National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

# Effect of loud music and active telephonic conversation on simple visual reaction time

**Pradeep Reddy Srikaram[1], Ambareesha K[1], Kasthuri Bai P[2]**

[1]Department of Physiology, MNR Medical College and Hospital, Fasalwadi, Telangana, India, [2]Department of Physiology, Medicity institute of Medical Sciences, Medchal, Telangana, India

**Correspondence to:** Ambareesha K, E-mail: drambreeshphysio@gmail.com

**Received:** December 28, 2017; **Accepted:** January 16, 2018

## ABSTRACT

**Background:** In India, there is at least one death for every 4 min due to road traffic accidents (RTA's) (1.37, 423 deaths in a year), of which 77.5% are due to fault of drivers. Many vehicles are equipped with high volume speakers and Bluetooth hands-free devices. Furthermore, pedestrians and two-wheeler drivers use headset or Bluetooth connected to phones or MP3 players. These may decrease visual, mechanical, and cognitive abilities. India's contribution to global RTA's is around 10%, despite very few studies were done in this regard (World Health Organization, 2004). **Aims and Objectives**: The aim of this study is to find the independent relation between listening to loud music and active telephonic conversation on simple visual reaction time (VRT). **Materials and Methods:** A total of 40 healthy, male subjects within the age group of 20–25 years are recruited in the study. VRT is estimated using Gary-Darby RT software, version-V4.03. Subjects are tested without any distractions and then while engaging in active telephonic conversation using hands-free device and finally are tested while listening to their favorite music at high volume. **Results**: Statistical analysis was performed by student *t*-test and $P < 0.05$ is considered as statistically significant. Mean average VRT and mean longest VRT without distractions are $0.32 \pm 0.08$ and $0.41 \pm 0.13$, with active telephonic conversation are $0.70 \pm 0.23$ and $1.10 \pm 0.44$, and with loud music are $0.34 \pm 0.06$ and $0.44 \pm 0.09$, respectively. **Conclusion**: Active telephonic conversation is significantly affecting VRT and hence driving ability. The effect of loud music on VRT is not significant; more research is required in this regard to other thought process such as choice RT, emotion, and judgment.

**KEY WORDS:** Visual Reaction Time; Active Telephonic Conversation; Music; Bluetooth Hands Free

## INTRODUCTION

According to the National Crime Records Bureau, Ministry of Road Transport and Highway, Law Commission of India, there are about 1, 37,423 people were killed in India's road traffic accidents (RTAs) in the year 2013.[1] In India, there is at least one accident death for every 4 min due to RTA's.[1] In terms of number of RTA's, the city of Delhi occupies top position followed by Chennai and least position by the city of Pune. State of Tamil Nadu is with maximum road crashes but state of Uttar Pradesh with a maximum number of road crash deaths.

16 children of India die on roads every day due to RTAs. One death for every 4 min due to RTA's occurs in India. Two-wheeler accidents account for 25% of all RTA's. People with the age of 25–65 years account for 53.9% of victims of RTAs.[1] All over the world, every year nearly 1.3 million people die and 50 million are injured as a result of road traffic crashes.[2]

| Access this article online | |
|---|---|
| Website: www.njppp.com | Quick Response code |
| DOI: 10.5455/njppp.2018.8.1249516012018 | |

Road traffic injuries affect all age groups, but their impact is particularly striking among the young - they are the leading cause of death worldwide among those aged 15–29 years.[3] In recent years, scientific research shows the increased risk of road traffic fatalities and injuries resulting from excessive or inappropriate speed, drink driving, and non-use of seat-belts, child restraints, or motorcycle helmets[4,5] Distraction while driving is the diversion of attention away from activities critical for safe driving toward a competing activity.[6] When drivers are distracted, their attention is temporarily divided between what is often referred to as the "primary task" of driving and "secondary tasks" not related to driving (Box 1). For example, during a mobile phone conversation, driver's cognitive (i.e., thinking) resources are being used to analyze both the driving situation (the primary task) and the conversation taking place (the secondary task). As a result, the driver's situational awareness, decision-making, and driving performance are impaired. Driver distraction can be one of four types. They are visual (e.g., looking away from the road for a non-driving-related task), cognitive (e.g., reflecting on a subject of conversation as a result of talking on the phone - rather than analyzing the road situation), physical (e.g., when the driver holds or operates a device rather than steering with both hands, or dialing on a mobile phone or leaning over to tune a radio that may lead to rotating the steering wheel), and auditory (e.g., responding to a ringing mobile phone, or if a device is turned up so loud that it masks other sounds, such as ambulance sirens).[6] More than one of these categories of distraction may occur at one time, depending on the particular trigger.

Fault of drivers accounts for 77.5% of all the causes of RTA's.[1] Distraction during driving is one of the important factors among different faults of drivers.[7] Visual reaction time (VRT) is one of the important factors required for driving. Due to the advent of technology in telecommunication and audio systems, the chance of these turning out to distract driver's attention is very much by decreasing visual and/or mechanical and/or cognitive abilities. It is a common observation that many vehicles in India are equipped with high volume output speakers and bluetooth hands-free devices. On the other side many pedestrians and two wheeler drivers are using Bluetooth devices and audio head set devices while they are commuting. There are no such laws which will prevent using headset and hands-free devices while driving, walking, and crossing a road in India. India's contribution in percentage to global RTAs is around 10% (World Health Organization [WHO], 2003). Despite the above fact, only very few studies were done in this regard. Hence, research in physiology aiming at wider applications not only helps in finding out solutions to prevent/cure/understands a disease but also to find solutions for many social concerns.

Driving is an active activity involving human aspects such as attention, alertness, continuous learning, training, proper judgment, detachment to other distracting activities, and compassion to fellow travellers. Each of the above aspects will, in turn, depend on many other factors such as boredom, emotional status, nutritional status, overall health of driver which includes mental and physical health, quantity of sleep, quality of sleep, and type of personality.

Loud music[8] is that which is played at a volume that disturbs others, such as neighbors or bystanders, who do not wish to hear the music, at least not at the same volume, or that is otherwise viewed as a nuisance to the public, and it may include music that is sung live with one or more voices, played with instruments or broadcast with electronic media, such as radio, compact disc (CD), or MP3 players. Hence, loud music is characterized by high volume and intensity.

Due to the advent of telecommunication technology and revolution in information and technology, the use of mobile phones has increased at unprecedented rate than ever. Furthermore, many cars are equipped with bluetooth hands-free devices having controls on steering. Many two-wheelers and pedestrians are using mobiles for voice communications while they are on roads. The Motor Regulation Act of India does not bar the usage of hands-free bluetooth device and headset devices while driving and also use by pedestrians. It only bans the use of handheld cell phones while driving. Even handheld mobile voice communication is allowed for pedestrians at present.

RT is the ability to give a quick motor response to a definite stimulus, while the time that elapses between the sensory stimulation and the motor reaction is called RT (Strulc, 1989). This is the time that elapses between a stimulus and the response to it. RT can be subdivided based on expected and unexpected stimuli into expected RT and unexpected RT. Expected RT is again divided into simple RT and choice RT. If the number of stimulus is more than one, this RT is defined as choice RT. If the number of stimulus is not more than one, then the RT is defined as simple RT.

Distracted driving is any activity that could divert a person attention away from the primary task of driving. All distractions will endanger driver, passenger, and bystanders' safety. The type of distractions includes mobile texting, calling, using smartphones for internet use, eating, drinking, talking to passengers, grooming, reading includes maps, using navigation systems, watching a video, adjusting a radio, adjusting CD player, and taking selfies.[9]

In the year 2013, 3154 people were killed in the USA due to motor vehicle crashes involving distracted driving and also 42, 4000 were injured.[9]

Technology is playing an important role in enhancing our quality of life. Yet, using the distraction causing technology while one is behind the steering can have devastating consequences.

Hence, the aim of the study is to find the independent relation between listening to loud music and active telephonic conversation on simple VRT.

## MATERIALS AND METHODS

A total of 40 healthy, male subjects within the age group of 20–25 years are recruited to test visual RT using Gary Darby computer RT software, version V4.03. Informed consent was obtained from all subjects. Exclusion criteria include hypertension, diabetes mellitus, thyroid diseases, neurological disorders, subjects who were born as preterm and who suffered birth asphyxia during birth, acute diseases, chronic diseases, visual problems, auditory problems, mental disorders, sportspersons, yoga practising persons, alcoholics, and smokers.

Before the start of test, subjects are made familiar with the test method. Each time 10 visual stimuli will appear on screen in the form of color image (red) in white computer background. Subject will respond immediately by pressing the space button with non-dominant hand once they see the color image and the same will disappear once they release the space button. Computer will record longest VRT, shortest VRT, and average VRT from the 10 responses. First, they are tested without any attention deviation. Second, they are tested while they are engaged in active telephonic conversation using a hands-free device. A standard questionnaire from Table 1 is used to engage the subjects in active conversation. Active telephonic conversation is different from passive conversation, as in former type, voice communication will be from both sides, and in later type, communication will be from one side and other one is passively listening. Finally, they are tested while listening to their favorite music. Subjects were asked to give their favorite rock music tunes so that the same tune will be played to involve them in listening to music as much as possible during the test. Only rock music tunes will be collected to maintain as much as uniformity as possible. Furthermore, standard music style is used because there are some studies which show significant variability in RT with different styles of music.

## RESULTS

Statistical analysis was done by student *t*-test and $P < 0.05$ is considered as statistically significant. SPSS software was used. Table 2 presents that mean average VRT and mean longest VRT without distractions are $0.32 \pm 0.08$ and $0.41 \pm 0.13$, with active telephonic conversation are $0.70 \pm 0.23$ and $1.10 \pm 0.44$, and with loud music are $0.34 \pm 0.06$ and $0.44 \pm 0.09$, respectively. There is a significant effect of active telephonic conversation on visual simple RT. However, loud music has not showed any significant effect on RT change.

**Table 1:** Questionnaire

| S NO | Questionnaire |
|---|---|
| 1 | Name any three fruits? |
| 2 | What is your date of birth? |
| 3 | What is your favorite hangout place? |
| 4 | Name any three colors you like? |
| 5 | Name any three trees? |
| 6 | Name any five countries in the world? |
| 7 | What is your favorite food? |

## DISCUSSION

In India, the motor vehicle population is growing at a faster rate than economic and population growth. The rise of motorization coupled with expansion of road networks has brought with it the challenge of addressing adverse factors such as the increase in RTAs.

According to the WHO, RTAs are the sixth leading cause of deaths in India with a greater share of hospitalization, deaths, and disabilities, socioeconomic losses in the young- and middle-aged population.[10] Behavioral risk factors such as speed, drunken driving, usage of hand signals, usage of vehicle signals, following signals, usage of mobile phones, helmet usage, seat belts usage, and usage of child restraints also play a significant contribution for the causation of RTAs.

It is well-known fact that many factors contribute to RTAs which include human factors, vehicle factors, climatic situations, condition of roads and local laws, and also other minor factors such as time of the day and month of the year also shown a significant relationship with RTAs. In this ever-changing world, the trend in RTAs is also changing.[1] To understand the causes for (Road traffic accidents) RTA's in general and also new causes for changing trend of RTAs, it is important to broaden the vision. In developing countries like India, various factors such as literacy, poverty, population, spirituality, local government policies, surveillance, research on RTAs, and level of technology usage play an important role in deciding trend in RTAs in that particular region. Furthermore, other factors such as urbanization, unemployment, average age of the population, level of mental stress in the society, fitness of the vehicle, fitness of the drivers, frequency and effectiveness of fitness checking, use of radium stickers for vehicles, government alcohol policies, narcotic drug policies, and extent of government transport system in a particular region also influence the causation of RTAs.

According to neuroscientific researches, "the human mind can multitask, but each task is performed with less brain power and lower proficiency." Active telephonic conversation is significantly affecting VRT and hence driving ability. The effect of loud music on VRT is not significant; more research is required in this regard to other thought process such as choice RT, emotion, and judgment.

**Table 2:** Mean RTs with and without distractions

| S. No | Without distraction test1 | With distraction using active telephonic conversation test 2 | With distraction using loud music test 3 |
|---|---|---|---|
| Mean average VRT | 0.32±0.08 | 0.70±0.23*** | 0.34±0.06 |
| Mean longest VRT | 0.41±0.13 | 1.10±0.44*** | 0.44±0.09 |
| Mean shortest VRT | 0.25±0.03 | 0.36±0.08* | 0.27±0.04 |

*P*<0.05 is considered as statistically significant. VRT: Visual reaction time, RTs: Reaction times

Some studies show that using in-vehicle entertainment systems has detrimental effects on driving performance.[11] Indeed, adjusting a radio, CD, or cassette player was found to be one of the major causes of distraction-related crashes in the United States. Bluetooth is a wireless technology that uses short wavelength radio transmissions from fixed and mobile devices, such as mobile phones. Many vehicles now come equipped with "Bluetooth" car kits which allow hands-free calls to be made. Some research suggests that the impact on driving performance of talking on a mobile phone is similar to that of holding a conversation with a passenger. However, other more recent studies suggest that there is a significant difference between these two situations, with a higher risk of distraction and effect on driving behavior for those using a mobile phone compared to those conversing with a passenger. Studies have shown that RTs are slower among drivers talking on a phone than among those talking to a passenger.[12]

This appears to be because the passengers are more aware of the driving situation and road environment and can moderate, adapt, or delay the conversation during challenging driving circumstances, a phenomenon that does not occur during phone conversations.[13,14] In the Netherlands, the use of mobile phones while driving was responsible for 8.3% of the total number of dead and injured victims in 2004.[16] Insurance companies in Colombia reported that 9% of all road traffic crashes were caused by distracted drivers in 2006. Of all cases where pedestrians were hit by cars, 21% were caused by distracted drivers.[15] In 2008, driver distraction was reported to have been involved in 16% of all fatal crashes in the United States.[17] In India market is flooded with latest mobile gadgets called smartphones and palmtabs which provide a wide range of e-mail and internet services which include services like wide-area wireless voice telephone, mobile Internet access, video calls, streaming movies, downloading applications and games.

Road traffic deaths have been steadily increasing in many low- and middle-income countries, particularly where rapid motorization has not been accompanied sufficiently by improved road safety strategies. While better communication could, in theory, result in a reduced need for road travel, and thus lower the exposure to risk of road traffic injuries, in practice, the combination of increased road transportation and better and continuous forms of communication may be detrimental to the global road safety picture. A number of studies have tried to determine how many drivers use mobile phones while driving. For example, in a number of high-income countries (e.g., the United States of America, New Zealand, Australia, and some European countries), 60–70% of drivers report using a mobile phone at least sometimes while driving.[13,16,18,19] A self-reported study in the Netherlands found that 2% of drivers reported frequently using handheld phones, compared to 14% who reported using a hands-free phone while driving.[14] An observational study in London, UK, found that while 2.8% of car drivers were using handheld phones, this figure was much higher (4.8%) for hands-free phones.[1] The use of hands-free phones had increased more than use of hand-held phones when compared to previous years. The proportion among taxi drivers and van drivers using hands-free phones was considerably higher, at 14.3% and 9.9%, respectively.[19] Auditory distraction, in the form of responding to a ringing phone, can also occur, although the duration of this distraction is likely to be shorter than for other forms of distraction.

The use of a mobile phone can impair performance on a number of driving tasks, leading longer RTs to detect and respond to unexpected driving-related events, impaired ability to maintain correct lane position, slower braking reactions with more intensive braking, and shorter stopping distances, impaired ability to maintain an appropriate speed (i.e., usually driving slower), slower reactions to traffic signals/missed signals, reduced field of view (i.e. drivers more likely to look straight ahead and not at periphery or in mirrors), shorter following distances, accepting gaps in traffic streams that do not give sufficient time for the driver to safely maneuver the vehicle into the traffic flow, increased mental workload, resulting in higher levels of stress and frustration, and reduced driver-awareness of what is happening around them.[6,16]

The complexity of the distracting task and its cognitive demands in particular seems to be important factors in determining the extent to which it affects driving behavior.[13,21] As the mobile phone market expands and technology becomes increasingly sophisticated, hands-free phones and other aids, such as voice activation and speed dialing, are being developed to reduce physical distraction associated with mobile phone use. It is unclear whether hands-free phone devices have less impact on driving behavior than handheld phones. While handheld phones have the physical distraction of holding the phone to their ear, a number of studies show that using hands-free phones also has negative impacts on various aspects of driving behavior (notably, an increased RT) that are similar to using a handheld phone. These findings are consistent with our studies. Using hands-free phones while

driving has been shown to lead to reduced visual monitoring of instruments in the car and the general traffic situation and negatively impacts on vehicle control. This evidence suggests that hands-free phones are not safer to use than handheld phones in terms of driving performance.[13,14,22,24-27] Although this may seen counterintuitive, evidence showing that it is the cognitive distraction that has the most impact on driving performance may explain why using a hands-free mobile phone may be as likely to cause a crash as using a hand-held mobile phone.[13,14,23,25,28-30] These conclusions are derived from epidemiological studies, meta-analyses, simulator studies, and reviews of the literature.[13,14,20,22,23,25,28,31,32] A few countries, such as Portugal, have extended bans on mobile phones to include hands-free kits. Such bans have also been applied at a sub-national level. For example, the state of New Delhi has extended the ban on mobile phones when driving to include use with a hands-free unit and text messaging. The fine, currently Rs. 1000 (US$ 21) may be increased in 2010 to Rs. 2000 or 6 months imprisonment.[33] To date, there is a lack of research that looks at the effects of banning hands-free mobile phone use in vehicles to assess whether such measures lead to any reduction in their use or on rates of road traffic crashes. The difficulty of enforcing bans on hands-free mobile phones has led many countries to ban only handheld phones. However, since studies demonstrate that there are similar effects on driving performance with both types of phones, laws that only prohibit drivers from using hand-held devices could be interpreted to mean that the use of hands-free mobile phones is safe and conveys a false sense of security to those using such devices. Indeed, a study carried out in London, United Kingdom, suggests that tougher enforcement on the use of hand-held phones was followed by a quick rise in the use of hands-free phones.[19] Laws limiting the use of all electronic communications devices by drivers may make the most sense based on the research, but such laws in Ilorin, Nigeria, 267 randomly selected noncommercial drivers were interviewed using a structured questionnaire.

More than 90% of respondents were aware that mobile phone use while driving increases the risk of a road traffic collision, but over a quarter of respondents (27.5%) admitted to phoning while driving. Appropriate legislation and enforcement, together with continued public education, is required to reduce the risk among drivers.[34] Police officers can see whether a driver is holding a phone to the ear, but it is much harder to determine if a driver is sending a text message or talking on a hands-free phone. No conclusive evidence to show that hands-free phoning is any safer than hand-held phoning, due to the cognitive distraction involved with both types of phones. Studies suggest that the use of mobile phones - regardless of whether handheld or hands-free - while driving leads to an increased crash rate compared to when a driver does not use a mobile phone. It is now clear that the relative impacts of distraction on driving ability may vary by the type of phone, age, or sex of the individual. In spite of the this variation, using a mobile phone while driving increases the absolute likelihood of a collision for all drivers. It is to be noted that loud music definitely will mask the auditory stimuli which are also the important requirement for driving. It is the collective responsibility of the drivers and pedestrians in preventing RTA's. Even the pedestrians walking on the road on the pavements and crossing a road should be very attentive. French Government has already passed a law making use of hands-free headsets as illegal while driving.[35] In India too, the same trend should be adopted in to decrease the potentials causes for RTAs.

## CONCLUSION

Active telephonic conversation is significantly affecting visual RT and hence driving ability. The effect of loud music on simple visual RT is not significant. May be more research is required to study the effect of loud music on driving because driving not only involves simple VRT but also many thought processes such as choice RT, emotional status, and judgment. It is to be noted that loud music definitely will mask the auditory stimuli which is also important requirement for driving. All the preventable distractions which will affect the attention aspect of drivers and pedestrians should be avoided. Internal control through self-discipline and external control through government policies will help in preventing RTAs.

## ACKNOWLEDGMENTS

We like to acknowledge our institution MNR Medical College and Hospital, Fasalwadi, Telangana ,India for allowing and encouraging us to carry out this work. We like to acknowledge the participants for their volunteer ship and cooperation. Furthermore, we like to acknowledge Dr. Devendra Singh Negi, Professor, Mediciti Institute of Medical Sciences, for his constant support and encouragement.

## REFERENCES

1. Accidental Deaths and Suicides in India 2013. National Crime Records Bureau, India. Available from: http://www.ncrb.gov.in/adsi2013/ADSI-2013.pdf. [Last cited on 2014 Jun 26].
2. The Global Burden of Disease: 2004 Update. Geneva: World Health Organization; 2008. Available from: http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_AnnexA.pdf. [Last accessed on 2011 Jan 06].
3. World Health Statistics 2008. Geneva: World Health Organization; 2009. Available from: http://www.who.int/whosis/whostat/2008/en/index.html. [Last accessed on 2011 Jan 06].
4. Elvik R, Vaa T. Handbook of Road Safety Measures. Amsterdam: Elsevier; 2004.
5. Peden M, Scurfield R, Sleet D, editors. World Report on Road Traffic Injury Prevention. Geneva: World Health Organization; 2004. Available from: http://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/en/index.html. [Last accessed on 2011 Jan 06].

6. Regan M. Driver distraction: Reflections on the past, present and future. In: Faulks IJ, Regan M, Stevenson M, Brown J, Porter A, Irwin JD, *et al*, editors. Distracted Driving. Sydney: Australasian College of Road Safety; 2007. p. 29-73.
7. Mobile Phone Use: A Growing Problem of Driver Distraction. Geneva, Switzerland: World Health Organization; 2011. Available from: http://www.who.int/violence_injury_prevention/publications/road_tra€c/en/index.html. [Last accessed on 2015 Aug 10]
8. Loud Music. Wikipedia, the Free Encyclopedia. Available from: https://www.en.wikipedia.org/w/index.php?title=Loud_music&oldid=682451036. [Last accessed on 2015 Nov 22].
9. Distracted Driving: U.S Department of Transportation. Washington: National High Way Traffic Safety Administration. Available from: http://www.distraction.gov/stats-research-laws/facts-and-statistics.html. [Last accessed on 2015 Nov 16]
10. Global Status Report. Available from: http://www.who.int/mediacentre/factsheets/fs358/en/. [Last accessed on 2016 Jul 24]
11. Horberry T, Anderson J, Regan MA, Triggs TJ, Brown J. Driver distraction: The effects of concurrent in-vehicle tasks, road environment complexity and age on driving performance. Accid Anal Prev 2006;38:185-91.
12. Burns PC, Parkes AM, Lansdown TC. Conversations in Cars: The Relative Hazards of Mobile Phones. Proceedings of the XV$^{th}$ Triennial Congress of the International Ergonomics Association. Available from: http://www. mthr.org.uk/research_projects/documents/Rum5FinalReport.pdf. [Last accessed on 2010 Aug 16].
13. Dragutinovic N, Twisk D. Use of Mobile Phones While Driving – Effects on Road Safety. Leidschendam, Netherland: SWOV Institute for Road Safety Research; 2005. Available from: http://www.swov.nl/rapport/r-2005-12.pdf. [Last accessed on 20911 Jan 06].
14. Brace CL, Young KL, Regan MA. Analysis of the Literature: The use of Mobile Phones While Driving. Vagverket: Monash University Accident Research Centre; Swedish Road Administration; 2007. p. 35.
15. Colombia, Fondo de Prevención Vial. Accidentalidad Vial en Colombia. Bogotá: FPV; 2006.
16. Use of Mobile Phone While Driving [Fact Sheet]. Leidschendam, Netherlands: SWOV; 2008. Available from: http://www.swov.nl/rapport/Factsheets/UK/FS_Mobile_phones.pdf. [Last accessed on 2010 Mar 30].
17. Traffic Safety Facts: n Examination of Driver Distraction as Recorded in NHTSA Databases. Research Note, DOT HS 811 216, September; 2009. Available from: http://www-nrd.nhtsa.dot.gov/Pubs/811216.pdf. [Last accessed on 2010 Aug 15].
18. Johal S, Napier F, Britt-Compton J, Marshall T. Mobile phones and driving. J Public Health 2005;27:112-3.
19. Narine S, Walter LK, Charman SC. Mobile Phone and Seat Belt Usage Rates. London, Wokingham: Transport Research Laboratory Ltd.; 2009. (TRL Project Report 418). Available from: http://www.centre/announcements/telstra-police-and-nrma-insurance-join-forces-to-target-mobile-phoneuse-on.xml. [Last accessed on 2011 Jan 06].
20. McCartt AT, Hellinga LA, Bratiman KA. Cell phones and driving: Review of research. Traffic Inj Prev 2006;7:89-106.
21. Patten CJ, Kircher A, Ostlund J, Nilsson L. Using mobile telephones: Cognitive workload and attention resource allocation. Accid Anal Prev 2004;36:341-50.
22. Caird JK, Willness CR, Steel P, Scialfa C. A meta-analysis of the effects of cell phones on driver performance. Accid Anal Prev 2008;40:1282-93.
23. Redelmeier DA, Tibshirani RJ. Association between cellular-telephone calls and motor vehicle collisions. N Engl J Med 1997;336:453-8.
24. The Impact of Cognitive Distraction on Driver Visual Behaviour and Vehicle Control. Transport Canada Publication TP# 13889E. Ottawa, Transport Canada; 2002. Available from: http://www.tc.gc.ca/roadsafety/tp/tp13889/pdf.tp-13889es.pdf.. [Last accessed on 2010 Aug 15].
25. McEvoy SP, Stevenson MR, McCartt AT, Woodward M, Haworth C, Palamara P, *et al.* Role of mobile phones in motor vehicle crashes resulting in hospital attendance: A case-crossover study. BMJ 2005;331:428.
26. Ishigami Y, Klein RM. Is a hands-free phone safer than a handheld phone? J Safety Res 2009;40:157-64.
27. Strayer, D Johnston, WA. Driven to distraction: Dualtask studies of simulated driving and conversing on a cellular phone. Psychol Sci 2001;12:462-6.
28. Breen J. Car Telephone use and Road Safety. Final Report. An Overview Prepared for the European Commission. Skipton, UK, Jeanne Breen Consulting, 2009. Available from: http://www.ec.europa.eu/transport/road_safety/specialist/knowledge/mobile/car_telephone_use_and_road_safety.pdf. [Last accessed on 2010 Aug 15].
29. McCartt AT, Hellinga LA, Bratiman KA. Cell phones and driving: Review of research. Traffic Inj Prev 2006;7:89-106.
30. Bellavance F. Linking Data from Different Sources to Estimate the Risk of a Collision When Using a Cell Phone While Driving. Toronto: International Conference on Distracted Driving; 2005. p. 2-5.
31. Laberge-Nadeau C, Maag U, Bellavance F, Lapierre SD, Desjardins D, Messier S, *et al.* Wireless telephones and the risk of road crashes. Accid Anal Prev 2003;35:649-60.
32. Horrey WJ, Wickens CD. Examining the impact of cell phone conversations on driving using meta-analytic techniques. Hum Factors 2006;48:196-205.
33. Six Months Jail for Cell Use While Driving. The Times of India. Available from: http://www.timesofindia.indiatimes.com/india/6-months-jailfor-cell-use-while-driving/articleshow/5216807.cms. [Last accessed on 2009 Nov 11]; [Last accessed on 2010 Aug 15].
34. Akande TM, Ajao MS. Awareness of hazards and use of GSM mobile phone among non- commercial drivers in Ilorin, Nigeria. Ann Afr Med 2006;5:166-9.
35. France Bans use of Hands-free Headsets—For Calls, Music, Podcasts.—While Driving. Available from: http://www.arstechnica.co.uk/tech-policy/2015/06/france-bans-use-of-hands-free-headsets-for-calls-music-podcasts-while-driving/. [Last cited on 2015 Jun 29].


**How to cite this article:** Srikaram PR, Ambareesha K, Bai PK. Effect of loud music and active telephonic conversation on simple visual reaction time. Natl J Physiol Pharm Pharmacol 2018;8(6):790-795.

**Source of Support:** Nil, **Conflict of Interest:** None declared.