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COGNITIVE EFFECTS OF DIALOGIC IN-VEHICULAR MUSIC COMMUNICATION ON DRIVING BEHAVIOURS: EMERGING FACTS AMONG COMMERCIAL MOTORISTS IN SOUTHEAST NIGERIA

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ABSTRACT: *This study explored Cognitive effects of dialogic in-vehicular music communication on driving behaviours: emerging facts among commercial motorists in South-East, Nigeria. The study was orchestrated by the steady rise of road traffic accidents and deaths statistics in Nigeria. 416 participants whose ages ranged from 27 to 59 years with a mean age of 39.50 years and standard deviation of 5.40 were selected using multi-stage sampling technique. Anchored on Distraction theory by Mitchell and MacDonald (2006), four research questions were answered using mixed method design while Pearson correlation statistics, thematic analysis and descriptive statistics were utilized to analyze survey, interview and observational data respectively. The result indicated that the prevalence of dialogic in-vehicular music communication is high at 68.4% whereas the awareness of the dangers posed by dialogic in-vehicular music communication is low at 45.2% among commercial motorist in South-East, Nigeria. Whereas dialogic in-vehicular music communication positively and significantly correlated hazard prone driving behaviours at $r(1, 321) = .39$, $p < .01$, awareness of the dangers posed by dialogic in-vehicular music communication negatively and significantly correlated hazard prone driving behaviours at $r(1, 321) = -.20$, $p < .01$. The findings were also supported by the themes which emerged from the analysis of the in-depth interview and descriptive analysis of the observational schedule. Considering the dangers of the low awareness level of dialogic in-vehicular music communication among commercial drivers, there is the need to deepen education and sensitization of the public regarding the associated hazards*.

KEYWORDS: Dialogic in-vehicular music communication, commercial, drivers, distraction, hazard prone behaviour, driving, transportation.

INTRODUCTION

The human system is complex, dynamic and interrelated. There are close association and influence among varying human behaviours including driving behaviour, since the later influence driving safety. Several studies such as: Adeyemi, and Adewole (2017); Arthur (2015); Cunningham, Nichol, Bainbridge and Ali (2014); and Agbonkhese, Yisa, Agbonkhese, Akanbi, Aka and Mondigha, (2013) have explored the remote causes of road traffic accidents in relation to unhealthy or reckless driving. However, there are still gaps especially regarding in-vehicular behaviours which endanger the driver, passengers and other road users (Unal, 2013).

According to Dibben and Williamson (2007), outside road worthiness of vehicles and environmental factors which are related to the nature of the road and traffic related issues, drivers' behaviours are one of the critical factors of driving safety. Many studies have explored the influence of objective factors such as: drivers' health, fatigue and training on driving outcome leaving gaps for subjective factors such as dialogic in-vehicular music communication. A great body of literature supports the theoretical assumptions that in-vehicular music communication constitutes more distraction than its pleasurable utility (e.g. Abrams, 2011). Despite this progress in literature, extant empirical evidence is lacking as regards dialogic in-vehicular music communication especially among Nigeria commercial drivers population. With the increasing national figure on road accidents and accident related deaths in Nigeria (WHO, 2016; Nigerian Pilot, 2016), the time is ripe to carry out a search outside the conventional search for factors which correlate the causes of these road harms and dialogic in-vehicular music communication could be one of them.
Dialogic in-vehicular music communication refers to listening and responding (reacting) to music (organized sounds and auditory stimuli) from motor vehicle radio and playables while driving (Dibben & Williamson, 2007). It is also being influenced by music or other organized sounds from the vehicle audio or video systems in a way that the listener responds to it behaviourally either in form of sing along, sit dance and other physical gestures which show communication between the listener and the auditory stimuli (Unal, 2013). Usually drivers engage in dialogic in-vehicular music communication by listening to the radio which means that he/she does not have the power to select the music that is being played or the programmes being aired at that point in time. Also, he/she may be listening to a purposively selected music or randomly selected music as the case may be and thirdly, the driver may reduce the volume so that it will play as background music or he/she may decide to increase the tempo so that it will be above any form of verbal communication in-vehicle. Whichever, these major behavioural patterns have become a subject of intense argument on whether it serves driving concentration or distraction. Without doubt, the utility of in-vehicle musical communication has challenged its usefulness and appropriateness especially in the wake of how safe the practice is in reality to severely damaged road infrastructure which has hitherto tripled road clashes and accidents nationwide.

Although, research findings have consistently emphasized that it is not music itself is the problem rather the varying effects which it precipitates on the listener such as mood changes, physiological changes and certain physical reaction which may be implicate driving safety. For this reason, Unal (2013); Dibben & Williamson, (2007) and Brodsky, (2002) noted that in-vehicular music communication has a lot of positive and negative consequences physically, psychologically and physiologically depending upon the user, his state of mind and circumstance of his environment (roads). It is in consideration of the circumstances above that the current research effort is born to provide theoretical linkage in support of the existing conceptual model and empirical evidence for the purpose of legislative framework which will seek to protect drivers, passengers and other road users from the harmful influence of in-vehicular music communication. It is on this note that this study is berthed on the premise that more than its usefulness, in-vehicular music

communication will serve more distraction purpose to drivers than concentration or relaxation purposes with its inherent dangers for driving safety.

The above happenstance is the motivation for the current study which is aimed to ascertain the cognitive influence of dialogic in-vehicular music communication on commercial drivers' driving behaviour. First, the study will establish the rate of prevalence, drivers' awareness and the association of the dialogic in-vehicular music communication with hazard prone driving behaviour. Second, the study will evaluate if drivers' awareness of the hazards of dialogic in-vehicular music communication will reduce the behaviour. Music influences peoples' mood in ways unimaginable and further influences their cognitive and physiological processes.

Based on the foregoing, there is need to explore the purview of in-vehicular music communication and its influences on drivers' cognitive process which will aid its correlation with psychomotor coordination and driving safety. Most road clashes are preventable if all the necessary caution is taken by road users. There is also the need to correlate the influence of in-vehicular music communication and its associated behaviours to hazard prone driving behaviours such as: changing music channel or playable, adjusting music volume or selecting the types of infotainment among Nigerian commercial motorists in South-East Nigeria.

LITERATURE REVIEW

Road traffic accidents in Nigeria

Nigeria has consistently ranked among the highest rate of road accidents in the world (Agbonkhese, Yisa, Agbonkhese, Akanbi, Aka, & Mondigha, 2013). For instance, in 2015, there were 12,077 road crashes (accidents) which resulted in 5,400 deaths nationwide; although the figure decreased by 25.8% in 2016 to 4005 deaths in 7657 road crashes, it is still worrisome. World Health Organization (WHO) data on Nigeria confirmed that road crashes remain next to Boko Haram insurgency as the highest source of violent death in Nigeria (WHO, 2016; Nigerian Pilot, 2016). WHO adjudged Nigeria as the most dangerous country in Africa with 33.7 deaths per 100,000 population every year making it one in four road accident deaths in Africa occurs in Nigeria. These figures are frightening as much as they real having claimed many lives even those of top government officers e.g. Hon. Minister of State for Labour and Employment Barr. James Ocholi, his wife and son and Maj. Gen. Yushau Mahmood Abubakar were all victims (Nigerian Pilot, 2016). In the face of these plaguing road harms in the road transportation system in Nigeria that Nigeria Federal Road Safety Corps Marshal Dr. Oyeyemi announced a mandatory psychological assessment of Nigeria road traffic offenders as from July 1, 2017 with pilot scheme taking off in Anambra State, South-East of Nigeria (Punch, 2017).

The ratification of psychological assessment policy by the Nigeria National Assembly has marked the beginning of such unusual search into unconventional causes of disasters including the high rate of road traffic accidents. The policy has intention to unlock the

"human factors" which may impact negatively on the public health. In the transport industry, such human factors may revolve around drivers' in-vehicular behaviours such as dialogic in-vehicular music communication which may constitute real dangers to lives and properties (Dibben & Williamson, 2007).

Listening to in-vehicular music while driving

The emergence of In-vehicular ICT systems in the 1970s has helped people to listen to news, recorded music or even listen to audio live streams while driving. These became possible as radios and stereos became fitted as standard features in many cars today. The growth of these features which included radios, stereos, compact discs, tape recorders and MP3 players have greatly revolutionized in-vehicle entertainment systems and the availability of variety of music sources, hence, the opportunity for self-selected music listening while driving has increased.

Several literatures and ongoing studies suggest that people listen to music while driving because it provides an enjoyable experience: it entertains and prevents boredom, provides stimulation and relaxes drivers. Listening to music is commonly mentioned as a counter-measure to driver fatigue: for example, turning up the volume of the radio was the most common technique reported by male college students to avoid drowsiness (Nguyen, 1998). The observational study by Stutts, (2003) revealed that audio was more likely to be on when there was less light, traffic conditions were moderate or heavy, and when no passengers were present in the vehicle, suggesting that music is used to entertain and relax. Using interviews, Bull (2001) has identified a number of recurrent themes in drivers' descriptions of their music-accompanied driving experiences: use of media in vehicles masks random environmental sounds, creating an 'accompanied' form of aural privacy, in which music provides an experience of 'connection' with others. This 'private space' makes possible a range of other experiences: drivers report that they listen to whatever they like, as loudly as they like, and can even sing along because they feel less observed than at home; they report finding potential frustrations of driving transformed by listening.

Several researchers have commented on the omnipresent nature of music being responsible for an increasing number of people listening to music at work (Bull, 2007; Haake, 2006; Prichard, Korczynski, & Elmes, 2007). Although music has an increasing presence in people's everyday lives, results on the effect of listening to background music while a person is engaged in another task are inconclusive (North & Hargreaves, 1999; Oldham, Cummings, Mischel, Schmidtke, & Zhou, 1995). Moreover, given the potential beneficial effects of music as reported in most literature, the question of whether background music with all its attendant risks in driving and listening could be used to produce beneficial effects in the workstation is in dire need of systematic investigation (North & Hargreaves, 2008).

The issues to be considered and these help paint the picture of the worry that was addressed by the study. First, listening to music via car radio or playable while driving is, perhaps, the most common auditory stimuli that drivers are exposed to on the road apart from the

stimuli of vehicular sounds. Second, the utility of in-vehicle musical communication is the main reason for its practice; which Brodsky (2002) as reported in (Dibben & Williamson, 2007) found to be relaxation and concentration. Third, this practice (listening to music while driving) could be gratifying on the one hand and hold some implications on the other hand for driving performance and safety, according to Stutts, Reinfurt, Staplin, & Rodgman (2001); Dibben & Williamson, (2007), Unal (2013).

Empirical review

Huiying, Sze, Qiang and Sangen, (2019) carried out a study on the effect of music listening on physiological condition, mental workload, and driving performance with consideration of drivers' temperament. Their study was on the association between in-vehicle music listening, physiological and psychological response, and driving performance, using the driving simulator approach, with which personality (temperament) was considered. The performance indicators considered were the standard deviation of speed, lane crossing frequency, perceived mental workload, and mean and variability of heart rate. Additionally, effects of the presence of music and music genre (light music versus rock music) were considered. Twenty participants of different personalities (in particular five, four, seven, and four being choleric, sanguine, phlegmatic, and melancholic, respectively) completed a total of 60 driving simulator tests. Results of mixed analysis of variance (M-ANOVA) indicated that the effects of music genre and driver character on driving performance were significant. The arousal level perceived mental workload, standard deviation of speed, and frequency of lane crossing were higher when driving under the influence of rock music than that when driving under the influence of light music or an absence of music. Additionally, phlegmatic drivers generally had lower arousal levels and choleric drivers had a greater mental workload and were more likely distracted by music listening.

Akpa, Booysen and Sinclair (2016) evaluate auditory intelligent speed adaptation for long-distance informal public transport in South Africa. The authors evaluated the impact of an auditory intelligent speed adaptation (ISA) intervention, applied at various intensity levels, on the speeding behavior of this seemingly intransigent mode of transport. The behavior of R61 between Beaufort West and Aberdeen were evaluated as regards: speeding distributions, speeding frequencies, speed percentiles, mean speeds, and the statistical relevance of key metrics. The result indicated that the auditory intervention has a clear impact on speeding behavior, both when applied at an audible level that can be drowned out by a radio, and even greater impact at a loud level. The impact on speeding is significant, with speeding frequency (both time and distance) reducing by over 20 percentage points.

In the same vein, Cunningham, Nichol, Bainbridge and Ali (2014) investigated social music in cars. This study looked at effect of music in the car on a group and not as an individual. Specifically, it focused on how songs are chosen for playing, how music both reflects and influences the group's mood and social interaction, who supplies the music, the hardware/software that supports song selection and presentation. They found that music

was seen as integral to the group experience on a trip; Music can contribute to driving safety; by playing songs that will reduce driver drowsiness and keep the driver focused; music can provide a background to conversation; listening to music can be the main source of entertainment during a trip, as the driver and passengers focus on the songs played etc. Shenge (2010) employed a correlational design to review self-regulation of driving as a viable means of achieving safe and efficient driving among drivers. Three hundred and sixty two randomly or purposely sampled drivers participated in the study that employed thematic analyses and correlations as analysis tools. The principal finding of the study was that psychosocial factors such as drunken driving, road rage, and engaging in distractive activities while driving e.g. in-vehicular music correlated significantly with road crashes. This study was quite insightful on the ground that it was conducted in Nigeria and also focused on driving.

Having agreed on the ubiquitous nature of music while driving, Dibben and Williamson (2007) in an exploratory survey of in-vehicle music listening explored the habit of in vehicle music listening. Their study was to discover the extent to which people listen to music while driving, what they are listening to and why and whether there is any association with driving safety, measured by possession of four or more years' no-claims on motor insurance. Using the survey method on 1,780 British drivers, the study reveals that approximately two-thirds listen to recorded music and music radio while driving, with music reported to be less distracting than conversation. The most commonly cited reasons for listening to music while driving were its benefits for relaxation and concentration. The survey indicates associations between possession of 'no claims' on motor insurance and a preference for silence. However, the genre of music playing also appears to influence driving performance: there was an association between possession of no-claims, genre of music, and a difference in the frequency with which certain genres were playing at the time of the last accident, relative to the expected norm for that genre. Their findings support evidence for music as a source of in-vehicle distraction, which can have both positive and negative effects on driving performance. The data for the study was collected online which this study sees as a limitation and which the researcher hopes to address by being physically present during the actual driving so as to note the variables that positively or negatively affect the effect of music on drivers.

THEORETICAL FRAMEWORK

Although, Abrams(2011a) proposed a relational theory that considers music therapy a discipline that "promotes human health both as and through music, in which music is understood as a temporal-aesthetic way of being transcending the concrete medium of sound, that manifests across all of the domains targeted in clinical music therapy goals." Abrams also suggests that humans can express their humanity and health in a way that is musical but not located within the medium of sound. Despite this theoretical attempt to relate music as a therapy however, fundamentally there is empirical evidences that its use while driving may constitute a driving distraction which may impair some basic cognitive driving behaviour such as longitudinal control with emphasis on speed and following

vehicular distance; lateral control as regards Lane keeping and steering measures and reaction time involving the duration within which one is expected to respond to an unexpected eventuality while driving. These are cognitive behavioural conditions required for an effective and safe driving. Hence, it is expected that multiple task theory may provide theoretical assumption for relating possible impairments caused as a result of distractibility of dialogic in-vehicular music communication on basic cognitive behavioural conditions during driving. Against this backdrop, distraction theory is hereby proposed as the framework for the anticipated causal relationship between the art of dialogic music communication and cognitive driving behaviours.

Distraction theory

Music may act as a distraction and the presence of any music will in effect, decrease productivity. Although, distraction may appear to have a negative meaning, in reality, distraction can either be positive or negative. This model stems from pain research where a beneficial effect of music is to emotionally engage the patient and take the mind of the patient off the painful condition or treatment (Mitchell & MacDonald, 2006). The main advantage music will have under such circumstances is in masking the 'other', possibly more distracting auditory stimuli. On the side of music as a distraction, some studies have concluded that music is distracting for task performance. For instance, in a study by Furnham and Strabac (2002), participants' performance in a reading comprehension and prose recall task was equally poor when background music or office noise was played compared to their performance in silence. The studies concluded that background music is as distracting as office noise. This is also supported by the multiple resource theory which asserts that multi-tasking is prevalent in our society. Issues such as listening to music and the dangers of using cell phones while driving call for understanding of the extent to which such dual-task performance will lead to decreases in attention and time-sharing ability. Multiple resource theory is one approach towards understanding this phenomenon.

Despite theoretical and empirical evidence in literature as regards possible hazards which may be associated with dialogic in-vehicular music communication; not many studies have captured the detrimental effects it may have on the human cognitive process which may produce stimulus response to driving behaviour capable of impacting driving safety. In order to address music as distraction stimuli to cognitive processes; the following research questions were raised to guide empirical investigation:

i. What is the prevalence rate of dialogic in-vehicle musical communication among commercial motorists in South-East, Nigeria?
ii. Would dialogic in-vehicle musical communication positively correlate hazardous driving among commercial motorists in South-East, Nigeria?
iii. What is the awareness level of commercial drivers in South-East, Nigeria on the dangers of dialogic in-vehicular music communication?
iv. Would the awareness of the hazards of the dangers of dialogic in-vehicular music communication while driving negatively correlate hazard prone driving behaviour among commercial motorists in South-East, Nigeria?

METHOD

Design - The design of the study is mixed method research which according to Creswell (2003) in Wimmer and Dominick (2014) helps to collect, analyse and integrate both quantitative and qualitative data in a single study. The study analyzed data with Pearson correlation statistics and thematic analysis of qualitative data. The observation schedule was also analyzed using descriptive statistics.

Area of study - The area of the study is limited to South-East Nigeria comprising the five States (Anambra, Imo, Enugu, Abia, and Ebonyi States of Nigeria) in the South-East geopolitical zone. However, the States were further delimited to the public motor parks in each State capital (Awka, Owerri, Umuahia, Enugu and Abakaliki) in South-East, Nigeria.

Study population - The population is commercial drivers in South-East, Nigeria. Data from the various state emblem units put the estimated population of inter-state commercial motorists at 1,617.

Sample/ sampling technique - With the adoption of the mixed method, the study had three different sample sizes for survey, observation and In-depth Interview (IDI). The sample size for survey was 321 based on Yamane's (1978) sample reduction formula of n=N/1+N(e)2; the sample size for observation was 81 based on the principle of theoretical saturation while the sample size for In-depth Interview was 15, also based on the principle of theoretical saturation. In all, the study sampled 416 participants whose ages ranged from 27 to 59 years with a mean age of 39.50 years and standard deviation of 5.40. They were selected using multi-stage sampling technique.

Instruments for data collection - Owing to the mixed method design, three instruments for data collection are: dialogic in-vehicular music communication scale by Ojiakor and Etodike (2016), observation schedule and interview guide. Pilot test was carried out to enhance its reliability revealed alpha co-efficience of $\alpha = .68$.

Procedure - At the inception of this study, the researchers foremost sought research declaration and permission from the relevant authorities to embark on the study at the approval of the awarding body. This approval marked the beginning of the study as can be sighted in appendices. Also approvals permission from Federal Road Safety (Corps) FRSC and the Nigerian Police Force (NPF) were sought. This is to forestall any kind of eventuality that might come up as a result of the research. Participants (commercial motorists) from five (5) States in the South-East were sampled using mixed sampling technique. To select the parks used, a simple random sampling was used. Having chosen the parks, the researcher proceeded to sample the participants (motorists). Simple random sampling was used. The commercial motorists (those waiting for their passengers) were approached and were asked to participate in an academic exercise in English language. Only those who affirmed that they were willing and capable of responding to the items were selected. Oral instruction on how to respond to the instrument was given and repeated

at intervals to the participants although it was also written clearly on the top of each questionnaire. At the completion of the filling, the researcher thanked each of the respondents for their time and collected back the filled questionnaire.

RESULTS

After analysis of quantitative and qualitative data, the following results were obtained from the field work:

Table 1: Prevalence rate of dialogic in-vehicular music communication among commercial motorists in South East, Nigeria

		Play Music often while Driving	Listen to the Radio while Driving	Play recorded Music or Radio as I drove off	Play recorded Music or Radio half way	Play Music anytime on Passengers' Request
N	Valid	321	321	321	321	321
	Missing	0	0	0	0	0
Mean		3.7201	3.2770	3.1866	3.3528	3.5685
Std. Deviation		1.17370	1.37297	1.47895	1.47525	.94921

Data on Table 1 is indicative that the mean scores of commercial motorists in South East, Nigeria on dialogic in-vehicular music communication behaviour was high as the mean scores of each of the behviour is above the theoretical mean score of a 5-point scale (which is n+1/2 = 5+1/2 = 3) at M(1, 343) = 3.42 (68.4%) (3.72+3.27+3.18+3.35+3.56 = 17.08/5 = 3.42). The finding from the sample is indicative that majority of the commercial motorists in South East often play music while driving, listen to the radio while driving, play either recorded music or radio as they drove off, play either recorded music or radio half way into the journey and play music anytime on passengers' request. Based on the finding, high prevalence of dialogic in-vehicular music communication and commercial motorists in South East Nigeria was confirmed.

Table 2: Correlation of dialogic in-vehicle music communication with hazard prone driving behavior

Correlations

		DIMC Behaviour	Hazard Prone Driving Behaviour
DIMC Behaviour	Pearson Correlation	1	.388**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	6221.714	5187.592
	Covariance	18.192	15.168
	N	321	321
Hazard Prone Driving Behaviour	Pearson Correlation	.388**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	5187.592	28703.009
	Covariance	15.168	83.927
	N	321	321

**. Correlation is significant at the 0.01 level (2-tailed).

Data from Table 2 is indicative that significant relationship was confirmed between dialogic in-vehicle music communication and hazard prone driving behavior among commercial motorists in South East Nigeria at r(1, 321) = .39**, p < .01. The finding confirmed that the patterns of in which commercial motorists in South East Nigeria indulged dialogic in-vehicle music communication was related their hazard prone driving behaviours. The finding is indicative that dialogic in-vehicle music communication behaviour influence hazard prone driving behaviour among the study sample.

Table 3: Awareness level of the hazards of dialogic in-vehicle music communication on hazard prone driving behaviour among commercial motorists in South East Nigeria

Awareness of Hazardous DIMC		
N	Valid	321
	Missing	0
Mean		2.2595
Std. Deviation		1.46290

From Table 3 it is observed that the awareness level of the hazards of dialogic in-vehicle music communication on hazard prone driving behaviour among commercial motorists in South East Nigeria is poor as the mean score of the sample was confirmed at M(1, 321) = 2.25 (45.2%) ; Std = 1.4629. The finding is indicative that most of commercial motorists in South East Nigeria are not aware that indulging in dialogic in-vehicle music communication could be hazardous to driving since they lead to hazard-prone driving behaviour.

Table 4: Correlation of awareness of the hazards of dialogic in-vehicle music communication with hazard prone driving behaviour among commercial motorists in South East Nigeria

Correlations

		Awareness of Hazardous DIMC	Hazard Prone driving behaviour
Awareness of Hazardous DIMC	Pearson Correlation	1	-.198**
	Sig. (2-tailed)		.000
	Sum of Squares and Cross-products	731.907	-908.399
	Covariance	2.140	-2.656
	N	321	321
Hazard Prone Driving Behaviour	Pearson Correlation	-.198**	1
	Sig. (2-tailed)	.000	
	Sum of Squares and Cross-products	-908.399	28703.009
	Covariance	-2.656	83.927
	N	321	321

**. Correlation is significant at the 0.01 level (2-tailed).

From Table 4, it is ascertained that there is a significant and negative correlation between awareness of hazards of dialogic in-vehicle music communication and hazard prone driving behaviour among commercial motorists in South East Nigeria at $r(1, 321) = -.20$, $p < .01$. The finding is indicative that the extent of commercial motorists' awareness on the dangers associated with indulging in dialogic in-vehicle music communication influence their hazard prone driving behaviour. Negative correlation is indicative that motorists who are more aware of the associated dangers of dialogic in-vehicle music communication showed less hazard prone driving behaviour.

Table 5: Analysis of real time observational schedule on commercial motorists in South East Nigeria

Observed Factor	Observation	Frequency	%	Remarks
Prevalence of Dialogic Invehicular Music Communication while driving	Yes No	54 27	66.7 33.3	Prevalence of dialogic invehicular music communication is confirmed. The behaviour is high and common among commercial drivers
Observed Dialogic Invehicular Music Communication Behaviours	Singing Humming Nodding Reflex movement Clapping Sit-dance Other gestures	13 23 24 10 4 4 3	16.0 28.4 29.6 12.3 4.9 4.9 3.7	Observed behaviour indicated that nodding, humming, singing and reflex movement are the most dialogic invehicular music communication behaviours exhibited by commercial drivers
Dialogic Invehicular Music Communication Behaviours with hazard prone driving behaviour	Glancing at music set Adjustment of channels/volume	64 57	79 71	It is observed that the time taken to glance of the music sets for selection of music and the adjustment of the music channel/volume interferes with the drivers' vision on the road
Awareness Level of Hazards of Dialogic Invehicular Music Communication	Aware Not Aware	38 43	46.9 53.1	Drivers who showed that they are aware of the hazards solicited for the passengers to assist them in changing or adjusting the music; those who are not aware tend to do it themselves

Data in Table 5 is indicative that 54 drivers (66.7%) were observed engaging dialogic invehicular music communication while driving as against 27 (33.3%) who did not engage in the behaviour. Observed dialogic invehicular music communication behaviours include: singing (16%), humming (28.4%), nodding (29.6%), reflex movement (12.3%), clapping (4.9%), sit-dance (4.9%) and other gestures (3.7%); the analysis is indicative that nodding, humming, singing and reflex actions are the most dialogic invehicular music communication behaviours observed among commercial drivers with a combined percentage of 86.3. On hazard prone driving behaviours, it was observed that 64 (79%) of the 81 commercial drivers glance through their music set while driving while 57 (71%) frequently adjusted the music channels or the volume while driving. Equally, behaviours of 38 (46.9%) drivers observed is indicative that they are aware of the dangers of dialogic

invehicular music communication while driving whereas that of 43 (53.1%) is indicative that they are not aware. The observations in real time confirmed the prevalence of dialogic invehicular music communication while driving, the patterns of dialogic invehicular music communication behaviours while driving, hazard prone driving due to dialogic invehicular music communication while driving and the drivers' awareness level of the hazards of dialogic invehicular music communication while driving.

Table 6: Thematic analysis from the in-depth interview with commercial drivers on dialogic in-vehicular music communication behaviour

Key Questions	**Themes**	**Remarks**
Do you play music while driving?	No, Sure, Yes, why not, Can't drive without music	Majority of the themes is indicative commercial drivers play music while driving
How do you respond to the music you are playing while driving?	Singing, humming, Reflex movement	Associated behaviours could endanger driving safety
Are you aware of dangers associated with playing music while you are driving?	No, Yes, Not possible, I haven't heard of any, No dangers, May be	Majority of the themes shows that most of the commercial drivers are not aware of the associated dangers of playing music while driving
Do you think that there are behaviours related to music playing while driving which endangers you and the passengers?	Increasing the music volume, changing the music source, tuning radio, arguing with passengers about playing music	Themes are evidence that behaviours associated with playing music while driving could constitute vision distraction

Themes in Table 6 are indicative that dialogic in-vehicular music communication among commercial drivers in South-East Nigeria is confirmed. Also, singing, humming and reflex movement emerged as themes from the answers on the interview question "how do you respond to the music you are playing while driving?" Furthermore, themes which emerged from the interviewees' responses on the awareness of dangers associated with playing music while driving indicated that most of the drivers are not aware of the dangers. Equally, themes which emerged from the interviewees' responses indicated that increasing music volume, changing the music source, and tuning radio are the behaviours which endanger drivers playing music while driving.

DISCUSSION OF FINDINGS

In the course of this study which explored Cognitive effects of dialogic in-vehicular music communication on driving behaviours: emerging facts among commercial motorists in South-East Nigeria, data from survey (Table 1) is indicative that high prevalence rate of dialogic in-vehicular music communication among commercial motorists was ascertained showing evidence that majority of the commercial motorists in South-East often play music, listen to the radio or play either recorded music while driving. Also, data from survey indicated that commercial drivers engage in the behaviour more as they drove off than half way into the journey and that most drivers play music anytime on passengers' request.

The finding was also supported by the themes which emerged from the in-depth interview (Table 6) in which most of drivers opined that they play music while driving. The results of the survey and interview as were further supported by the analysis of the observational schedule (see Table 5) in which the researchers observed that greater percentage of the commercial drivers engage in the beaviour in real time. Nigerian prevalence rate of dialogic in-vehicular music communication was also established in Adeyemi, and Adewole's (2017) study on Risk factors of road traffic accidents among commercial inter-state drivers in Lagos State, Nigeria which established drivers' behavioural characteristics such as drugs, distractions (including music) as major causes of loss of vehicle control leading to road traffic accidents.

Equally, Oluyemisi, Opeyemi and Giwa's (2012) study on Understanding of Traffic Signs by Drivers in Ondo State, Nigeria which identified playing music as some the human factors which distract drivers from noticing and observing the traffic signs also supports the ascertained prevalence rate of dialogic in-vehicular music communication among commercial motorist in South-East, Nigeria. Based on the findings from triangulation and the weight of empirical evidence high prevalence of dialogic in-vehicular music communication was ascertained and confirmed among commercial motorists in South-East Nigeria.

As regards the relationship between dialogic in-vehicle music communication and hazard prone driving behaviours, data from survey as in Table 2 confirmed that significant and positive correlation exist between the two. The finding was also supported by the real time observation made by the researchers as indicated in the observational schedule (see Table 5) which showed that the time taken to glance of the music sets for selection of music and the adjustment of the music channel/volume interferes with the drivers' vision on the road which constitutes hazard prone driving behaviours. The underpinning of the finding can be found Mitchell and MacDonald's (2006) Distraction theory which propounded that music may act as a distraction and the presence of any music will in effect, decrease productivity (quantitative and qualitative).

Furthermore, themes which emerged from the in-depth interview were indicants that most of the drivers appear to understand this relationship. Both findings are supported by Huiying, Sze, Qiang and Sangen's (2019) study on Effects of music listening on physiological condition, mental workload, and driving performance with consideration of driver temperament and Dibben, and Williamson's (2007) finding that the genre of music playing appears to influence driving performance which supports that music is a source of in-vehicle distraction, which can have both positive and negative effects on driving performance. On the negative effects, Arthur's (2015) study revealed that on commercial drivers' perception on the causes of road traffic accidents in affected by a host of factors including driver's in-vehicular behavioural patterns. The findings supported by related works confirm that the patterns of in which commercial motorists in South East Nigeria indulged dialogic in-vehicle music communication are related hazard prone driving behaviours.

With several road crashes linked to in-vehicular distraction of drivers, one could have expected that the level of awareness will be relatively; however, data from survey (see Table 3) which correlated both real time observational data in Table 5 and themes which emerged from in-depth interview (see Table 6) indicated that contrary to the expectation, awareness of hazards of dialogic in-vehicle music communication is still low among commercial motorists in South East Nigeria. Survey scores of the participants were below average on the awareness of associated dangers of dialogic in-vehicle music communication. Similarly, real time observations made revealed that most drivers were seen glancing and changing music source or increasing or decreasing the volume as they drive. This behaviour concurs with the opinions of the interviewees on their awareness of dialogic in-vehicle music communication which is indicative that they are not aware of such dangers. For example one of the interviewees opined that "such hazards are not possible since music soothes his mood" while another responded that "I haven't heard of any". This finding however is in sharp contrast to Dibben, and Williamson's (2007) finding which accounted that 2/3 of drivers in Britain are aware of the dangers of in-vehicular distraction including listening to music. The reason for this contrast may be as a result of level and penetration of education which increases awareness and the effectiveness of road/traffic agencies which unfortunately do not work effectively in Nigeria. The analysis of these different data sources confirmed validation that awareness of the dangers of dialogic in-vehicle music communication abysmally low among commercial drivers in South-East Nigeria.

Finally, this study also correlated the awareness of the hazards of dialogic in-vehicle music communication with hazard prone driving behaviour among commercial motorists in South East, Nigeria and through the data from survey (Table 4); it was found that there is a significant and negative correlation between awareness of hazards of dialogic in-vehicle music communication and hazard prone driving behaviour. The survey data was also supported by the real time observed behaviour of the commercial motorists which revealed that drivers who are aware of the hazards or dangers of dialogic in-vehicle music communication always requested the passengers to assist in tuning or changing the music

source and increasing or reducing the volume while they concentrate on actual driving behaviours. This implies that hazard prone driving behaviours among commercial motorists in South East tend to reduce as awareness on dangers of dialogic in-vehicle music communication tends to increase. In line with Arthur's (2015) findings, this may be attributed to commercial drivers' perception on the causes of road traffic accidents may be affected by a host of factors including driver's in-vehicular behavioural patterns which will helps them to avoid the behaviour. This is equally supported by Mitchell and MacDonald's (2006) Distraction theory. The negative relationship is indicative that awareness and sensitization of commercial drivers on the dangers of dialogic in-vehicle music communication related to less proneness to engage in dialogic in-vehicle music communication and could be one of the first lines of control measures against the menace as a public health concern.

Implications of the findings

Theoretical and pragmatic implications arise from the findings especially for drivers, Federal Road Safety Corps, the passengers and the entire transport industry. In line with Mitchell and MacDonald's (2006) Distraction theory, dialogic in-vehicular music communication which involves the use of media in vehicles evokes safety concerns for drivers, passengers and other road users. Considering the poor state of roads in Nigeria, the high prevalence as revealed in the result constitutes a major public health challenge.

Also, the findings revealed that majority of the drivers are not aware of the dangers as regards the correlation between to dialogic in-vehicular music communication especially as regards the multiple tasks of maintaining vision on the media source and on the lane. The assumption of this difficulty is captured with the proponents of Distraction theory. However, the low level of awareness of the hazards of the menace offer insights on the need for educational and policy enactment in the regard in order to bring commercial motorist to the understanding of the dangers and hazards.

For those who cannot do without dialogic in-vehicular music communication, the findings implicate the technological advancement in the area of media source in order to increase hands-free and eyes-free dialogic in-vehicular music communication among motorists for safety of lives and property. In this regard, Abrams (2011) theory of music utility becomes pertinent in harnessing technologically driven approach towards harnessing the utility of music while driving.

Limitations of the study

There is always an inherent bias in survey which may reduce the correctness of participants' responses to the survey; in consideration to this, this study utilized data from other sources (mixed) in order to checkmate this form of bias. Consequently, an observational schedule and in-depth interview were also utilized in the method.

Recommendation

Considering the dangers of the low awareness level of dialogic in-vehicular music communication among commercial drivers, there is the need to deepen education and sensitization of the public regarding the associated hazards. It is also recommended for automobile tech companies optimize hands free and eyes free media system to reduce the hazards associated with musical sourcing, glancing and volume tuning.

Future Studies

There is the need to ascertain the socio-economic background of the drivers to ascertain if the findings were as a result of class structure or as generalized behaviour of the drivers. The importance of ascertaining this factor stems from the fact the sample was selected from predetermined area (state capital) of each of the states sampled. Future studies should also endeavour to ascertain the dimensions of distractibility which are implicated by dialogic in-vehicular music communication. There is also need to ascertain the patterns of hazardous driving which are implicated by dialogic in-vehicular music communication.

CONCLUSION

The focus of the current study was to ascertain the prevalence of dialogic in-vehicular music communication among commercial motorists in Nigeria and whether dialogic in-vehicular music communication constitute driving hazard to drivers, passengers, and other road users. Given its threat to lives and property, mixed method design was used to carry out an investigation into commercial drivers' behaviour as regards dialogic in-vehicular music communication in the South-East Nigeria. The result indicated that the prevalence of dialogic in-vehicular music communication among commercial drivers in South-East Nigeria was high whereas awareness of the dangers associated with the behaviour was low. Also, the study found positive and significant correlation between dialogic in-vehicular music communication and hazard prone driving behaviours whereas negative and significant correlation was recorded between awareness of the dangers of dialogic in-vehicular music communication and hazard prone driving behaviours. The result of thematic analysis and analysis of the observational schedule further supported the quantitative result of the survey. Although there are need for future studies in other directions such as the type and nature of distractibility caused by dialogic in-vehicular music communication, the study recommended rapid education and sensitization of the public on the hazards of dialogic in-vehicular music communication.

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