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Comparative Visual Perception Measurement among Some Commercial Drivers in Jos and Environs

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ABSTRACT

The importance of visual acuity for safe driving cannot be over emphasized. This research work measured the visual perception of some drivers. This study comparatively analysed using the t – test on the visual perception of 100 drivers were carried out to determined visual acuity, visual field, binocular vision and colour vision perception of drivers in Jos and environs. A questionnaire was used to get information on the driving history of all the drivers. The Snellen letters and the Tumbling E chart was used to test the visual perception of driver's right eye and left eye. The confrontation method was used to measure the visual field and binocular vision of the drivers. The color vision of the drivers was detected using the Ishihara color Book 1995. The information from the questionnaire showed lacked of eye test by many of the drivers. The results showed that using both the Snellen letters and Tumbling E indicated 75% and 62% have normal visual acuity with 25% and 38% have abnormal visual acuity in the right eye and left eyes respectively. The normal of visual field indicated that 84% (R), 88% (L) of the drivers have normal peripheral visual field with16% (R), 12% (L) have defects in peripheral visual. This work indicted 88% have central visual field with defects of 12% in the right eye and 87% have normal central visual field with 13% defects in the left eye. For the binocular vision, the study indicated 89% have normal with 11% defects. The color test plates of 1995 detected total color defect in only 13 of the drivers. These showed that 87of the drivers have good color vision. The SPSS software version 23 of 2015 was used to analysed the results. The study comparatively using the t –test to test the visual perception of 100 drivers was carried out to determine the visual acuity, visual field, binocular vision and color vision perception of drivers in Jos and environs. The analysis indicated a significance of 0.103, 0.304 and 0.587, 0.208 respectively for Snell letters and Tumbling E was obtained for both right and left eyes. A significance of 0.500 was obtained for visual field, binocular vision and color vision. These showed that there is a significance difference in the visual acuity, visual field, binocular vision and color vision of the drivers since their significance values were greater than the p – 0.05. This implies that there is an increase in the abnormality of visual perception of the drivers and this make driving unsafe for 25 of the drivers. A cut-off value of 6/9 and 6/24 in the right and left eye were established based on the FRSC visual acuity standard for commercial drivers in Nigeria. This work indicated that a visual acuity of less than the cut – off mark showed that driving is unsafe. In this research, the visual perception of drivers was not dependent on age or years of driving and that drivers can always go for eye test.

Keywords: Vision, Visual acuity, visual field, commercial drivers, safe driving

INTRODUCTION

The importance of vision perception to human beings cannot be over emphasized. Without vision one is in perpetual journey to a world without arrival. Vision welcomes one to the world and the ability to perceive, discriminate colours and welcomes one to a world of beauty. It is established that 83% of information received is through vision, 11% through hearing, 1% through tasting, 3.5% through smelling (Jeff, 2012). This shows that good vision is conducive to learning.

In the visual world, objects are considered in terms of their temporal, spatial and spectral or color composition. Visual perception is concerned with detection, recognizing, resolving and identifying of objects. It is the ability to interpret the environment by meaningfully integrating information in visible light. These information are received through the sense organ and transmitted to the brain. McLeod, (2007) discussed that Gregory viewed visual perception as a reality dependent on environment as well as past or stored information. He argued that visual perception is environmental with sensory information being analyzed from simple raw materials to complex analysis through the visual system. (1978) stated that three major components are involved in visual perception with the eyes to focus an image from the outside world unto the retina, the millions of nerves that carry the information into the brain and the visual cortex that interprets all the impulses reaching it. They (John and Weiley 1978) further stated that blindness results if any one of the parts does not function.

Most vision is restricted to the macula lutea and all detailed vision take place in the fovea centralis (John 1978). Rods used for scotopic vision and cones for photopic visions are symmetrically distributed in all directions except the blind spot.

Visual perception is very important in our daily activities and different professions. It is quite regrettable for one to lose his sense of vision as it helps us appreciate beauty, avoid certain danger and complete certain task with ease.

Commercial drivers are considered to be very important in the socioeconomic development of any country, especially in a developing country such as Nigeria, where majority of the people go on public transport. This reliance on public transportation makes operators of commercial vehicles an important component of the socioeconomic development hence the need to ensure its safety. While recent study, have shown an increase in the rate of road traffic crash (RTC) globally.

According to Aderamo (2010), developing countries like Nigeria are bearing disproportionately high burden of injuries and fatalities. Ability to see is inarguably a fundamental component of safe driving because driving relies heavily on vision for its successful execution. Vision constitutes about 95% of the sensory requirements for driving. Clear and comfortable vision is important for driving for a number of reasons which includes; to judge distances, in reading of road signs and traffic lights as well as in responding to changes in the environment quickly and efficiently. Impaired visual function may translate to delayed response or failure to perceive potentially dangerous situations exposing the drivers, passengers and other road users to avoidable dangers. Therefore, a driver's vision will largely determine how efficiently he will perform; this may consequently influence the occurrence of road traffic crashes (RTCs). In terms of the standard for driving, the maximum distance visual acuity (VA) requirements for driving in Nigeria as set by the Nigeria Federal Road Safety Corps (FRSC) is 6/9 in the right eye and 6/24 in the left eye for commercial drivers in Nigeria (Chidoka, 2012). A continuous horizontal binocular visual field of 140o or more and 20o continuous above and below fixation with both eyes open and examined together is recommended for Nigerian drivers. Any visual field of less 110o horizontally should be a contradiction for driving in Nigeria (FRSC training manual, 2011). Compliance to this standard is important in driving since an adequate field of vision is important to safe driving as well as good visual acuity (Aderamo, 2010)

MATERIALS AND METHODS

Subjects

The subjects consist of 100 commercial drivers in Jos and environs.

Materials

The materials used in this research work include; Snellen chart, the tumbling E chart, and a measuring tape for the measurement of the visual acuity. Ishihara colour book 1995, for measurement of colour vision defect, two red cardboard and a red target to measure the visual fields and Binocular vision. A Questionnaire was used to get information about driving history of the 100 drivers.

Procedure

This work was done under normal lighting condition at the motor park area. The measurements were in four stages: first, the visual acuity was measured using the Snellen letter and tumbling E. The colour vision was measured using the Ishihara colour book 1995. The visual field (peripheral and central) test and binocular vision was measured using the confrontation method.

Visual Acuity Measurements

The test was done in the motor park area using both the Snellen chart and the tumbling E from the ophthalmology department of Plateau State Specialist Hospital (PSSH) Jos.

First the tumbling E was used followed by the Snellen letter chart for subjects to get used to the process since the tumbling E test is much easier.

The chart was held at 6m away from the subject using the measuring tape. The left eye was occluded with an ocluder and subjects read from top to bottom of chart. For the tumbling E, the investigator points at the E on the chart and subjects indicate by pointing with the finger the direction in which the fingers of the letter E points from top to bottom. After this, the right eye was occluded and subjects read from top to bottom until subjects can no longer identify correctly the direction the E points. The Snellen letters was used after the tumbling E at the same distance.

The subjects occlude the left eye and identify optotypes on the Snellen chart from top to bottom. The points which subjects cannot correctly identify the optotype determine their acuity. The acuity measurement will be represented with numerals as in Table 1 showing visual acuity measurements and its equivalent in meters. In this work, 20/20 and 6/6 numeral 7 will be taken or considered normal while any eye with a fraction less than 1 will be considered abnormal.

Ishihara Colour Test

The test was carried out on drivers in the motor park area within Jos and environs. The Ishihara colour test book 1995 which consists of 24 plates was used. Plates number 1-17 are numerals. 18 -24 are windings to be traced by those who cannot identify numbers. All participants have at least primary school education and can identify numbers. To be sure, participants identify numbers 0, 1, 2…9 before the test is done. The colour book starting from plate 1 is held at arm's length and subjects identify the numerals seen within an interval of two seconds. The identification is done for the left eye with the right eye occluded and for the right eye with the left eye occluded.

The 24 plates edition 1995 Ishihara colour test book for colour vision deficiency have the normal non defective eye reading the plates as in table 2. In this work, when participant sees nothing, it will be marked as 'X' otherwise whatever is seen is being recorded. The interpretation for normalcy and abnormality in the colour vision is summarized in Table 2. Plates number 16 and 17 will test for protan and deutan colour deficiency and its severity. The numerals in parenthesis shows the number cannot be read clearly.

Visual Field

The confrontation method for visual field measurement was used. The peripheral visual defect is being tested with a red target in the four visual quadrants while the central field defect was tested using the two red cardboard paper.

In testing the peripheral visual defects, participant sits at a distance of 1m from the researcher whose visual field has been tested and found normal. The subject occludes the left eye while the researcher occludes the right eye. The subjects then fixate on the open eye of the researcher that is not occluded. The examiner brings a red target from the outward direction kept equidistant between researcher and the participant towards the central field of vision. The remaining three direction; inward, upward and downward direction is being tested to measure tunnel 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 measure the central field defect, the subjects 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 colour or colourless, the field is defective. The right is tested in the same way. The binocular vision was measured with both the two eyes open. In this work the normal visual field, binocular vision is

represented with the numeral 1 and the abnormal visual field, binocular vision, is represented by the numeral 2.

RESULTS AND DISCUSSION

Socio-demographic data

One hundred commercial drivers participated in the study. The age of the respondents ranged from 20 to 80 years with a mean age of 25±14.96 years. Majority (80%) of the drivers were in the age group 31 – 60 years. The respondents were all male. Many of the respondents (50%) had secondary education, (33%) had tertiary education and only (17%) had primary education. Majority (73%) of the respondents were married while 27% were single

Driving Safety

About one – third of the respondents (34%) had been involved in Road Traffic Crash (RTC) one, twice and thrice in the past years

Table 1 Socio-demographic variables (N=100)

Age Group	Frequency	Percentage
18 – 30	6	6%
31 – 60	80	80%
61 – 80	14	14%
EDUCATIONAL LEVEL		
Primary	17	17%
Secondary	50	50%
Tertiary	33	33%
MARRITAL STATUS		
Single	27	27%
Married	73	73%
EYE TEST		
Yes	39	39%
No	61	61%

Table 2 shows that one – third (32.4%) of the road traffic crashes were due to vehicles factor. Only (11.8%) and (5.9%) had their road traffic crash due to eye problem and over speeding

Table 2 Road Traffic crash among respondent

Variables	Frequency	Percentage
Involvement in Road Traffic in the past years		
Yes	34	34%
No	66	66%
Number of Road Traffic in the past (34)		
Once	66	66%
Twice	16	47%
Thrice	11	32.4%
Fourth	2	5.9%
Causes of road traffic Crash (=34)		
Road factor	6	17.6%
Vehicular factor	11	32.4%
Haman factor	8	32.4%
Animal factor	3	8.8%
Eye Problem	4	11.8%
Over speeding	2	5.9%

Visual function assessment

Table 3A and figure 3 show using the Snellen chart majority (83%) of the drivers had normal visual acuity in the right eye and 17% have inadequate visual acuity. Table 3 and figure 4 showed that 85% have normal visual acuity and only 15% inadequate visual acuity in the left eye. Considering table 3 and figure 3 and 4 shows that in terms of the standard for driving in Nigeria, maximum distance visual acuity requirement as set by the Nigerian Federal road safety (FRSC) which is 6/9 in the better eye and 6/24 in the left commercial drivers (Chidoka, 2012)

Table 3A and figure 5 and 6 revealed that 84%, 88% of the respondents have good peripheral visual field in their right and left eye respectively. Majority of the respondents 88%, 87% have good central field ability in the right and left.

Table 3A Visual Acuity Perception of Drivers

Variables	frequency (%)	Frequency (%)
Visual acuity	**Right eye**	**left eye**
Normal	83%	85%
Abnormal	17%	15%
Visual field		
Peripheral visual field		
Normal	84%	88%
Abnormal	16%	12%
Central visual field		
Normal	88%	87%
Abnormal	12%	13%
Colour vision		
Normal	85%	87%
Abnormal	15%	13%

This result shows that 16%, 12% have abnormal peripheral visual field in the right eye and left eye while 15%, 13% indicates abnormal central visual field in the right and left eye respectively. In table 3a

indicates (85%), (87%) of the drivers has good colour in the right eye and left eye while 15%, 13% have colour vision defects in the right and left eye.

This study indicates that majority (80%) falls within the age group of 31-60 years. This shows that commercial driving occupation is usually done by adults who are active enough. Majority (50%) of the respondents had secondary education, 17% proportion had primary education and 33% had tertiary education. Just 39% of the drivers in the study passed through a driving test at first licencing but large proportion (61%) of them could not passed through a driving test at first. This is a clear indications that some drivers with poor visual acuity may be certified as fit for driving even when they are deficient if compared to the visual acuity standard set by FRSC of 6/9and 6/24 in the right eye and left eye. This study shows that, respondents past history of visual function revealed that majority (86%) of them have good peripheral visual field perception with goo distance vision detection ability of 6 meters.

The study shows that majority (84%) of the drivers had normal acuity for driving base on FRSC visual acuity standard for commercial driving in Nigeria (Nwosu,-*et, al* 1999)

Table 4 Visual Acuity of Commercial Drivers Right Eye

Variables		Frequency	percentage (%)
Valid	6/24	2	2
	6/18	10	10
	6/12	5	5
	6/9	15	15
	6/6	23	23
	6/5	45	45
	Total	100	100

Table 5 Visual Acuity for Commercial Drivers Left eye

	Variables	**Frequency**	**Percent (%)**
Valid	6/36	1	1
	6/24	5	5
	6/18	2	2
	6/12	7	7
	6/9	13	13
	6/6	24	24
	6/5	48	48
	Total	**100**	100

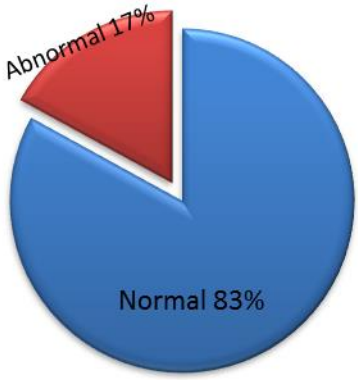

Figure 1 visual acuity in the right eye

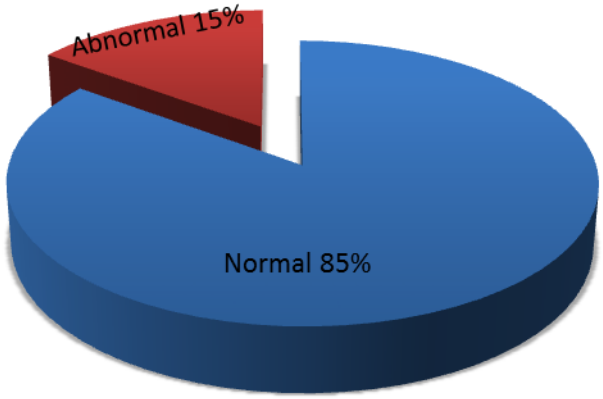

Figure 2 Visual acuity in the left eye

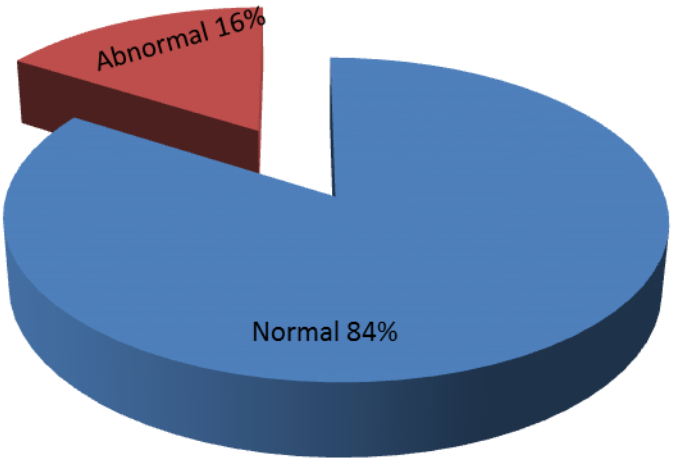

Figure 3 Peripheral visual field in the right eye

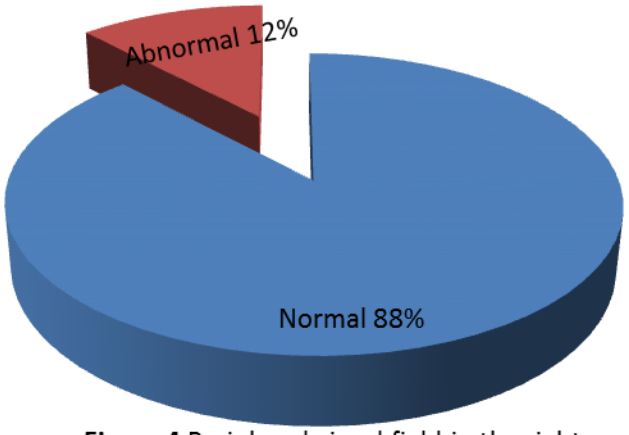

Figure 4 Peripheral visual field in the right eye

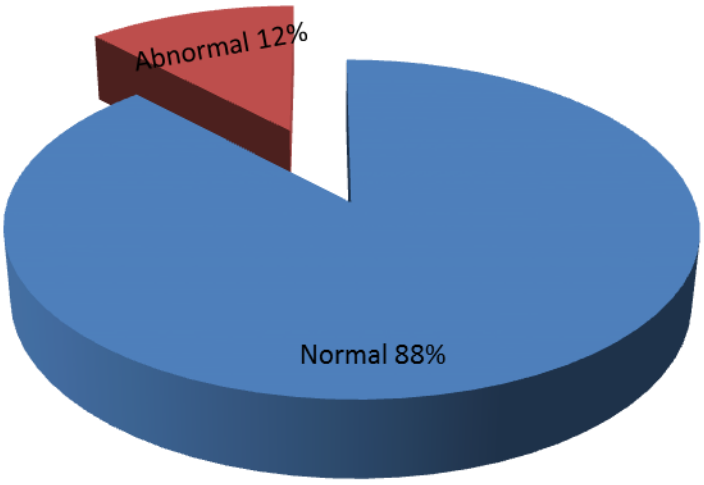

Figure 5 Central visual field in the right eye

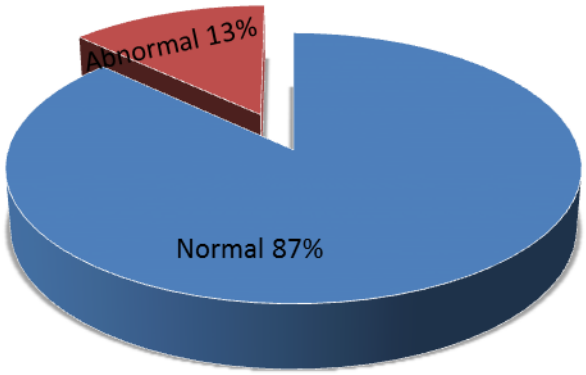

Figure 6 central visual field in the left eye

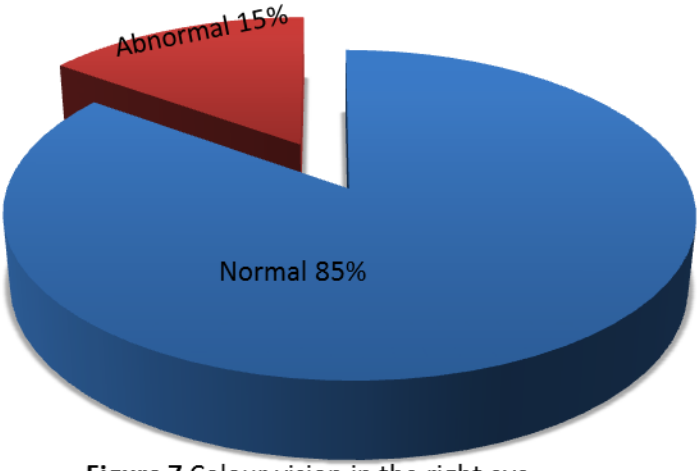

Figure 7 Colour vision in the right eye

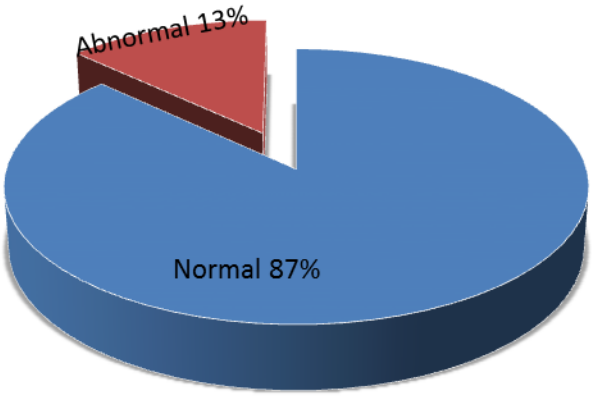

Figure 8 Colour vision in the left eye

Table 3 figure 7 and 8 indicates that (88%), (87%) of the drivers have good central visual fields in the right and left eye. This shows that driving a vehicle along a road and through intersections involves the simultaneous used of central and peripheral vision which requires monitoring of primary and secondary tasks (Aderamo, 2010). Figure 9 and 10 indicated that (85%) out of the 100 drivers have good colour vision perception in the right eye and (87%) in the left eye with (15%), (13%) as colour defects in the right and left eye respectively. This showed that a significance difference of 2% with a prevalence of 2% impaired defects. In figure 5 and 6, 4% significance difference in peripheral visual field with 4% prevalence impairment. This study also showed that a1% significance were seen in central visual field of the drivers as found in figure 7 and 8.

CONCLUSION

The visual acuity of 100 drivers showed a significance difference and cut-off value of 6/9 and 6/24 in the right and left eye were established based on the FRSC visual acuity standard for commercial drivers in Nigeria. In this research a significant association was found to exist between visual acuity and involvement in road traffic crash. There were no significant association found between visual field defects and abnormal colour vision and involvement in road traffic crash.

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