
Conflicts of Interest: Effects of In-Vehicle Distractions on Driver Performance

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ABSTRACT

Nowadays driver distraction has emerged as a major issue in road safety with a negative impact on driver performance throughout the world. Drivers are distracted due to multiple reasons while driving. The main thrust of the study is to determine the prevalence and implications of selected forms of internal driving distraction in Nigeria and to find out the relative contribution of each of them as they affect drivers performance. Data collected from 400 respondents was analyzed using multiple regression analysis and the result was 0.78, this implies that the proportion of variation in the dependent variable (driver performance) explained by the independent variables (cell phone use, child/infant distractions, eating/drinking and adjusting radio, car a/c or cd) was 78%. The F-ratio of 285.810 was produced which is significant at 0.05 level of confidence. This shows that loss of attention that caused road traffic impedance significantly increases with increased mobile phone use, child/infant distractions, eating/drinking and adjusting radio or cassette control. Based on the findings, recommendation as to how to reduce distracted driving in order to reduce road traffic impedance are suggested for improved road traffic flow in Nigeria.

Keywords: Driver Performance, Cell Phone, Distraction, In-Vehicle,

Journal Reference Format:

Ajala, D.O. (2019): Conflicts of Interest: Effects of In-Vehicle Distractions on Driver Performance. Humanities, Management, Arts, Education & the Social Sciences Journal. Vol. 7. No. 3, Pp 29-38
Article DOI: [dx.doi.org/10.22624/AIMS/HUMANITIES/V7N3P4](https://doi.org/10.22624/AIMS/HUMANITIES/V7N3P4). Available online at www.humanitiesjournal.org

1. INTRODUCTION

Someday soon, cars may drive themselves, and perhaps we will be better off for it. Until then, driving remains a human task, subject to fundamental limits on our ability to pay attention. Despite the complexities of the driving task, it is not unusual to see drivers engaged in various other activities while driving, including talking to passengers and listening to the radio and even reading. Preoccupation with electronic devices while driving is also becoming increasingly common. Any activity that is in conflicts with driving or competes for driver's attention while driving has the potential to degrade driving performance and have serious consequences for road safety. Distracted driving is the act of driving while engaged in other activities—such as looking after children, texting, talking on the phone or to a passenger, watching videos, eating, smoking, necking or reading. These activities take the driver's attention away from the road. All distractions compromise the safety of the driver, passengers, bystanders and those in other vehicles. Ever since the automobile was first invented, there have been distractions that can pull the driver's attention away from the task of driving.

In the past, those distractions were limited to people inside and objects outside the vehicle, such as animals, pedestrians, traffic, and road conditions. However, modern technology has provided new distractions to the driver: music and DVD players, cell phones, laptops, tablets, GPS devices, etc. Recent studies show that even if a driver uses hands-free technology to access these devices, they are still in conflict with driving procedure.

Distraction in most literature is defined as one possible consequence of engaging in events that:

(a) are unrelated to driving, (b) occur either inside or outside the vehicle and away from the forward roadway and (c) prompt the driver to look away from the forward roadway (Posner, 1980; Klauer, 2006; Chan, 2008; Chan, Pradhan, Knodler, Pollatsek and Fisher, 2010). A defining characteristic of distraction when the above conditions are met is a lapse of situation awareness, a lapse which leads to the driver to fail to scan the forward roadway for events relevant to driving (Rumar, 1990).

A report done by the American Association Foundation for Traffic Safety (AAFTS) states “Human brains do not perform two tasks at the same time. Instead, the brain handles tasks sequentially, switching between one task and another. Brains can juggle tasks very rapidly, which leads us to erroneously believe we are doing two tasks at the same time. In reality, the brain is switching attention between tasks – performing only one task at a time.” However, attributed driver distraction as occurring “when a driver is delayed in the recognition of information needed to safely accomplish the driving task because some event, activity, object, or person within or outside the vehicle compelled or tended to induce the driver’s shifting attention away from the driving task” the distraction source can either be internal or external to the vehicle.

Driving is a complex and demanding task, but drivers often shift their attention between driving and non-driving tasks (Young and Regan, 2007). Such intermittent attention to the road can undermine traffic flow and driving safety, but drivers often adapt their behavior to the environment by making decisions as to when to perform the secondary task without compromising driving performance (Poysti, Rajalin et al., 2005). To complete the secondary task successfully and to maintain safe driving, drivers often compensate for decreased attention to driving by increasing their safety envelope, i.e., reducing speed and maintaining larger headways (Horberry, Anderson et al., 2006). However, this compensatory strategy is not always successful. Drivers fail to fully compensate for their inattention to driving because they often underestimate the risks involved in performing particular secondary tasks (Strayer and Johnston, 2001; Lesch and Hancock, 2004; Horrey, Lesch et al., 2008). In these cases, drivers fail to divide their attention between driving and secondary tasks adequately. This excessive or poorly timed diversion of attention from driving can undermine driving performance and increase the safety risk. The sources of distraction can be divided into two categories; distraction internal to the vehicle (in-vehicle distractions) and distractions external to the vehicle (Out-of-vehicle distractions). This study will however focus on internal vehicle distractions,

2. FORMS OF IN-VEHICLE DISTRACTIONS

Some of the main internal sources of driver distraction are: adjusting temperature controls, using /adjusting "in-built" entertainment systems radio, / CD /, DVD players, dialing or texting on a mobile phone, eating or drinking, moving an object in the vehicle, talking to other vehicle occupants, smoking, talking on a mobile phone, using a device or object integral to the vehicle (e.g. speed adaptation system), using a device or object brought into the vehicle (e.g. Blackberry, iPod, laptop computer, etc.. In-vehicle (internal) distractions include "grooming" as well and talking with passengers. However, it is the growing number of new electronic devices that are of most concern to those involved in road safety: these include systems that are not integrated into the car, also called "portable" or "nomadic devices", such as mobile phones, laptops,

portable music or information devices (e.g. iPods, Blackberrys), and non-integrated navigation (Global Positioning Systems). While some of these systems, such as navigation systems and intelligent speed adaptation (ISA) systems, have the potential to help drivers in unfamiliar settings (e.g. using a GPS system may be safer for drivers than using printed maps), they may also be a source of driver distraction. Internal sources of distraction also include the growing number of communication technologies that are now integrated into vehicles - for example, the Bluetooth1 technologies and those that allow drivers to access their e-mails and Internet. There is very limited data available on the extent of use of these in-vehicle sources of distraction while driving, or on their effects on driving performance. Some studies show that using in-vehicle entertainment systems has detrimental effects on driving performance.

2.1 Conceptual Framework

The conceptual framework of the study is made up of different constructs which are discussed in details. The framework shows the relationship of the variables to be included in the study.

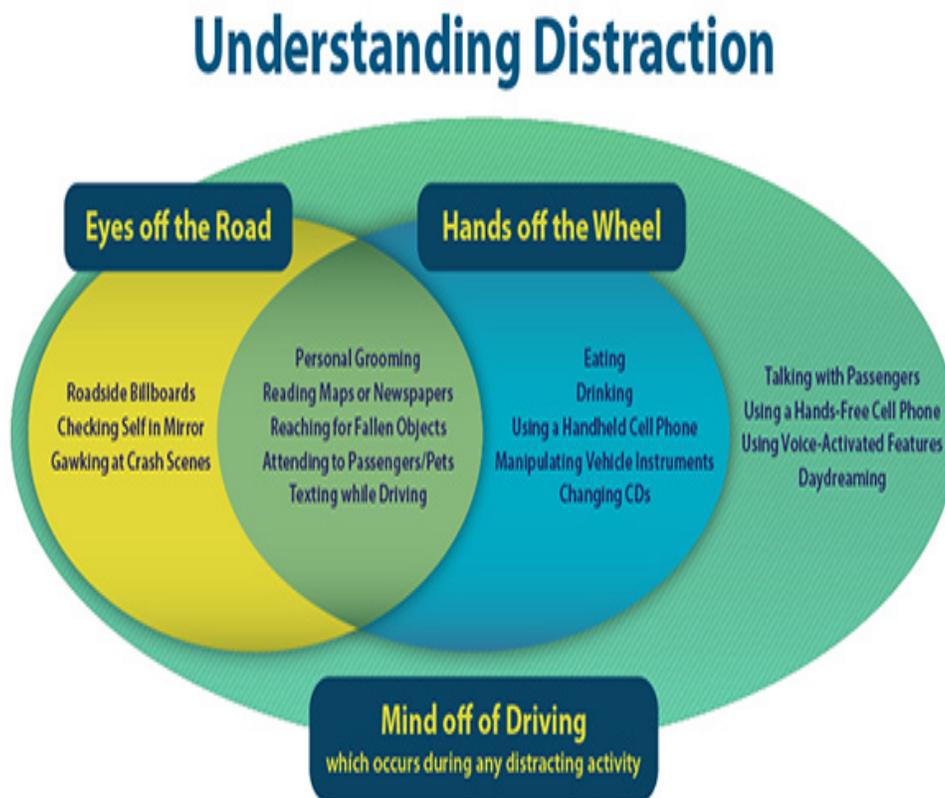


Fig.1: Understanding distraction (adopted from The AAA Foundation for traffic safety 1990).

From the above diagram, the concept of driver distraction can be separated into three distinct groups: visual, manual, and cognitive. Visual distraction involves taking one's eyes off the road, while manual distraction involves taking one's hands off the wheel. Cognitive distraction occurs when an individual's focus is not directly on the act of driving and his/her mind "wanders".

1. Manual Distraction

The capacity of a driver to keep his/her hands on the wheel at all times while driving is inversely related with a certain type of driver distraction called manual distraction. Manual distraction is anything external to the driver that may take his/her hands off the wheel for whatever reason. Examples would range from the driver fixing his/her hair to shifting radio stations. When the driver is manually distracted, his attention is focused on the manual task at hand rather than on the road. As a result, driving errors are committed and important stimuli coming from the road are ignored. The problem of manual distraction while driving can be explained by code interference in the visuo-spatial working memory of the driver. Tasks that impose high load on spatial working memory should not be done simultaneously with other tasks that require the same resources.

2. Visual Distraction

Too many visual distractions may affect the driver's ability to concentrate on looking at the road. Vision is key to a person's perceptive capabilities since visual impairment hampers the person's capacity to perceive the environment around him. In a driver's case, it is tantamount to him/her seeing what's in front of the car at all times. It should also follow that the driver gets to occasionally see what's behind or beside his/her vehicle through the use of the rearview and side mirrors. Visual distraction is defined as any type of distraction that takes the driver's eyes off the road. Unlike other types of distraction, visual distractions could prove to be more costly in the event that perception, attention and working memory is compromised by some underlying factors such as low vigilance, driver drowsiness, and drunk driving among others.

3. Attention

Attention is the cognitive process of selectively concentrating on one aspect of the environment while ignoring other things. According to Almen attention may be captured involuntarily by salient features of the environment, and it happens quite often that the attention drifts away and the driver gets distracted. In avoiding car accidents, it is crucial to find a way to control the driver's attention in a way that would keep the focus on driving and minimize unwanted capturing. Distraction is attention to irrelevant stimuli or actions, and this implies a definition of what is relevant or irrelevant for a given goal, which in this case is driving from point A to point B. It is imperative for a driver to be able to keep his mind on the primary task at hand especially since in such cases as driving, failure to do so could lead to accidents. Keeping attention at a high level would help in controlling the cognitive performance of drivers, and thus could help in minimizing risks, preventing accidents and injuries, and ensuring that the driver is able to get from point A to point B in a safe manner.

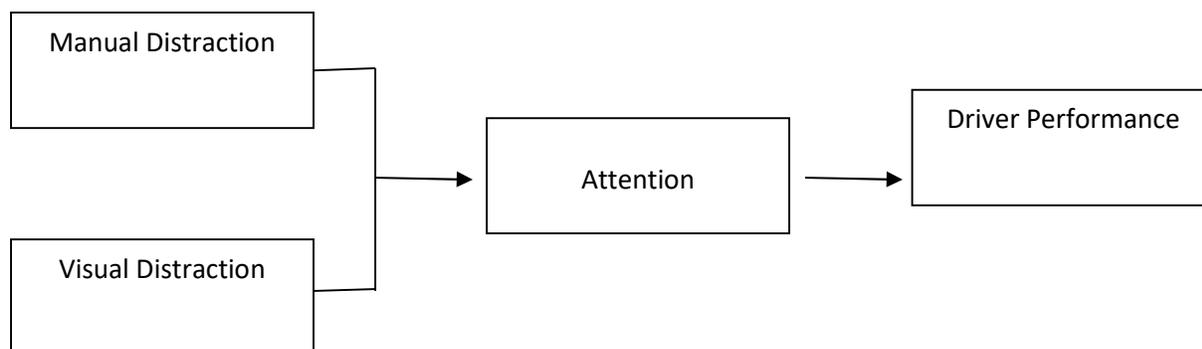


Figure 2. Conceptual Model

3. METHODS AND MATERIALS

400 participants volunteered to complete the questionnaire distributed to professional/ licensed drivers, passengers on the selected routes, bus stops and motor garages. Respondents were required to complete the questionnaire based on identified and common in-vehicle driver distractions. Distractions were carefully selected to include only those that all participants were likely to encounter thus excluding distractions such as smoking.

The distractions investigated were: device adjusting climate controls; using a hand held/ hands free mobile phone; reading or writing a text message; eating or drinking; looking at a map or book; grooming (e.g. looking in the mirror, combing hair etc.); tuning the radio/searching a CD; listening to music; adjusting your seatbelt; communicating with a passenger; reading (e.g. mail/newspaper); reaching or leaning for an object; listening to a radio talk show; passenger in-vehicle entertainment; writing (e.g. in a notebook) grooming (e.g. adjusting hair/make-up).

3.1 Study Area

The study area is Osogbo Township. History had it that Olutimehin (a renowned hunter), Oba Laroye and many of his chiefs and subjects founded Osogbo in the 18th century (Falade, 2000). It is a typical indigenous Yoruba town and one of the largest towns in Nigeria. It is located between latitude 7° 47' north of the equator and longitude 4°33' east of the Greenwich Meridian as reflected in (Fig.1.0).

The present site of Osobo is the third settlement in succession, the other two sites being Ontoto and Ita Ontoto. Because of its central location, Osogbo is easily accessible from many towns within and outside the area. The city and its environs presently cover an area of about 30km². Osogbo as the capital of Osun state is about 220km to Lagos, the popular seaport in Nigeria, about 820km to Abuja, the Federal Capital Territory, and about 96km to Ibadan, the capital of Oyo state.

Also the city is about 30km to Ile-Ife, 32km to Ilesa, 5km to Ikirun, 5km to Ilobu and about 4km to Ede. These road systems complement the railway line which passes through the town. For many years, Osogbo was the northern terminus of what is now the Lagos - Kano Railway line. Locational advantages and infrastructural opportunities combine with the historical importance of the city to enhance its socioeconomic importance and also determine the nature and tempo of governmental patronage.

Table 3. Independent Variables in Equation

Variables	B	Se β	Beta	T	Sig.T
Constant	52.7182	5.104	-	10.6713	0,05
X1	3.2510	0.263	0.257	12.545	0.01
X2	2.2390	0.250	0.233	8.896	0.02
X3	3.3121	0.232	0.378	13.991	0.05
X4	2.6290	0.201	0.215	13.477	0.01
X5	1.5530	0.242	0.314	5.374	0.01

Source: Computed from Primary data

The summary output of multiple regression estimation is as shown as:

$$Y=52.7182+ 3.2510X1+2.2390X2+3.312X3+2.6290X4+1.5530X5+U_i.....(ii)$$

The analysis in table 3 shows the relative contributions of each of the five explanatory variables. This indicates that each of the critical variables selected independently made significant contribution to prediction of driver's performance leading to traffic flow problems in Osogbo, though in different degree. The most potent contributor happens to be cell phone use, ($\beta=3.3121$) closely followed by talking/conversation with ($\beta =3.251$), eating/drinking with ($\beta=2.6290$), adjusting radio / cassette control ($\beta =2.2390$) and child / infant distraction with ($\beta=1.5530$). This implies that cell phone use made the highest contribution to problems of traffic flow in osogbo, when all the independent variables are put together at 0.05 significant levels.

4. DISCUSSION

The results obtained from the statistical analysis of the research questions shows that cell phone use, talking/ conversation, child/infant distraction, eating/drinking, adjusting radio or cassette control made a joint significant contribution of about 78% to the drivers performance in Nigeria. Moreover the F ratio value of 285.811 shows the effect of the four explanatory variables in driver performance in Nigeria. It could also be inferred that 78% of the variance in driver performances are accounted for by the combination of the four factors.

The most contributor is cell phone use ($\beta=3.3121$), talking/conversation with ($\beta = 3.251$),then followed by eating/drinking ($\beta=3.2.629$), adjusting radio or cassette control ($\beta=2.2390$) and child infant distractions ($\beta=1.5530$) It implies that cell phone use made the highest contribution when all independent variable are put together at 0.05 significant levels.

4.1 Consequences of Driving while Distracted.

- Inability to avoid collision with stopped vehicles
- Not maintaining proper lane position
- Inability to make quick decisions
- Reduced situational awareness
- Inability to execute emergency maneuvers
- Inability to recognize and obey traffic signals and signs

4.2 Countermeasures for Minimizing Distraction

To improve driver performance try to examine and recognize the activities that distract you; such as eating, phone calls, or changing a CD. Reduce the use of technology sensibly. Once you recognize these distractions, you can work to eliminate them. Also, know your route in advance and have a good understanding of your directions. If you are transporting children, make sure that they are all properly buckled up and that you keep them occupied with books or soft toys.

Concentrate on your driving. Make sure that you are not upset or tired when getting on the road. This is not the time to have a serious or emotional conversation with your passengers. Manage your time so that you do not have to multi-task or drive aggressively on the road. Scan the roadway to make sure that you are aware of other road users at all times. Be prepared for the unpredictability of others.

Fasten seat belt on every trip. Make sure that everyone in the car is properly buckled up. This is the best defense against distracted driving. Every driver should try to adjust seat positions, climate controls, sound systems and other devices before driving off or when the vehicle is stopped. Know how all the controls work so if you must adjust something while driving, you will be less distracted or have your passenger assist you.

If you want to use your cell phone, pull over to a very safe place. Talking while driving will always make you take your mind off the task of driving, and even your hand and eyes. No driver should multi task while driving. Driving is complicated enough, doing other things while driving will be distracting. Don't try to read, write or do your personal grooming while you're behind the wheels, just drive. If your children are distracting you, pull over to care for them. Don't try to feed them or change them while driving.

5. RECOMMENDATION

There is the need to switch off the phone or switch to silent mode while driving. If you need to use your cell phone, stop in a safe parking area, but we also need to keep our attention tightly focused; if you need to yell at the kids acting up in the back seat, pull over. Always adjust the seat and mirrors, fasten your seat belt, tune the radio into your favorite station before you shift the transmission into drive.

It is also recommended that we strongly need to adopt and enforce legislation relating to mobile phone use. Supporting this legislation with strong enforcement and public awareness campaigns to emphasize the risk of the behavior. Do not text or use cell phones. Set up a special message to tell callers that you are driving and you'll get back to them as soon as possible, or sign up for a service that offers this. Pull over to a safe area if you need to make a call or, if possible, ask a passenger to make the call for you. Focus on driving and driving alone. Refrain from smoking, eating, drinking, reading and any other activity that takes your mind and eyes off the road.

Also avoid arguments or distracting conversations with passengers. Instead of eating while driving, leave a little early to allow yourself time to stop to eat. Be sure children are properly and safely buckled up and give them books, toys or games to occupy their time.

Before you commence your journey it is recommended that you adjust vehicle controls, mirrors, heat or air conditioning, otherwise you are advised to take advantage of normal stops to adjust controls or ask your passenger to adjust controls. Do not wear headphones to listen to music, stay focused, pay attention, and expect the unexpected.

On the part of passengers. speak up if your driver is distracted. You're essentially placing your life in the driver's hands, so feel free to say something if someone is driving distracted and thereby endangering your safety. Ask if you can help them take a call or return a text, offer your navigation service so they don't have to look down at their map, or simply remind them that whatever the distraction might be, they can pull over or it can wait until you reach your destination.

6. CONCLUSION

Distracted driving is a deadly epidemic that has devastating consequences on our nation's roadways, Today's drivers recognize and appreciate technology, automakers are advised to find a way to balance the innovation consumers want with the safety we all need. Combined with good laws guiding drivers, good enforcement and good education, these guidelines can save lives."

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