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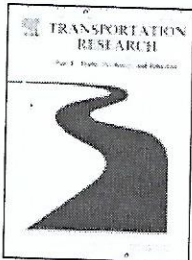
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Young drivers and speed selection: A model guided by the Theory of Planned Behavior Original Research Article

Pages 219-232

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► The Theory of Planned Behavior was used to model two different outcomes. ► Intention to decrease speed and actual speed selection were measured in young drivers. ► Norms and perceived behavioral control significantly explained both outcome variables. ► Attitudes toward speeding did not predict actual speed selection. ► Pedestrians walking along the road are significant deterrents of speeding behavior.

Use of change blindness to measure different abilities to detect relevant changes in natural driving scenes Original Research Article

Pages 233-242

Arnaud Koustanai, Pierre Van Elslande, Claude Bastien

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► Change detection depended greatly on driving experience, the environmental setting and the task at hand. ► Change detection abilities reflect in some respect inability to detect hazard in real driving. ► Results were not conclusive when considering an overtaking manoeuvre. ► Change detection was strongly correlated with subjective judgement on manoeuvre difficulty.

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► The influence of a zebra crossing on behaviour and perceptions. ► The crossing location was used more when the zebra was installed. ► The zebra crossing

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reduced both observed and perceived waiting time. ▶ The zebra crossing increased feeling of safety and decreased vulnerability to traffic.
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Ioannis Kaporias, Michael G.H. Bell, Ashkan Miri, Carol Chan, Bill Mount
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- ▶ Pedestrians feel more comfortable with few vehicles, many pedestrians and safe zones. ▶ Female and older pedestrians feel less comfortable in shared space. ▶ Drivers feel less confident with many pedestrians, and in particular children and elderly. ▶ Male drivers and drivers with previous shared space experience are more willing to share. ▶ Good lighting improves the perceptions of both pedestrians and drivers.
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Abstract

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The study investigated motorcycle operators in Minna city with a view to observing the riders' signaling behavior and the presence or absence of navigational aids and their usage. The study was carried out in three stages. First, a 15 min rapid survey of 3135 motorcyclists was carried at both ends of three pre-selected busy roads with emphasis on observing the possession of navigational aids by the motorcyclists. Secondly, another set of study on signaling behavior was carried out in another three junctions within a 15 min period and finally an interview was conducted among 120 commercial and private motorcyclists from commercials and office parks for a more detailed study. The mean age and mean year of riding experience of the commercial motorcyclists were 28 (SD = 5.9) and 4 years (SD = 2.1) respectively compared to 32 (SD = 7.4) and 7 (SD = 7.4) years for private motorcyclists. The findings show that 18.1% of the motorcyclists had no trafficators and as high as 85.3% had no side mirrors. Of the 626 motorcyclists studied for signaling behavior, 574 (91.7%) failed to trafficate while turning at junctions. It was also found that 65 (54.2%) of the 120 motorcyclists interviewed had accidents with their motorcycles. Chi Squared test shows that effect of possession of side mirror on accident experience is not statistically significant ($\chi^2 = 2.11, p = .349$) while possession of trafficators ($\chi^2 = 5.99, p = .050$) and driving license ($\chi^2 = 12.603, p = .000$) are statistically significant. The study revealed that 61.5% of motorcyclists that have trafficators had experienced accidents which points out the fact that riding behavior is more critical in road safety than having a perfect

Velocity versus safety: Impact of goal conflict and task difficulty on drivers' behaviour, feelings of anxiety, and electrodermal responses Original Research Article

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- Drivers chose a lower speed the higher their conflict between velocity and safety.
- Self-reported anxiety, attention and arousal increase with drivers' goal conflict.
- Task difficulty causes speed reduction and increased self-reported anxiety.
- The effects of goal conflict and task difficulty do not interact.

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- The acceptability of section control, informative ISA, and EDR is relatively high.
- EDR is accepted to a lesser extent than section control and informative ISA.
- EDR has greater privacy implications than section control and informative ISA.
- General beliefs (e.g., problem awareness) are important for acceptability.
- Specific beliefs (e.g., perceived fairness) are important for acceptability.

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- We model the overtaking of young drivers in two-lane highways via Bayesian Networks.
- Relevant data are derived from a driving simulator experiment.
- Male drivers, on average, accept smaller gaps for overtaking than female drivers.
- Microscopic traffic characteristics are found to influence the decision to overtake.
- The spacing is more influential than vehicle's speed to the probability to overtake.

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- Drivers reported higher internality and lower externality after training.
- Changes in

internality/externality independently predicted change in driving behavior. ▶ Training motivation and pretraining self-efficacy predicted changes in driver LOC.

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▶ Effect of cognitive secondary task on eye movements recorded in rural road driving. ▶ Occlusion point defined as the nearest point where the view of the road is blocked. ▶ When approaching a curve with an open view, drivers glance towards the occlusion point. ▶ Glances toward the occlusion point can be interpreted as visual anticipation of potential hazards. ▶ Executive working memory load leads to a significant decrease in visual anticipation.

Exploring the ability to identify visual search differences when observing drivers' eye movements Original Research Article

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▶ Novices and learners correctly classified the eye movement traces of other learners. ▶ Drivers can extract information about scanning strategy just by watching a video. ▶ Training interventions should take into account in-group identification tendencies.

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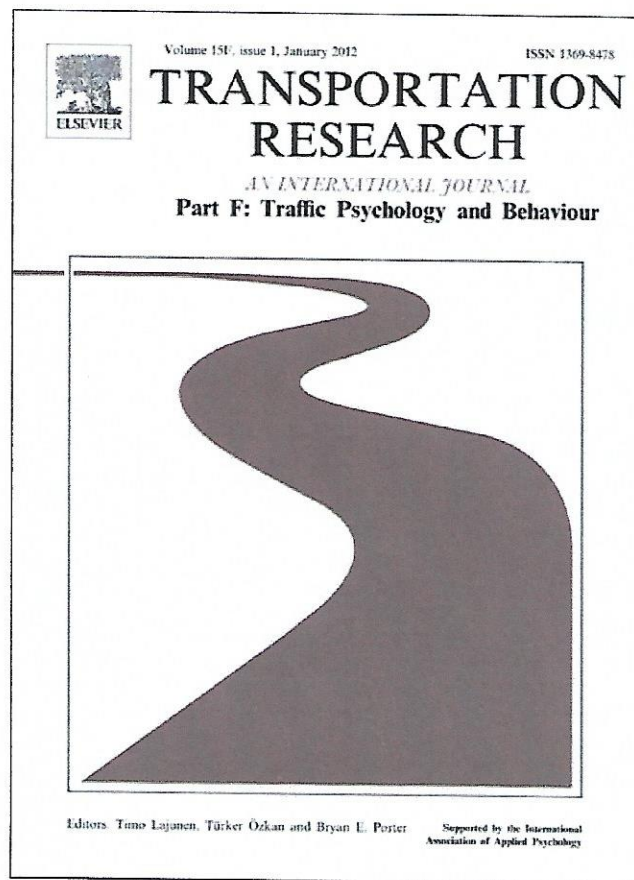
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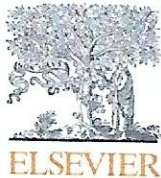
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Flying without navigational aids – The case of commercial motorcyclists in Minna, Nigeria

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ABSTRACT

The study investigated motorcycle operators in Minna city with a view to observing the riders' signaling behavior and the presence or absence of navigational aids and their usage. The study was carried out in three stages. First, a 15 min rapid survey of 3135 motorcyclists was carried at both ends of three pre-selected busy roads with emphasis on observing the possession of navigational aids by the motorcyclists. Secondly, another set of study on signaling behavior was carried out in another three junctions within a 15 min period and finally an interview was conducted among 120 commercial and private motorcyclists from commercials and office parks for a more detailed study. The mean age and mean year of riding experience of the commercial motorcyclists were 28 (SD = 5.9) and 4 years (SD = 2.1) respectively compared to 32 (SD = 7.4) and 7 (SD = 7.4) years for private motorcyclists. The findings show that 18.1% of the motorcyclists had no trafficators and as high as 85.3% had no side mirrors. Of the 626 motorcyclists studied for signaling behavior, 574 (91.7%) failed to trafficate while turning at junctions. It was also found that 65 (54.2%) of the 120 motorcyclists interviewed had accidents with their motorcycles. Chi Squared test shows that effect of possession of side mirror on accident experience is not statistically significant ($\chi^2 = 2.11, p = .349$) while possession of trafficators ($\chi^2 = 5.99, p = .050$) and driving license ($\chi^2 = 12.603, p = .000$) are statistically significant. The study revealed that 61.5% of motorcyclists that have trafficators had experienced accidents which points out the fact that riding behavior is more critical in road safety than having a perfect vehicle. The study recommends, among others, that the Federal Road Safety Corps and Vehicle Inspection Officers should be as strict with the motorcyclists as they are with the motorists in enforcing road safety.

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1. Introduction

The inadequacy of urban mass transit programmes in Nigeria is best gauged by the preponderance of commercial motorcycles (variously called "okada", "akauke", "going") on virtually all urban roads in the country. Motorcycle usage in the past was common as private means of transportation to work, recreation and courier services. The rising level of unemployment, especially among the youths, high rate of urbanization which has tended to further lengthen the home-work distance, the failure of the urban mass transit programme to meet the demand for mobility and inaccessibility of some neighborhoods in the city make the emergence of commercial motorcycles inevitable. Available records show that the number of registered motorcycles in Nigeria rose from 218,802 in 2001 to 1,016,514 in 2004 while the corresponding figures for Niger State of which Minna is the capital city during the same period was 7237 and 25,272 (Gbadamosi, 2006). A check on the records at the Federal Road Safety Corps Office in Minna shows that a total of 333 motorcycles comprising 151 private and 182 commercial were registered in 2010 as against 266 and 226 for cars and buses respectively.

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Concomitant to this rise in the number of motorcycle taxis is the rate of accidents involving commercial motorcycles put at (31%) of the total road traffic accidents in the country between 2000 and 2005 (Olawole, 2010), and the high incidence of crime among the motorcyclists, which has reached a high point recently. In Lagos state, Nigeria, between January and December 2011, 346 robbers were nabbed on "okadas", and between October and November 2011, 79 robbery cases were reported (Balogun, 2011). This and other cases of negative externalities of "okada" business have resulted in the banning or restricting "okada" taxis to certain parts of the city or certain hours of the day from city to city in the country.

In terms of accidents, Nwadiaro, Ekwe, Akpayak, and Shitta (2011) for instance observed that 30.3% of all the road traffic accident victims admitted into the Jos University Teaching Hospital in Nigeria between April 2006 and March 2007 were motorcycle accident victims. A study of 363 motorcycle road traffic injuries by Oluwadiya et al. (2009) is also quite revealing. Their study shows that 68.9% of the patients sustained their injuries while walking or going to walk and 23.4% on their way to school. Furthermore, 176 (48.5%) of the crashes were as a result of collision with other moving vehicles and in 83 (22.3%) cases, either the motorcycle or the other vehicle is moving against the traffic. A further deduction from this study reveals that the motorcycle riders' behavior is a major contributing factor as 31.7% of the cases involved motorcyclists travelling at night without headlamp.

A study by Olusanya and Williams (2004) in South-West Nigeria concerning level of compliance with safety rules showed that only one among 480 motorcyclists observed wore a helmet. Other safety problems observed included speed, failure to stop at a junction before entering a main road, wearing non-protective light clothing and slippers, carrying in excess of one passenger, and failure to make appropriate turn signals.

As observed by Schneider, Savolainen, Van Boxel, and Beverley (2012), an unfortunate fact related to motorcycle crashes is that many crash-involved riders tend to exhibit a series of high-risk behaviors, such as being inappropriately licensed, uninsured, under the influence of alcohol, riding without a helmet, or speeding. In Vietnam, Tuan and Shimizu (2009) have attributed 70% of the total motorcycle and automobile accidents to the risky behaviors of the drivers. The authors examine the "grouping" behavior of the motorcyclists at junctions. This is a situation where the motorcycles usually move in groups while crossing the intersection. They noted that because the majority of the intersections in Hanoi city are two-phased signalized, the conflicts between groups of vehicles going straight (through groups) on the main road and groups of vehicles turning left from the opposite direction of the main road (unprotected left-turn groups) become the most dangerous.

A comprehensive study of vehicle-to-motorcycle conflict and motorcyclist behavior at intersections was also undertaken using video data by Nobuyuki, Maki, Takashi, and Tsutomu (2010). Their investigation revealed that drivers' right turn decision making, which was induced by an oncoming right turning vehicle in the opposite lane, can be a crucial contributing factor for right turn accidents at intersections. Particularly relevant to this present study is the observation that right turn signaling error by the oncoming vehicle (signaling but not actually turning) caused a conflicting situation in 5 out of 63 cases. This point underscores the importance of signaling in vehicular traffic. A situation where the motorcyclists fail to signal while making turns portends even greater risks to other road users.

A bolder attempt by Seyed, Mohsen, Habibollah, and Mehrdad (2011) to comprehensively capture the behavioral risk factors of traffic crashes using a modified version of Elliot, Baughan, and Sexton (2007) 43-item Motorcycle Riders' Behavior Questionnaire (MRBQ) shows that the five most frequently reported behaviors were: "taking someone without helmet", "skid on a wet road or manhole cover", "take a large carriage with motorcycle", "fail to notice or anticipate that another vehicle might pull out in front of you and have difficulty stopping", and "open up the throttle and just 'go for it' on country roads". The five least frequently reported behaviors were found by the authors to comprise: "have a crash with a parked vehicle and make damage to it but escape from crash scene", "ride when taking drugs or medications which might have effects on your riding", "attempt to do, or actually do a wheelie", "unintentionally do a wheel spin", and "intentionally do a wheel spin".

However, conspicuously missing in all the factors of crashes considered by the various scholars, including those considered in the 43-item MRBQ, is the effect of non-signaling by the motorcyclists and missing navigational aids on the motorcycles. An attempt by Rößger, Hagen, Krzywinski, and Schlag (2012) only shows that motorcycles with a T-shaped light configuration are more quickly identified, particularly when the motorcycles are in visual competition with other motorized road users.

Most of the previous studies on "okada" saga in Nigeria too have tended to concentrate on the emergence of commercial motorcycle and characteristics of the riders (Gbadamosi, 2006; Ogunsanya & Galtima, 1993; Oyesiku, 2001), injury types (Kopjar, 1999; Nzegwu, Aligbe, Banjo, Akhiwui, & Nzegwu, 2008; Solagberu et al., 2006; Nwadiaro et al., 2011), use of psychoactive substance by the riders (Alti-Muazu & Aliyu, 2008) and road safety knowledge of the riders (Amaran, Eme, Giwa, & Gbolahan, 2006). Few other studies that touched on road crash characteristics (Oluwadiya et al., 2009), motorcycle crashes (Adogu, Ilika, & Asuzu, 2009), conspicuity (Hole, Tyrell, & Langham, 1996) and risk factors (Iribhogbe & Odai, 2009) concentrated on safety issues and causes of motorcycle crashes.

Since there are certain traffic rules that must be obeyed before overtaking, in motion (as regards speed), while approaching intersections and in making turns at intersections, specific studies on how the motorcyclist behave in these situations is very imperative and should be intensified if safety is to be guaranteed on the roads. It is this issue of motorcycle riders' behavior that forms the basis of this present study.

2. Aim and objectives of study

This study was carried out with the aim of assessing the signaling behavior of commercial motorcyclists at road junctions in different locations in Minna metropolis. The objectives of study are to:

1. Examine the motorcycle accident situation in Minna.
2. Measure the proportion of motorcycles that have side mirrors and trafficators intact.
3. Measure the proportion of motorcyclists that obey/disobey traffic rules at junctions as regards trafficating.
4. Explore the relationship between possession of trafficators, side mirrors and accident experience among commercial and private motorcycle users.

3. Materials and methods

Data used in this study was derived from records of the Federal Road Safety Corps (FRSCs), Minna Office and three separate field studies within the study area. The first study involved taking the census of motorcycles possessing or not possessing side mirrors and trafficators and those that trafficated or not at selected junctions. Typical busy road junctions were selected to reflect various land use types and hence road traffic characteristics. Junctions were chosen for this survey because in the absence of assistance from traffic wardens, junctions become points where speed is reduced to enable observations to be made and recorded. The duration of the traffic survey was limited to 15 min to minimize double entry for motorcycles that may pass through the same point more than once from 8.00 a.m. to 8.15 a.m. (a typical rush hour period) and on a Wednesday (mid-week). The selected road junctions are:

- i. Kpakungu–Bida road junction (inter-city road).
- ii. Bosso–Mypa School junction (residential zone).
- iii. Obasanjo Shopping Complex – Airport road junction (commercial area).

For the first stage, four research assistants were deployed on either sides of each junction to record in-bound and out-bound motorcycle traffic. Two of the research assistants were to make observations and voice it out and the other two were to record the observations. Attentions were focused on the presence or absence of two front trafficators and side mirrors. A total of 3135 motorcycles were surveyed.

During the second survey carried out simultaneously with the first but at different part of the city using the same methodology as in the first stage, attention centered on whether or not a motorcyclist trafficated while turning at a junction. The possibility of double-count is higher in the commercial areas which are usually the largest day time destinations for urban trips hence a residential area with mixed residential land use density, that is, Bosso ward, was purposely chosen. Bosso ward has the characteristics of traditional and modern city being that it is made up of three distinct neighborhoods, that is, the old Bosso town, the modern low-density Bosso Estate and medium-density Bosso Low – Cost Housing Estate.

The selected road junctions are:

- i. Bosso Estate – Means Filling Station.
- ii. Okada – MYPA.
- iii. Bosso Estate – Okada.

A total of 626 motorcycles were observed during this stage.

The third stage involved a questionnaire survey to obtain other relevant data from the motorcyclists which may help further in understanding the characteristics of the motorcyclists. One hundred and twenty questionnaires were administered on the commercial and private motorcyclists to enable comparisons and inferences to be made particularly about the presence or absence of navigational aids and their accident experience. For this survey, major on-street commercial motorcycle parks were selected and purposive sampling of sixty riders (not passengers) was carried out since the motorcyclists are usually clustering together at the parks while waiting for passengers in turns. For the private motorcyclists, thirty respondents each were interviewed at two major employment centers namely, the Federal University of Technology, Main Campus and the Niger State old Secretariat both in Minna on “first come, first served” basis beginning at 7.30 a.m. on the day of survey. The first 30 motorcyclists at each employment center and the first 60 at the commercial motorcycle park were selected for the interview which was conducted both in English and Hausa (local language) as the case may be. The fieldworks were conducted by trained field assistants.

Statistical methods employed include simple frequency analysis, cross-tabulation and Chi-squared statistical technique as the data collected through the questionnaires was based on nominal scale.

4. Results

4.1. Motorcycle accident situation in Minna

With an average of 109 crashes reported each year resulting in 10,611 injuries and 208 deaths, motorcycle crashes, injuries and death records in Minna are very disturbing and should be a source of worry to the road safety authority. As shown in Table 1, the sudden increase in the number of injured persons from 465 in year 2000 to 2614 in 2010, representing 562% increase, is phenomenal.

4.2. Presence of navigational aids

The physical condition survey of the motorcycle with a view to verifying the possession or otherwise of navigational aids revealed that out of the total of 3135 motorcycles surveyed 65.7% had the two frontal trafficators, 16.2% had only one trafficator and 18.1% had none as shown in Table 2. Traffic rules require that motorized vehicles intending to make a turn at a junction or park on the street ought to have been signaling at a reasonable distance before doing so. A total of 1076 (with one or no trafficators at all) representing 34.3% defaulted in terms of presence of frontal trafficators.

Table 3 on the other hand reveals that as high as 85.3% of the motorcycles surveyed did not have any side mirror while 9.3% had the complete two mirrors and 5.5% had only one.

4.3. Signaling behavior

In this study, a separate survey of 626 motorcyclists on three road junctions revealed that with or without trafficators, as high as 574 representing 91.7% of the motorcyclist failed to trafficate while making turns at junctions. Only 52 of them trafficated with their pointers (trafficators) or their hand. Fig. 1. shows the turning at junctions' behavior of the motorcyclists at the three locations.

4.4. Characteristics of the selected commercial and private motorcyclists

In the third survey, 120 motorcyclists were closely studied. The mean age of the motorcyclists was found to be 30 years (SD = 7) and the mean years of riding experience of 7 years (SD = 6.1). Mean age and riding experience is higher among private motorcyclists (32 years, SD = 7.4. and 10 years, SD 7.4 respectively) as shown in Table 4. Level of schooling attained also vary among them from no schooling (7.5%) to attended post-secondary (36.7%). Private motorcyclists had higher level of schooling with over 40% of them having post-secondary school education.

Fifty-five percent of the commercial motorcyclists had plate number, 26.7% had driving license and only 26.7% had traffic codes booklets compared to private motorcyclists with 80% (plate number), 51.7% (driving license) and 56.7% (traffic codes booklet).

4.5. Possession of side mirrors and trafficators by the selected motorcyclists

Table 5 indicates that about 28% of the motorcyclists without side mirrors claimed that they deliberately remove them to avoid loss during accidents while 20% of those without trafficators lost the trafficators to accidents without replacing them. However, the fact that 69.2% of the motorcyclists had their two trafficators intact may be an indication of realization of the importance of the trafficators by the motorcyclists.

4.6. Involvement in accidents

Of the 120 motorcyclists interviewed, a total of 65 (54.2%) had been involved in accidents while riding the motorcycle, 36 (55.4%) of them were commercial operators as shown in Table 6. The difference in the rate of accident between the private and commercial operators in the samples is, however, not statistically significant ($\chi^2 = 1.645, p = .27$) signifying that being involved in an accident in the study area does not depend on mode of operation (private or commercial).

Table 1
Motorcycle crashes, injuries and death (2000–2010).

Year	Crashes ^a	Injuries ^b	Death ^b
2000	84	465	11
2001	84	491	13
2002	63	518	24
2003	114	602	27
2004	111	483	27
2005	107	679	18
2006	137	712	19
2007	116	545	20
2008	165	900	21
2009	96	2602	23
2010	123	2614	5
Total	1200	10,611	208
Mean	109	1769	35
Std	28	822	7

^a Federal Road Safety Corps, Minna (2011).

^b General Hospital, Minna (2011).

Table 2
Number of Motorcyclists possessing trafficator light.

Location	1 Trafficator	%	2 Trafficators	%	No trafficator	%	Total
Kpakungu-Bida	83	15.6	344	64.8	104	19.6	531
Bida-Kpakungu	80	21.0	227	59.6	74	19.4	381
Bosso-Mypa	48	14.6	211	64.3	69	21.0	328
Mypa-Bosso	53	13.4	257	64.7	87	21.9	397
Obasanjo-Airport	112	18.1	415	67.0	92	14.9	619
Airport-Obasanjo	132	15.0	605	68.8	142	16.2	879
Total	508	16.2	2059	65.7	568	18.1	3135

Authors' Fieldwork (2009).

Table 3
Number of motorcyclists possessing side mirrors.

Location	1 Side mirror	%	2 Side mirrors	%	No side mirror	%	Total
Kpakungu-Bida	23	6.3	45	12.4	296	81.5	363
Bida-Kpakungu	22	4.8	47	10.3	388	84.9	457
Bosso-Mypa	22	7.1	41	13.3	245	79.5	308
Mypa-Bosso	16	2.4	50	7.5	597	90.0	663
Obasanjo-Airport	32	4.7	50	7.4	597	87.9	679
Airport-Obasanjo	56	8.4	59	8.9	551	82.7	666
Total	171	5.5	292	9.3	2673	85.3	3135

Authors' Fieldwork (2009).

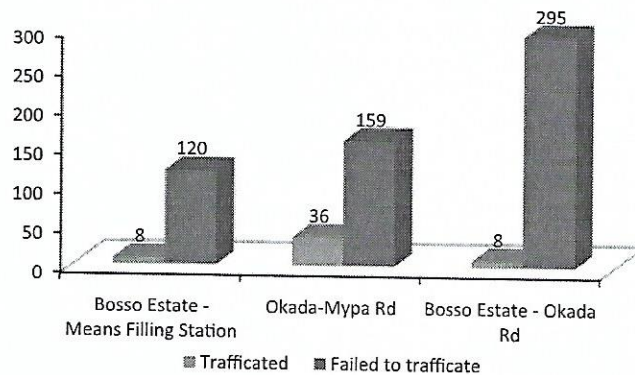


Fig. 1. Trafficating behavior of motorcyclists at junctions.

Table 4
Characteristics of motorcyclists.

	Commercial	Private	Total
Mean age of motorcyclists	28 years (std = 5.9)	32 years (std = 7.4)	Mean = 30 years (std = 7.0)
Mean years of riding experience	4 years (std = 2.1)	10 years (std = 7.4)	Mean = 7 years (std = 6.1)
Level of education			
None	3 (6%)	6 (10%)	9 (7.5%)
Primary	28 (46.7%)	6 (10%)	34 (28.3%)
Secondary	9 (15%)	24 (40%)	33 (27.5%)
Have plate number			
Yes	33 (55%)	48 (80%)	81 (67.5%)
No	27 (45%)	12 (20%)	39 (32.5%)
Have license			
Yes	16 (26.7%)	31 (51.7%)	47 (39.2)
No	44 (73.3%)	29 (48.3%)	73 (60.8%)
Have traffic codes booklet			
Yes	16 (26.7%)	34 (56.7%)	50 (41.7%)
No	44 (73.3%)	26 (43.3%)	70 (58.4%)

Authors' analysis of data (2011).

4.7. Side mirrors and accidents

As it was shown that there is no difference in level of involvement in accidents between the private and commercial operators, attempt was made to identify the factors responsible for accident involvement. From Table 6, a total of 46 (38.3%)

Table 5
Reasons advanced for the missing trafficators and side mirrors.

	Response	Commercial	Private	Total
Have trafficators?	None	10 (16.7%)	6 (10%)	16 (13.3)
	One	15 (25%)	6 (10%)	21 (17.5%)
	Two	35 (58.3%)	48 (80%)	83 (69.2%)
Why is/are trafficator(s) missing?	I removed it/them	3 (5%)	5 (25%)	8 (6.7%)
	Lost to accident	20 (33.3%)	4 (15%)	24 (20%)
	Stolen	2 (3.3%)	3 (5%)	5 (4.2%)
	Not applicable	35 (58.3%)	48 (55%)	83 (69.2%)
Have side mirrors?	None	37 (61.7%)	9 (15%)	46 (38.3%)
	One	6 (10%)	9 (15%)	15 (12.5%)
	Two	17 (28.3%)	42 (70%)	59 (49.7%)
Why is/are mirror(s) missing?	I removed it/them	21 (35%)	12 (20%)	33 (27.5%)
	Lost to accident	10 (16.7%)	6 (10%)	16 (13.3%)
	Stolen	6 (10%)	0 (0.0%)	6 (5%)
	Not applicable	23 (38.3%)	42 (70%)	65 (54.17%)

Authors' analysis of data (2011).

Table 6
Accident experience by operation type and possession of navigational aids.

Item	Ever involved in accident			Total
	Response	Yes	No	
Operation type	Commercial	36 (55.4%)	24 (43.7%)	60
	Private	29 (44.6%)	31 (56.4%)	
Total		65 (54.2%)	55 (45.8%)	120
$\chi^2 = 1.65, p = .27$				
Have trafficators	No	13 (20.0%)	3 (5.5%)	16 (13.3%)
	One	12 (18.5%)	9 (16.4%)	21 (17.5%)
	Two	40 (61.5%)	43 (78.2%)	83 (69.2%)
$\chi^2 = 5.99, p = .05$				
Have side mirrors	No	28 (43.1%)	18 (32.7%)	46 (38.3%)
	One	6 (9.2%)	9 (16.4%)	15 (12.5%)
	Two	31 (47.7%)	28 (50.9%)	59 (49.2%)
$\chi^2 = 2.11, p = .35$				
Have traffic code booklet	Yes	22 (33.8%)	28 (50.9%)	50 (41.7%)
	No	43 (66.2%)	27 (49.1%)	70 (58.4%)
$\chi^2 = 3.57, p = .04$				
Have license	Yes	16 (24.6%)	31 (56.4%)	47 (39.2%)
	No	49 (75.4%)	24 (43.6%)	73 (60.8%)

Authors' analysis of data (2011).

motorcyclists had no side mirrors at all while 59 (49.17%) had the two mirrors intact. Of those who have had accidents, 31 (47.7%) had the two mirrors intact while 28 (43.1%) had none and 6 (9.2%) had only one. However, the difference in their accident experience is not statistically significant ($\chi^2 = 2.108, p = 0.35$).

4.8. Testing for the effect of trafficators

A further observation of Table 6 shows that 40 (61.5%) of the motorcyclists that had experienced accidents with their motorcycles had their trafficators intact while 13 (20%) had none. A test of difference shows that this observation is statistically significant ($\chi^2 = 5.99, p = 0.05$). This is paradoxical in that more accidents occurred among motorcyclists with their trafficators intact. This shows that motorcyclists riding behavior is more important than having all the navigational aids intact. It has already been demonstrated above that majority (91.7%) of the motorcyclists do not make use of the trafficators.

4.9. Possession of traffic codes booklet

As shown in Table 6, a total of 70 motorcyclists did not possess traffic codes booklet. Among these 43 (66.2%) out of 65 of those involved in accidents did not possess the traffic codes booklet while 22 (33.8%) claimed to have the booklet (Table 6). The difference in involvement in accidents is barely statistically significant ($\chi^2 = 3.57, p = 0.06$).

4.10. Possession of driving license

Table 6 also shows that about 61% of the motorcyclist did not have driving license and 51% of these are private owners. Furthermore, as high as 49 (75%) out of 65 motorcyclists that have ever been involved in accidents with their motorcycle did not possess a riding license while only 16 (25%) possessed it. This difference in accident experience was found to be highly statistically significant ($\chi^2 = 12.603, p = 0.000$). This lends credence to the fact that most motorcycle riders did not undergo riding test for the purpose of obtaining a license to operate.

5. Discussion of findings

With incomplete or nonexistent trafficators, signaling becomes difficult as the motorcyclists will have to resort to hand signaling and this implies that the motorcyclists will be using one hand to pilot the motorcycle while the hand signaling lasts. This makes the motorcyclist predisposed to accident and indeed may be responsible for the average of 109 crashes per year recorded in the city between years 2000 and 2010 which resulted in 10,611 injuries and 208 deaths.

This disproportionately high percentage of motorcyclists without side mirrors at all (85.3%), is a very serious source of concern because safe driving requires motorists and motorcyclists to be mindful of vehicles coming at the rear before crossing to the other lane or make a turning at a junction. Navigating without side-mirrors put other road users at risk as untimely change of lane or miscalculation of the distance from the vehicle at the rear side may lead to a crash. Deliberate removal of side mirror (60%) is the strongest reason for the absence of this navigational aid on some of the motorcycles. It is noteworthy that only 7% of the motorcyclists deliberately removed their trafficators thus signifying that the motorcyclists have an idea of the importance of signaling.

The presence or absence of trafficators was found to have significant effects on the accident experience of the motorcyclists in the study area. As regards the side mirror effect on accident experience, private and commercial motorcyclists with or without complete navigational aids were alike involved in accidents. A statistically significant difference was also found to exist in accident experience between those who possessed driving license and those who did not.

The study revealed a situation where significant number of private and commercial motorcyclists in Minna do not obey traffic laws such as being negligent about possessing and maintaining their vehicle navigational aids (90.8% possessing one or no side mirror and 4.3% possessing one or no trafficators), do not have driving license (60.8%), plate numbers (32.5%) and failing to trafficate at junctions (91.7%). These riders' characteristics are very similar with those observed by Olusanya and Williams (2004) in South-West Nigeria and Adogo (2006) in Eastern Nigerian state of Anambra. This situation has implication for not only road safety but also for urban security as the number of deviant motorcyclists continues to rise. Most of the assassinations and bombings in North-East Nigeria attributed to the *Boko-Haram* religious sect were carried out on motorcycles.

Previous studies (Iribhogbe & Odai, 2009; Sanni, 2010) show that majority of the commercial motorcyclists are school drop-outs and migrants to the city who capitalized on the poor commuter services to turn to commercial motorcycle transport operators without driving test. This portends danger to, not only the motorcycle passengers but also, other automobiles and pedestrians on the road.

6. Conclusion

This study has examined the usage of navigational aids, that is, trafficators and side-mirrors, by motorcyclists in Minna. While the private motorcycle users are more matured in terms of age, years of experience in riding motorcycle and possession of higher level of education, there is no significant difference in their involvement in accidents when compared to the commercial motorcyclists. It is also quite revealing that in spite of the fact that more private motorcyclists had side mirrors intact compared with the commercial motorcyclists, there is still no significant difference in the road accident experience between the two classes of riders. However, a further analysis of data revealed that possession of trafficators, driving license and knowledge of traffic codes (measured by possession of traffic codes booklet) have significant effects on involvement in accidents. Future studies should attempt looking into the factors responsible for the motorcyclists' failure to trafficate at turns and this will involve collaboration with the law enforcement agencies since the offenders must first be apprehended before useful behavioral data could be collected.

7. Recommendations

In view of the various findings above, it is recommended that the Vehicle Inspection Officers (VIOs) and the Federal Road Safety Corps (FRSCs) should be as strict as with the motorcyclists as they are with the motorists. Riders must be compelled to pass riding tests and possess riding license as well. Enlightenment campaigns by law enforcement agents, particularly the Federal Road Safety Corps and concerned Non-Governmental Organisations, should be regularly organized for the motorcycle operators in conjunction with their umbrella organization – Amalgamated Commercial Motorcycle Riders Association of Nigeria (ACOMORAN).

Stop and check operations should be regularly carried out on the roads by the VIOs and FRSC officials to ensure that the motorcycles meet up with safety standards. The commercial motorcycles should gradually be phased out and replaced with tricycles as is being witnessed in Owerri, the capital of Imo State, Nigeria.

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