

Influence of Non-Driving Tasks on Road Traffic Accidents Involving Heavy-Duty Automobiles in North-East Nigeria

¹Ibrahim, Umar Aliyu, ²kumazhege, S. Z., ²Lkama, J. D.

¹Department of Vocational and Technology Education,
Abubakar Tafawa Balewa University Bauchi, Bauchi State, Nigeria

²Department of Technology Education,
Modibbo Adama University Yola, Adamawa State, Nigeria

ABSTRACT

The primary objective of this study was to investigate the impact of non-driving tasks on road traffic accidents involving heavy-duty automobiles in the north-eastern region of Nigeria. Survey research methodology was employed, utilizing structured questionnaires as the primary data collection instrument. The study population consisted of 2,645 individuals, including personnel from the Federal Road Safety Corps (FRSC), Traffic Police, Vehicle Inspection Officers (VIOs), and drivers. From this population, a sample of 235 respondents was selected using proportional sampling techniques. Multiple regression analysis was conducted using SPSS version 25 software to test the hypotheses formulated for the study. The findings of the analysis revealed that visual and auditory distraction, biomechanical distraction, and cognitive distraction significantly influence road traffic accidents involving heavy-duty automobiles in the north-eastern region of Nigeria. As a result, it is recommended that both federal and state governments should prioritize the establishment of adequate trailer parks to provide drivers with opportunities for rest and sleep, thereby mitigating the effects of fatigue-related issues. Furthermore, the development of such trailer parks could serve as a potential revenue source for the government.

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INTRODUCTION

Road traffic accident (RTA) is defined as fatal or non-fatal incident sustained as a result of a collision or event involving at least one road vehicle in motion on a public road or private road to which the public has right of access resulting in at least one injured or a killed person (Shantajit, Kumar & Zahiruddin, 2018). In the same vein, Onokala (2015) viewed RTA as an unexpected and unpleasant event that causes loss or injuries to passengers, vehicles and other mobile or immobile facilities along a road. RTAs have serious implications for the lives of those involved as well as financial costs and also involve the risks of death. Road traffic accident may be classified as minor when the injuries are minor, serious when the injuries caused involve hospitalization, and fatal when death is involved (Onokala, 2015). World Health Organization (WHO, 2019) and United Nations (UN, 2018) labelled RTA as a major cause of

death and disability in both developed and developing countries of the world.

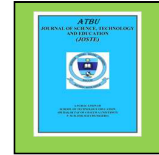
In another development, Afolayan, Adebara, Oluwasola and Lasis (2017) stated that human and vehicle related factors are known to be major causes of road traffic accidents in Nigeria. The vehicle driver's habit was found to be the primary cause and it plays out in waywardness to traffic safety rules which include driver distraction, driving under substance influence and fatigue (Aborajadeh, Jew, & Aborajadeh, 2012; Afolayan et al., 2017; Peter, Mang'uriu, & Diang'a, 2017). Hu, Bao, Wu, and Wu (2020) and Akande (2020) further stressed that nearly 90% of accidents are caused by human factors, and human becomes one of the most unstable factors in causing traffic safety problems. It was also found that the major perceived human factors responsible for road traffic accidents are; working states of drivers, inexperience with the driving task and distracted driving (Saxena, 2017; Topolšek, et

Corresponding author: Ibrahim Umar Aliyu.

✉ uiaiyu@atbu.com.ng

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al., 2019; Riaz & Shahid, 2018; Hu et al., 2020; Ullah, et al., 2021). Based on the above, it is obvious that the major causes of road traffic accidents globally are driver's driving tasks, non-driving tasks and the general nature of the road.

Non-driving related tasks/activities range from conversing with passengers, listening to the radio, to applying make-up and even reading using cell phone, and any other thing that could make the driver remove hand(s) off steering wheel, hence engage in distracted driving (Young & Regan, 2017). WHO (2011) defined distracted driving as the diversion of attention away from activities critical for safe driving towards competing activities. Distracted driving is categorized into four distinct types: visual, auditory, biomechanical (physical/manual) and cognitive distractions (Alamri et al., 2020; Young & Regan, 2017; Fernandez, et al, 2016; Strayer, et al., 2015; Chinebuli, 2014). Distracted driving was found to be common act among truck/heavy-duty automobile drivers (Hu et al., 2020; Ullah, et al., 2021).

Murray (2020) categorized heavy-duty automobile as any vehicle exceeding 8,000 kilograms. These types of vehicles are primarily used for long-haul transportation and for carrying heavy loads. They are categorized into class 4, 5 and 6 according to their Gross Vehicle Weight Ratings for trucks (GVWR) (Soard, 2017 and Murray, 2020). North-east Nigeria is blessed with abundant of this kind of vehicles (locally called 'Trailer'), especially in Bauchi, Gombe and Yobe states. It is therefore important to understand which class these vehicles belong for compliance to safety and maintenance. That is why Fathalla, et al. (2017) described the characteristics of heavy-duty automobiles as: their large size and weight represents a great danger to other vehicles and their passengers, and results in the complexity of any road accident involving them. Hardly any day passes without news or stories of road mishaps on the major highways. The human wrecks that are found in the hospitals as well as horrifying road crash data from the Nigeria Police and the Federal Road Safety Corps are clear evidences (Iweze, 2020). There was a claim by Oroleye (2019) that roads in the region are in deplorable condition, yet the roads uphold meaningful number of vehicles flying them on

daily basis. Based on the above, the researchers intend to determine influence of non-driving tasks on road traffic accidents involving heavy duty automobiles in north-east Nigeria. This is because, according to Xie et al. (2020) understanding the factors that contribute to traffic crashes and their influence could help provide fundamental basis to plan and develop appropriate countermeasures for road safety issues.

Purpose of the Study

The purpose of this study is to determine the influence of non-driving tasks on road traffic accidents involving heavy-duty automobiles in north-east Nigeria.

Hypotheses Development

Visual and Auditory Distractions (VAD)

Visual and auditory distractions are exactly what they sound like: visual and auditory stimuli which attract driver's attention off the road (Faulks et al., 2017). Even though, several studies demonstrated that humans cannot ignore sudden and unexpected stimuli (e.g., visual, physical, auditory) regardless of their irrelevance to the driving tasks (Brodsky & Slor, 2013; Chinebuli, 2014; Hoekstra-Atwood, 2015; Young & Regan, 2017) but there are still some studies that indicated the significant effects of visual and auditory distractions on RTAs. Sterkenburg (2015) emphasized that studies have shown that auditory inputs and speech responses can interfere with the driving task and weaken performance and consequently cause RTAs.

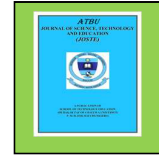
Young (2012) and Young and Regan (2017) reported that studies show that driver safety increases to the extent that a driver's eyes are on the road. The studies further showed that 70% of crashes come from directions visible through the front windshield so gaze concentration should help reduce crashes. In another study conducted by Hughes, et al. (2012) and Ross et al. (2014) it was reported that in visually complex environments, such as driving in a city with pedestrians, cars and other non-motorized road users and listening to music has been found to be detrimental to driving performance as compared to no music. Brodsky and Slor (2013) in their study measured heart rate variability while driving and confirm that listening to music adds to mental workload and

Corresponding author: Ibrahim Umar Aliyu.

✉ uiaiyu@atbu.com.ng

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consequently cause road crash. Lastly, Wang, et al. (2015) in their findings indicated that music (especially high-tempo music) leads to more passed traffic lights, more collisions with other cars, and more lane crossings. Contrarywise, Kolawole (2015) found that music has a defensive effect on driver while driving. Based on these findings, the following hypothesis was developed:

H1: *Visual and auditory distractions significantly influence road traffic accidents involving heavy-duty automobiles in north-east Nigeria.*

Biomechanical Distraction (BD)

Strayer et al. (2015) and WHO (2018) reported distracted driving as a serious and growing threat to road safety. Collisions caused by distracted driving have captured the attention of most of the developed nations and professional medical organizations during the last few years. Biomechanical distraction is any physical action that can make the driver takes his hand(s) off the steering wheel. Studies (Kawanaka et al., 2013 and Zamani et al., 2020) indicated that biomechanical distraction (especially, use of cellphone) is one of the main causes of vehicle crashes. In the same vein, Beanland, et al. (2013) reported that more than 70% of RTAs in Australia are caused by biomechanical distracted driving. Also, in a study by Fernandez et al. (2016) they reported that factors spoiling attention (distractions) were identified to cause 905 crash events over a 36-month period among 3500 drivers. Talbot and Fagerlind in Fernandez et al., (2016) also reported that distraction and inattention have influence on causing about 75% of all crashes in Finland. In their study, Riaz and Shahid (2018) found that biomechanical distracted driving has strong effect on traffic accident occurrence. Similarly, Hoekstra-Atwood (2015) reported that there was countless lane deviation in simulated driving when participants manually (biomechanically) dialled on a mobile phone than when they were talking on the phone via mic. In their study, assessing cognitive distraction in the automobile, Strayer et al. (2015) established that there are significant impairments to driving that stem from the diversion of attention from the task of operating a motor vehicle and that the impairments to driving are directly related to the physical

distraction. Based on these findings, the following hypothesis was developed:

H2: *Biomechanical distractions significantly influence road traffic accidents involving heavy-duty automobiles in north-east Nigeria.*

Cognitive Distractions (CD)

Cognitive distraction includes any thoughts that absorb the drivers' attention to the point that they are no longer able to navigate through the road environment safely (Young & Regan, 2017). Other authors described cognitive distraction as a situation in which the driver may be looking at the road and all of the relevant information is available, but he or she is unable to process the information because the necessary mental resources are dedicated to secondary tasks (Sterkenburg, 2015; Strayer et al., 2015 and Alamri et al., 2020). Fatigue, sleep deprivation, drowsy driving (or sleepiness), road congestions, day dreaming, boredom, substances abuse and taking alcohol were found to be major causes of cognitive distraction (Staryer et al, 2015; Issa, 2016; Alamri et al., 2020; Marzooq, 2021 and Yakoop, Abdulrahman & Alhassan, 2021). Body of literatures indicated that cognitive distraction have influence on RTAs.

Alamri et al. (2020) reported that 408 people were killed in 3,092 RTAs. From the study, they indicated that 78% of RTAs in Kingdom of Saudi Arabia are related to cognitive distraction. Jarosch, et al. (2017) and Feldhütter, et al. (2018) in their separate studies confirmed that prolonged periods of conditionally automated driving can lead to the occurrence of fatigue and influence road crash. Also, Marzooq (2021) and Yakoop et al., (2021) reported in their separate studies that sleep deprivation, distracted driving, alcohol and exhaustion are associated with an increased risk of accidents and other adverse outcomes. It was reported that more than 33% of fatal crashes in the United States could be attributable to drowsy driving and it is costing the country about \$12.4billion dollars per year (International Road Federation IRF, 2021). In Nigerian context, Afolayan et al. (2017) in their study, where they evaluate road traffic accidents in Ondo state Nigeria from 2015-2010, they found that large portion of their respondents claimed that cognitive distraction is one of the

Corresponding author: Ibrahim Umar Aliyu.

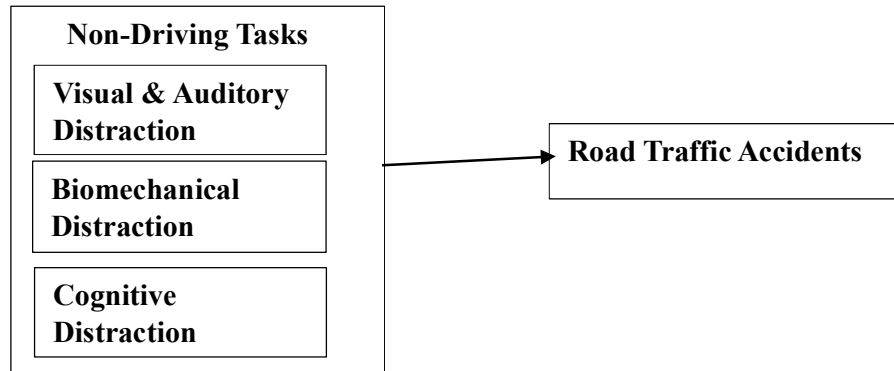
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major cause of RTAs in the area of the study. Based on these findings, the following hypothesis was developed:

H3: Cognitive distractions significantly influence road traffic accidents involving heavy-duty automobiles in north-east Nigeria.



METHODS

Design

This study used a survey research design to determine the influence of non-driving tasks on road traffic accidents involving heavy-duty automobiles in north-east Nigeria. A survey method is used when a researcher collects information about target respondents to describe and explain their attitude, knowledge and behaviour about a particular phenomenon (Sekaran & Bougie, 2016). The authors further argued, in this method, a researcher collects and analyses a quantitative data to establish the relationship between the variables of interest. This study collected and analysed quantitative data from FRSC personnel, VIOs, Traffic Police and Drivers. Hence, a survey method was considered appropriate for this study.

Population and Sample

The population of this study comprised of 639 Federal Road Safety Corps (FRSC) personnels, 82 Traffic Police, 262 Vehicle Inspection Officers (VIOs) and 1662 drivers (those registered with National Union of Road Transport Workers, NURTW and Petroleum Tanker Drivers, PTD only) in north-east Nigeria. This made the total population of two thousand six hundred and forty five (2,645). This population was chosen because FRSC, Traffic Police and VIOs were found to be stakeholders in road network administration (Oroleye, 2019). The researchers adopted

stratified and proportionate sampling for this study. The sample size for this study was 235. This sample size was drawn from the population based on the table established by Adam (2020). According to the table, population of 2645 should have sample size of 235 at 95% level of confidence. Then, using proportionate allocation, the sample sizes for different strata were: FRSC (57), Traffic Police (7), VIOs (23) and Drivers (148) which is in proportion to the sizes of the strata viz., 639: 82: 262: 1,662 respectively.

Measurement

The study adapted measurements from the existing studies related to this study, this was done because Sekaran and Bougie (2016) recommended that a researcher can adopt or adapt measurement from the existing studies relevant to the current research. The instrument, comprising three constructs adapted from prior studies, was used in this study. The three constructs have 28 items as adapted from previous studies. In this study, the Likert scale was adopted for all the items, and respondents were asked to indicate their responses to each item on a five-point scale. This is because Dawes (2008) states that a five or seven-point scale is likely to produce better results.

Validity and Reliability of the Instrument

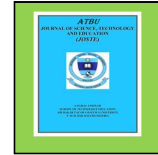
The content validity of the instrument was carried out in this study. To ascertain this,

Corresponding author: Ibrahim Umar Aliyu.

✉ uiaiyu@atbu.com.ng

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the researchers gave the copies of the questionnaire to four experts in the field of research from four tertiary institutions in north-east Nigeria that are offering automobile technology education. This is in line with the suggestion of Kothari (2004) that content validity of the instrument is established by experts' judgment. The suggestions of the experts which include: adjustments in the introductory aspect, amendments of some items of measurements were taken into account and improved the measurement instrument for final use.

In order to ascertain the reliability of the instrument of this study, a pilot study was conducted in the area that is not part of the study area. The data generated from the pilot survey was subjected to statistics analysis using Cronbach Alpha. Hair et al. (2017) argued that if the items are scored as continuous variables the Cronbach Alpha provide a coefficient to estimate consistency of scores in the instrument. The Cronbach alpha coefficients of

0.77 was obtained, the results suggested that the instrument is reliable based on the recommendation given by Hair et al. (2017). According to Hair et al. Cronbach alpha coefficient of at least .70 is considered satisfactory and acceptable.

Analysis

The inferential statistical tool of multiple regression was used to test the hypothesis of the study. A multiple regression is a statistical tool for ascertaining the influence of multiple independent variables on a single continuous dependent variable (Tabachnick & Fidell, 2013). Hence, multiple regression was appropriate in testing the hypothesis of this study. In this study, the analysis was done with the aid of statistical package for the social sciences (SPSS) version 25. Additionally, alternate hypothesis with a p -value of less than 0.05 was rejected while hypothesis with a p -value of 0.05 and above 0.05 was accepted.

RESULTS

Table 1: Influence of non-driving tasks on road traffic accidents involving heavy-duty automobile in north-east Nigeria

Variables	Standardised Coefficients Beta	T value	P value	
VAD	.280	2.003	.006	
BD	.302	3.101	.002	
CD	.269	.840	.000	
R Square				.35
Adjusted R Square				.30
F value				29.80
p value				.002

Table 2: Summary of Multiple Regression Results

	Hypotheses	Decision
H1	VAD significantly influence RTAs	Supported
H2	BD significantly influence RTAs	Supported
H3	CD significantly influence RTAs	Supported

In the current study, the analysis of multiple regression was performed to test the hypotheses as presented in Table 1. The statistical evidence revealed that the model was statistically significant based on the F ratio 29.80, $p = .002$. The result shows a significant power of this model in predicting the RTAs. The result also revealed the R^2 value of .35, which

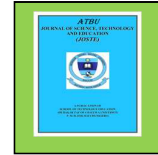
indicated that the model fit is large. For individual contribution of independent variables, the variable VAD has a standardized coefficients beta value of .280, $p = .006$, that is the VAD variable has a significant influence on RTAs. This result support the prediction of hypothesis H1, that VAD has significant influence on RTAs. Hypothesis 1 is accepted.

Corresponding author: Ibrahim Umar Aliyu.

✉ uiaiyu@atbu.com.ng

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On the other hand, the variable BD has a standardized coefficients beta value of .302, $p = .002$. This indicated that BD has significant influence on RTAs. Hypothesis 2 is, therefore, supported. Similarly, the CD variable has a standardized coefficients beta value of .269, $p = .000$. This suggested that CD has significant influence on RTAs. Hypothesis 3 is, therefore, supported.

DISCUSSIONS

Finding from hypothesis 1 of this study is in line with that Ross et al. (2014) who reported that visual and auditory distraction is detrimental to driving performance and can lead traffic crashes. The finding is, also in tandem with that of Brodsky and Slor (2013) and Wang, et al. (2015) who in their separate studies found that visual and auditory distraction especially high-tempo music leads to more passed traffic lights, more collisions and more lane crossings. But the finding contradicted that of Kolawole (2015) who found that listening to music has a defensive effect on driver while driving. Also, finding from hypothesis 2 is in consonance with that of Kawanaka et al. (2013), Beanland, et al. (2013) and Zamani et al. (2020) who in their separate studies reported that biomechanical distraction is one of the main causes of vehicle crashes. Also, the finding is in line with that of Riaz and Shahid (2018), Hoekstra-Atwood (2015) and Strayer et al. (2015) who in their separate findings indicated that biomechanical distraction influence RTAs. Lastly, the finding from hypothesis 3 coincides with that of Alamri et al. (2020), Marzooq (2021) and Yakoop et al., (2021) who in their separate studies found that cognitive related distractions have significant influence on road crashes. The finding is also, in line with that of Afolayan et al. (2017) who reported that large portion of their respondents claimed that cognitive distraction is one of the major cause of RTAs in the area of their study.

CONCLUSION

This study proved that non-driving tasks have significant influence on road traffic accidents involving heavy-duty automobiles in north-east Nigeria. By understanding these factors that influence traffic crashes, it can help provide a fundamental basis to plan and develop appropriate countermeasures for road safety issues. Therefore, with these empirical

findings it will help to comprehensively understand the impact of various risk factors associated with non-driving tasks in contributing to road accidents involving heavy duty automobiles in north-east Nigeria.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were offered:

1. Adequate trailer parks should be provided by federal and state governments for the drivers to rest and sleep in order to reduce fatigue related effects. This could also, serve as a source of income to government.
2. The use of head set and or loud music while driving should be charged more than what is currently on 2018 Nigerian Road Safety Bill (of N5, 000) because of the severity of danger associated with the act.
3. Heavy-duty automobile drivers should be informed through seminars by collaboration of FRSC, NURTW and PTD on the dangers of using substances (e.g., alcohol, drugs, caffeinated drinks, etc.) that may have impact on their cognitive wellbeing.

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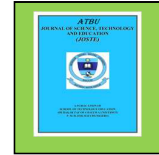
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Corresponding author: Ibrahim Umar Aliyu.

✉ uiaiyu@atbu.com.ng

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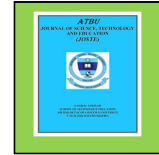
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Corresponding author: Ibrahim Umar Aliyu.

✉ uiaiyu@atbu.com.ng

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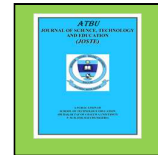
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Corresponding author: Ibrahim Umar Aliyu.

✉ uiaiyu@atbu.com.ng

Department of Vocational and Technology Education, Abubakar Tafawa Balewa University, Bauchi.

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