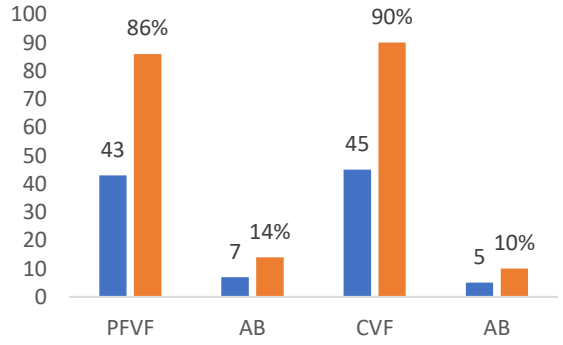

Figure 3: Graph of Visual field right eye

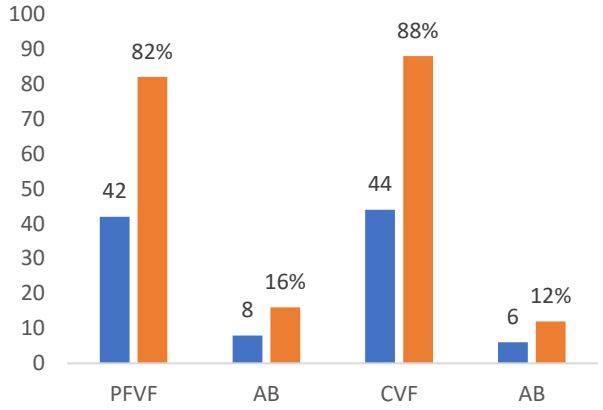

Figure 4: Graph of Visual field right eye

CONCLUSION

The article shows that, there is a relationship between the Visual perception of 24 (48%) drivers and Road Traffic crashes. This indicated that, 42(84%) and 44(88) have adequate Visual acuity in both right and left eye. Visual Filed, Binocular Vision and Contrast Sensitivity in both Right and Left eyes respectively. The article indicated a total defect of 15(30%) and 11(22%) was detected in Right and Left Eye of the Commercial Drivers in Plateau. This defect calls for regular eye test among the commercial drivers before driving license should be issued out. The defect is mostly as a result of careless of the drivers and is associated with the Road Traffic Crashes.

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