

In-vehicle Distraction among Four Wheeler Drivers in Kerala

Srinath R^a, Rajesh R^b, Sasikumar R^c and Subin B^d

a, b, c-Rajiv Gandhi Institute of Technology, Kottayam, India, krishna.srinath@gmail.com

d-National Transportation Planning and Research Centre, Thiruvananthapuram, India, mailmesubin@gmail.com

Abstract : There has been a tremendous growth in the number of vehicles in Kerala over the past many years which has resulted in a consistent increase in the number of accidents causing fatality and injury. One of the main reasons for road accidents is driver's error. An important cause for this error is distraction caused to the driver. The focus of this paper is to examine the sources and extent of in-vehicle distraction among four wheeler drivers in Kerala for which the data has been collected through a three part questionnaire prepared as a result of a literature review. In this paper, descriptive statistics of the study are presented for Part A which consists of questions on how much the respondents are involved in distractions inside the vehicle while driving (n=1203). One way ANOVA has been used to find significant differences in Part A variables with respect to demographic variables such as age, gender, experience, driving speed, penalizing and accidents. The questionnaire survey on distracted driving stresses the need to focus on human-machine interactions that causes in-vehicle distractions and safety incidents, and calls for scientific training methods and technological interventions.

Keywords : in-vehicle distractions, four wheeler, driver error, ANOVA

1 Introduction

There has been a consistent growth trend in the number of vehicles and number of road traffic accidents in Kerala for many years. Records available with the state authorities attribute driver's fault as the cause for majority of the accidents. Negligent driving is a generic term used to represent driver's mistake. However there are no specific details as to the reason for negligence. In this context, the concept of distracted driving becomes relevant. Since, today's cars are equipped with facilities for more than what is required for driving, the chances for the driver to lose focus is high due to indulging in distracting activities.

According to National Highway Traffic Safety Administration (NHTSA) 2015, driver distraction is a kind of driver inattention that occurs when drivers divert their focus from the driving task and allot the same for some other non-driving related activity. Driving distraction can also occur due to activities such as interaction with passengers, meeting personal requirements such as eating or drinking while driving, using mobile phones, manipulating controls of electronic equipments and adjusting environment inside the vehicle etc. Distracted driving as a major haphazard has been studied for many years in western countries. In India, the literature on distracted driving is sparse. The objective of this study is to examine the sources and extent of in-vehicle distraction prevalent among the four wheeler driving population in Kerala.



2 Literature Review

Many researchers have concentrated on one or more secondary tasks or distractions that drivers undertake and their impact on driving and safety. According to Birrell et al. (2014), driving distraction is a very difficult multi faceted issue. Caird et al. (2014) states that drivers who use mobile phones while driving shift their focus many times, miss key points and exhibit lower responses to hazards. Singh et al. (2010) has focussed on glance behaviour, personal interactions, eating/drinking while driving, smoking, use of communication and infotainment equipments etc. McEvoy et al. (2007) and Charlton et al. (2009) have considered the relative influence of remote conversations and in-vehicle passenger conversations. Nelson et al. (2009) and Atchley et al. (2011) have studied the influence of using mobile phone while driving by means of questionnaire surveys. Collet et al. (2009) has evaluated the strain undergone by drivers carrying out a secondary task while driving. Brodsky et al. (2013) and Ünal et al. (2012) have analyzed the in-fluence of background music as a risk factor for distraction among drivers. Knapper et al. (2014) has considered the distracting effect of smartphones and navigation systems on driving in urban and other motorways.

According to Golias et al. (2002), the environmental parameters inside the vehicle such as temperature, seating, rear and side mirrors etc. must be identifiable and adaptable for the driver, otherwise adjusting them will prove to be distracting. In addition, glancing into meter console and distraction due to improper lighting, which from the literature review, are seen to have not been included in studies are also considered.

3 Methodology

Critical issues or causative factors of in-vehicle distraction have been identified through a literature review. A questionnaire survey has been conducted to elicit responses from four wheeler drivers regarding the extent of in-vehicle distracting sources/activities they experience or undertake (Part A) and their perception towards the safety concerns associated with those activities (Part B). Part C included questions for deriving engineering and administrative solutions for the improvement of safety. The questions cover distracting factors such as in-vehicle environment, personal interactions, shifted glance behaviour and use of infotainment and communication devices. A random sampling approach has been used to administer the questionnaire. The response is obtained from 1203 respondents at 5 districts in Kerala, India. The mean (std dev) age of the respondents is found to be 33.14 (SD=10.66). A five point Likert scale has been used to collect the responses. One-way Analysis of Variance (ANOVA) is used to analyze the responses to Part A based on age group, gender, experience, occupation, driving speed, penalizing and accident involvement, and results are presented in this paper.

4 Results and Discussion

4.1 Descriptive statistics of the sample

The demographic details of the respondents is given in Table 1.

Table 1 Descriptive statistics of the sample

Item	Classification	Percentage
Age group	18-30	50.59
	31-40	23.44
	41-50	18.33
	Above 50	7.64
Gender	Male	84.8
	Female	15.2
Experience	< 5 yrs	41.97
	5-10 yrs	33.82
	10-15 yrs	13.97
	> 15 yrs	10.24
Occupation	Professional driver	17.62
	Private Driver	82.38
Driving speed	< 40 kph	9.64
	40-60 kph	67.26
	60-80 kph	21.6
	> 80 kph	1.5
Penalizing	Penalized	15.62
	Not penalized	84.38
Accidents 16.04	Met with accidents	
	Not met with accidents	83.96

4.2 Extent of in-vehicle distraction

The extent to which the respondent drivers indulge in secondary activities or experience distraction within the vehicle is given in figure 1.

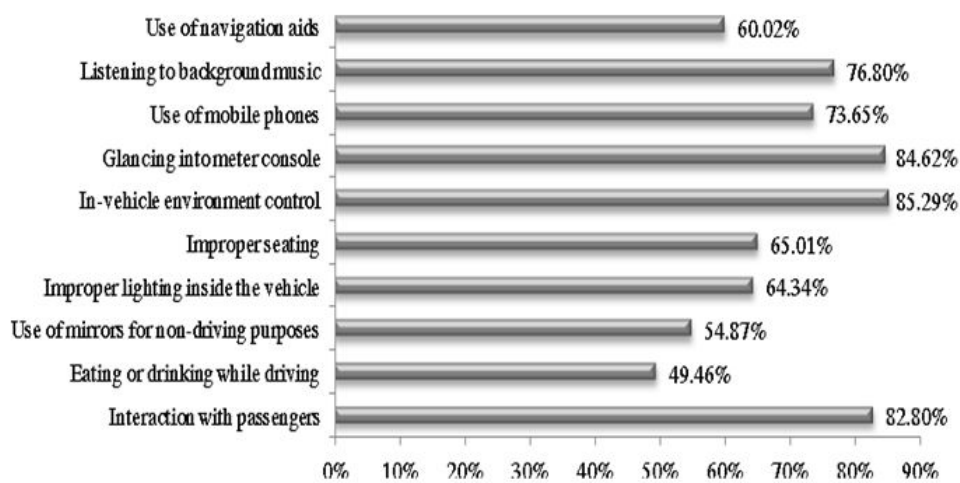


Fig. 1 Extent of in-vehicle distraction among respondent drivers



It has been reported that 82.8% of the respondents interact with passengers in the vehicle while driving. 49.46% of the drivers eat or drink along with driving. 54.87% of the drivers use the rear and side view mirrors for non driving activities such as grooming. 64.34% of the respondents have reported to experience visual distraction while driving at night due to improper or incorrect interior lighting. 65.01% of the respondents have reported of adjusting the driving seat while driving, which makes them momentarily incapable of responding to emergency situations. 85.29% of the respondents regulate the internal environment of the vehicle which consists of parameters such as temperature, sound level etc. 84.62% exhibit frequent glancing behaviour into the meter console, which makes them prone to lane deviations. 73.65% of the respondents use mobile phones while driving. 76.8% of the drivers listen to music or radio programmes when they are driving. 60.02% of the drivers reported using navigation aids while driving.

4.3 Differences in extent of distraction among respondents

One way Analysis of Variance (ANOVA) has been performed to elicit the information regarding type of in-vehicle distractions experienced by the respondents based on age group, gender, experience, driving speed and incident parameters such as penalizing and accidents.

From the ANOVA, it has been found that there is significant difference between the age groups in attending to the passengers. Drivers above 50 years of age reported to be least attending to the passengers and the drivers of age 18-30 interact with passengers the most ($F(3,1191)=3.868$, $p=0.009$). Respondents in the age group 18-30 are most involved in distracting activities while driving. Respondents in the age group of 41-50 reported of least glance behaviour into the meter console ($F(3,1193)=9.884$, $p=0.000$). Respondents above 50 years of age do not use mobile phone as much as other age groups ($F(3,1189)=3.054$, $p=0.028$).

The male population interacts with the passengers more than female drivers ($F(1,1199)=6.432$, $p=0.011$). There is a marginal difference in the extent of eating or drinking while driving between men and women ($F(1,1199)=3.926$, $p=0.048$) and in the use of mobile phone while driving ($F(1,1197)=4.434$, $p=0.035$). Men use mirrors for non driving purposes while driving than women ($F(1,1200)=9.298$, $p=0.002$). Men report to be adjusting the seat position more often than women ($F(1,1201)=8.237$, $p=0.004$). Female drivers do not tend to adjust the in-vehicle environment as much as their counterparts ($F(1,1201)=10.858$, $p=0.001$). Men have the tendency to look at the meter console marginally more than women ($F(1,1201)=4.246$, $p=0.040$). Women do not use navigation aids as much as men ($F(1,1183)=13.735$, $p=0.000$).

Professional drivers interact less with passengers ($F(1,1166)=19.899$, $p=0.000$), glance less to the meter console ($F(1,1168)=13.203$, $p=0.000$), and drive with background music more than private drivers ($F(1,1159)=7.656$, $p=0.006$). It has been observed that the use of mirrors for non driving purposes decreases with increase in driving experience ($F(3,1184)=4.562$, $p=0.003$). Also the use of interior lighting reduces with increase in driving

experience ($F(3,1185)=11.598, p=0.000$).

Respondents who drive at less than 40 kmph have reported to be least at-tending to passengers than other drivers ($F(3,1176)=12.739, p=0.000$). Those who drive above 80 kmph reported to be involved in distracting activities more than other drivers. There is an increasing trend in the use of mirrors for non driving purposes with driving speed. It has been observed that the tendency of drivers to adjust the position of driving seat increases with driving speed ($F(3,1178)=8.715, p=0.000$). Those driving between 60 and 80 kmph regulate the environment inside the vehicle more frequently than other drivers ($F(3,1178)=5.225, p=0.001$). There is an increasing trend in mobile phone use with increase in driving speed. Respondents who drive below 40 kmph have reported of listening to background music less than other drivers ($F(3,1169)=10.674, p= 0.000$) and reported least use of navigation aids ($F(3,1161)=9.111, p=0.000$).

From the study, it has been observed that those who have been penalized and have met with accidents report experience distraction than other drivers in case of sources and behaviours other than improper interior lighting.

5 Conclusion

The relevance of the study is that it has helped to examine the nature and extent of the in-vehicle factors of distracted driving. It has been found that majority of the drivers in the state are distracted within the vehicle while driving, due to behavioural or environmental reasons. ANOVA has been used to compare the extent of distraction between drivers. There is a need to focus on human-machine interactions that causes in-vehicle distractions and safety incidents. Further, there is a need to focus on scientific training methods and technological interventions that would address the issue of in-vehicle distractions. Concerted technology driven measures in engineering as well as administrative domains are essential to counter increasing accident rate and generate a safety oriented transport culture among drivers in the state.

References

1. "Economic Review", 2014. Planning Board. Kerala. Available from <http://spb.kerala.gov.in/images/pdf/er14/index.html>, accessed June 15, 2015
2. "Accident Deaths in Kerala", 2014. Kerala Police. Available from <http://keralapolice.gov.in/newsite/road.html>
3. Traffic Safety Facts, 2015. "Distracted Driving 2013." National Highway Traffic Safety Administration: 1-6.
4. Atchley, P., S. Atwood and A. Boulton. 2011. "The choice to text and drive in younger drivers: Behavior may shape attitude." *Accident Analysis and Prevention* 43:134-142.
5. Bingham, C.R., 2014. "Driver Distraction: A Perennial but Preventable Public Health Threat to Adolescents." *Journal of Adolescent Health* 54: S3-S5.
6. Birrell, S.A. and M. Fowkes. 2014. "Glance behaviours when using an in-vehicle smart driving aid: A real-world, on-road driving study." *Transportation Research Part F* 22: 113-125.



7. Brodsky, W. and Z. Slor. 2013. "Background music as a risk factor for distraction among young-novice drivers." *Accident Analysis and Prevention* 59: 382-393.
8. Brusque, C. and A. Alauzet. 2008 "Analysis of the individual factors affecting mobile phone use while driving in France: Socio-demographic characteristics, car and phone use in professional and private contexts." *Accident Analysis and Prevention* 40: 35-44.
9. Caird, J.K., K.A. Johnston, C.R. Willness, M. Asbridge and P. Steel. 2014. "A meta-analysis of the effects of texting on driving." *Accident Analysis and Prevention* 71: 311-318.
10. Charlton, S.G. 2009. "Driving while conversing: Cell phones that distract and passengers who react." *Accident Analysis and Prevention* 41: 160-173.
11. Collet, C., A. Clarion, M. Morel, A. Chapon and C. Petit. 2009. "Physiological and behavioural changes associated to the management of secondary tasks while driving." *Applied Ergonomics* 40: 1040-1046.
12. Golias, J., G. Yannis and C. Antoniou. 2002. "Classification of driver assistance systems according to their impact on road safety and traffic efficiency". *Transportation Reviews* 22:179-196.
13. Knapper, A.S., M. P. Hagenzieker and K.A. Brookhuis. 2014, "Do in-car devices affect experienced users' driving performance?" *IATSS Research*. Article in Press.
14. McEvoy, S.P., M.R. Stevenson and M. Woodward. 2007. "The contribution of passengers versus mobile phone use to motor vehicle crashes resulting in hospital attendance by the driver." *Accident Analysis and Prevention* 39: 1170-1176.
15. Nelson, E., P. Atchley and T.D. Little. 2009. "The effects of perception of risk and importance of answering and initiating a cellular phone call while driving." *Accident Analysis and Prevention* 41: 438-444.
16. Singh, S. 2010. "Distracted Driving and Driver, Roadway, and Environmental Factors", Mathematical Analysis Division, National Center for Statistics and Analysis, National Highway Traffic Safety Administration.
17. Ünal, A.B., L. Steg and K. Epstude. 2012. "The influence of music on mental effort and driving performance." *Accident Analysis and Prevention* 48: 271-278.