

Sleepiness among Indian Taxi-Drivers: A Psychological Probe

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Abstract:

Background: Sleepiness during driving is a major though underrated factor in traffic crashes. Strenuous work schedules and lack of sleep is one of the major causal factors for traffic crashes all over the world. As driving is a complex task, trait and state factors play a crucial role in determining one's driving behavior in a specific situation. Thus, a 'state' of feeling sleepy while driving may be related to other variety of factors.

Objectives: In order to understand the role of these factors, aggression, dislike towards driving, hazard monitoring, fatigue proneness and thrill-seeking were taken as variables. *Methodology:* In this study, thirty-one male taxi drivers holding valid four-wheeler driving license and having average ten years of experience as driving taxi were taken as a sample. The individuals were randomly selected from various taxi services being operated in Chandigarh. The participants were administered Epworth Sleepiness Scale and the sub-scales of Driver Stress Inventory (DSI) along with a socio-demographic questionnaire. **Findings:**

Results revealed significant positive relationship of sleepiness with hazard monitoring and fatigue proneness, negative correlation between sleepiness and thrill-seeking, while no relationship of sleepiness with aggression and dislike towards driving was observe *Conclusions:* The socio-demographic profile of drivers revealed few interesting facts on their driving history, work and sleep patterns, traffic violation history and perspective on road crashes. Most of them did not appear for any driving test. Red light jumping was the majorly reported traffic violation. Smoking was the key strategy of remaining awake while feeling sleepy behind the wheel. *Recommendation:* **Stringent procedure** for obtaining driving license, strict penalties for violating traffic rules, implementation of in-vehicle fatigue monitoring systems and suggestion for enough time for sleep among commercial drivers.

Keywords: Driving behaviour, India, Males, Sleepiness, Taxi-driver.

Introduction

Sleep is indispensable as it is a state of natural rest and is important for optimal functioning of human body. Where sleep is an altered state of consciousness, sleepiness is a difficulty in remaining awake despite being engaged in some activity [1]. Driving is one of the complex activities where optimal level of alertness is quintessential for safe handling of a vehicle. Low alertness can lead to deterioration in performance to a point where it compromises with safety [2-4] Therefore, sleep deprivation adversely affects one's ability to focus and

one's driving performance as well. Research studies on same lines have reported that sleep-related crashes in United States have claimed over 15,000 lives and accounted for more than 12 billion dollars in lost productivity and property damage in a year [5,6]. Another study reported 15-20% sleep-related road crashes on motorways and urban roads in United Kingdom [7]. There can be varieties of reasons as to why many drivers when sleep-deprived still tend to drive [8,9], including certain socio-cultural factors for some holiday travelers [10] or monetary rewards for professional drivers [11].

In another research conducted by 'Adelaide Centre for Sleep Research' [12], concluded that drivers not having slept for 24 hours, suffer from deteriorated driving performance equivalent to that of an individual who has consumed alcohol having BAC of 0.1/100ml, and are found seven times more likely to have a road crash than drivers who are not sleep deprived. A poll conducted by National Sleep Foundation (NSF) [13] revealed that 36% of American adults have nodded off or fallen asleep while driving. A telephonic survey of 1000 drivers in New York [14], found that 55% of the drivers have driven in a drowsy state in the last one year followed by 23% of the drivers who claimed to have fallen asleep while driving and 4.7% of the respondents reported admitted having a crash due to drowsiness or after falling asleep. In another survey in UK, 29% of the drivers had at least one experience of a serious drowsiness episode during the last one year [15]. No such official data is available on the similar incidents in India which

points to the need of having a record on drowsiness-related road crashes and developing counter-measures for the same.

The present research looks at a few psychological variables and its relationship with sleepiness i.e. aggression, dislike towards driving, hazard monitoring, fatigue proneness and thrill-seeking. These five psychological variables form five distinct dimensions for driver stress inventory [16]. Aggression can be

defined as a behavioural component of anger directed towards another person, event or situation with the intent of causing harm or an injury. In a driving context, it involves negative appraisals of other drivers which manifests through threatening behaviour or competing with them. These cognitive processes initially generate feeling of anger followed by dangerous driving behavior. Dislike towards driving is an aversive feeling which is often characterized by negative affect, anxiety and lack of confidence as a driver. Hazard monitoring on the other hand reflects a style of coping that seeks to preempt threat by vigilant search for danger while fatigue proneness may refer to involuntary sleep onset during driving, to sub-optimal performance efficiency due to circadian rhythms, can also be fatigue induced by the task itself [16].

Thrill-seeking is an activity which is unusual, novel and tends to excite or promises adventure. It is a hazardous behavior in a driving context leading to risky driving and increased accident involvement [17]. Studies have shown that aggression and thrill-seeking are strong predictors for self-reported accidents, speeding and violations, whereas dislike towards driving is linked with driver error, associations for the same being replicated and proved in driver simulator studies [18]. Thrill-seeking was therefore one of the variable studied in this research.

It has been observed that professional drivers (i.e. people whose job is driving) contribute significantly towards road traffic crashes [19, 20] both in terms of human and financial costs [21]. Many research studies also confirm that these commercial drivers are at a higher risk of crashes than general driving

population [22, 23]. Majority of studies envisaged the on-road behavior of non-professional drivers while safety researchers have given less attention to traffic crashes among the professional drivers [24]. A research was conducted by University of Teesside which found taxi-drivers to be more aggressive and high on thrill-seeking dimension

as compared to the other drivers (police drivers, heavy goods vehicle drivers, commuters, occasional drivers) [25]. As per the national database of Finland on road accidents from 1991 to 2001, it was reported that 15.3% of accidents were related to sleepiness. They further concluded that sleepiness/fatigue seriously impairs the attention and decision making ability of the drivers [26]. A survey by All India Institute of Medical Sciences (AIIMS) also found that majority of drivers involved in the road crashes had a history of sleep-related disorders in the past with over 60% of road accident victims with head-injuries being diagnosed with 'excessive daytime somnolence' [27], reflecting the need of this study.

There is a dearth of literature on the same in India. This study, therefore, focuses on these professional drivers, specifically the taxi or cab drivers, who drive to earn their livelihood. Whatever research has been done till now among professional drivers, the taxi drivers have become popular subject for research [28-30] with some of their high-risk personality dimensions being explored [31] while other researchers examined their attitudes in relation to the traffic laws and its enforcement [32, 33]. However, this research aims to explore the relationship of sleepiness with aggression, dislike towards driving, hazard monitoring, fatigue proneness and thrill-seeking among drivers.

Hypothesis

- **(H₁)** It was expected that there will be a positive relation of sleepiness with aggression, dislike towards driving and fatigue proneness among taxi drivers.
- **(H₂)** It was expected that there will be a negative relationship between sleepiness and hazard monitoring and thrill-seeking among taxi drivers.

Methodology

Sample: A cross-sectional study design was formulated in which total of thirty-one professional taxi-drivers from Chandigarh with mean age of 33 years with an average driving experience of ten years were taken as a sample. Only drivers affiliated to taxi stands and plying in the city were taken for the study. *Tool:* For the present study the sub-scales of Driving Stress Inventory (DSI) [34] i.e. aggression, dislike for driving, hazard monitoring, fatigue proneness and thrill seeking were used. Each participant's response was measured on a 10-point Likert scale. The reported internal consistency of scale is ($\alpha = 0.80$).

Sleep Deprivation was evaluated in terms of the Epworth Sleepiness Scale (ESS) [35]. The sleepiness scale is a good measure of the overall sleep debt and an indicator of daytime sleepiness. The reported internal consistency of ESS scale is ($\alpha = 0.88$). Apart from this, a demographic questionnaire was administered to gather other relevant information. *Procedure:* The questionnaire and the scale were administered to the individuals personally and it took 45 minutes to an hour to record their responses. The participation was voluntary and full confidentiality was assured. For analysis, correlational analysis was applied on the data and results were computed.

Findings

Table I shows the correlational analysis and Table II consists of the results obtained on demographic information form. Table 1 revealed significant positive correlation of sleepiness with hazard monitoring ($r = .546^{**}$) $p \leq 0.01$ and with fatigue proneness ($r = .490^{**}$) $p \leq 0.01$. However negative correlation of sleepiness with thrill-seeking ($r = -.535^{**}$) $p \leq 0.01$ while no significant correlation was found between sleepiness, aggression and dislike towards driving. The responses obtained on demographic questionnaire revealed the driving history of the taxi drivers, their working hours, how do they keep themselves awake when drowsy, their biggest fear and major concerns while driving.

Discussion

This study was planned to have an insight into the sleep deprivation or daytime sleepiness experienced by taxi-drivers and its relationship with aggression, dislike towards driving and thrill-seeking. A random selection of thirty-one taxi drivers from various taxi stands in Chandigarh was done. Their mean age was 33 years with 10 years of driving experience as a taxi-driver. These cab drivers were long-route drivers who commuted between various states of India, thus mostly driving inter-city and not within Chandigarh. They were administered Epworth Sleepiness Scale and the sub-scales of Driver stress Inventory i.e. measures of aggression, dislike of driving and thrill-seeking along with a demographic questionnaire. For analysis, correlation analysis was done.

The first hypothesis of the study which expected a positive relationship of sleepiness with aggression, dislike towards driving and fatigue proneness among taxi drivers was partially supported. The present study found positive correlation of sleepiness with fatigue proneness while no significant relationship of sleepiness with aggression or dislike for driving. As per the review of literature, many research studies show close association between sleepiness and fatigue with these two terms often being used interchangeably [36]. Many researchers have studied these two phenomena together [37-39] reflecting fatal consequences when driving. The findings of the present study are also in line with aforementioned studies. This study also revealed no significant relationship of sleepiness with aggression and dislike for driving. Research findings in the past on sleepiness and aggression have shown mixed results, some assert that sleep deprivation actually increases aggressive behavior [40] whereas limited support was found between aggression and sleepiness in a workplace

context [41]. For dislike for driving, not many relevant studies on relationship between sleepiness and dislike for driving could be found.

The second hypothesis of the study where it was expected that there will be a negative relationship of sleepiness with hazard monitoring and thrill-

seeking among taxi drivers was also partially supported (H₂). The findings of the present study showed negative correlation of sleepiness with thrill-seeking as expected however, a positive correlation between sleepiness and hazard monitoring was observed. Thrill seeking reflects the desire to engage in thrill-seeking activities, substantially correlated with confrontive coping [42-43], in contrast to sleepiness. Studies have also found that sleep deprivation is associated with decline in self-reported risk-taking activities and reduced tendency to expend effort to earn money on a behavioral measure of risk-taking [44-46]. Thrill seeking dimension refers to the 'thrill' or the enjoyment a person experiences in the face of danger. An individual who is sleepy is less likely to engage, experience and enjoy any activity and since driving for long hours become monotonous, it is very unlikely to induce any thrill or enjoyment. Hazard Monitoring reflects a dimension related to coping with potential danger through active search for hazards [47] and as not much literature on direct relation with sleepiness and hazard monitoring could be found, studies with associated variables were studied. Another study concluded that sleep deprivation is associated with significant decline in alertness, vigilance, the speed of psychomotor responses and cognitive processing [48] unlike what is desired in hazard monitoring. The contrast findings of the present study could be due to the fact that the measure of sleepiness was daytime sleepiness and there is a possibility of deliberate attention on the part of the driver and hence high hazard monitoring even though faced with sleepiness while driving.

Demographic questionnaire revealed certain interesting aspects of a taxi driver's driving history. It was observed that majority of respondents belonged to a neighboring state of Punjab (52%) who had moved to the capital city, Chandigarh to earn their livelihood. Others were Himachal Pradesh (13%), Haryana (10%) and Uttarakhand, Uttar Pradesh, Jammu & Kashmir and West Bengal accounting for (7%). Chandigarh, one of the Union territory of India has witnessed surge in migrant population from neighbouring states. As per the 2011 census, more than six people out of ten are migrants contributing to 67.1% of total population

[49]. An average monthly income of respondents was approximately INR14,555 and the average monthly household income including the other earning members in the family (84%), was found out to be INR.19,038.5. Therefore majority of them were not the sole bread earners of the family.

It was further found that 84% of the respondents were hired as drivers by the owner of the cab service or travel agency and did not own the taxi themselves. Majority of taxi-drivers were self-trained (39%) and did not go to any driving school, 23% respondents learnt it with the help of some uncle or relatives, 19% of them were trained at Taxi-stands while doing other menial jobs, and only 10% went to a driving school. Getting a driving license seemed easy since 65% of the drivers confessed that they did not appear for any driving test either practical or theoretical before obtaining their driving license. Though the minimum eligibility age for obtaining driving license in India is 18 years, 26% of drivers had obtained the license and started driving even before reaching the legal age for driving a motorized vehicle while 52% were reportedly driving vehicles even before obtaining a valid driving license. In India, procurement of a driving license comes under the jurisdiction of regional transport authority set up in every state and though it is quite important to conduct written and practical tests before obtaining a driving license, ironically it is not followed strictly.

As regards to the traffic violation history, 68% of these drivers were found to have received traffic challans/tickets, majority of them for jumping traffic lights (23%), for crashes (16%), driving without seat belt (13%), wrong parking (10%), while others for over speeding, consuming alcohol and using mobile while driving (6%). Forty-eight percent of the drivers reported that they have violated traffic rules more than one time. It is also observed that compliance among male drivers is more in presence of a traffic policeman [50]. This again points out towards the laxity and non-compliance of the traffic rules resulting from lack of awareness about traffic rules.

Through demographic questionnaire, it was also found that the average daily working hours of these drivers were 12.9 hours with average 6 hours

of sleep. Sixty eight percent (68%) of drivers confessed that they felt sleepy sometimes while driving. The present study also found that in order to cope with drowsiness behind the wheel most of the taxi drivers used to smoke (26%) followed by taking rest, having tea, washing face, having some snacks, consuming alcohol and in some cases drugs as well. The current research also revealed that 16% of participants were involved in a road crash though 36% of them nurtured this as their biggest fear while driving. When asked about their perspective on what causes road crashes, they enlisted wrong side overtaking (42%), over speeding (39%), drunken driving(29%), drowsiness and careless driving (16%) as one of the key factors. Suggestions were drawn as to what according to them could help in reducing road crashes. Majority of them proposed strict implementation and abiding of traffic rules by road users (36%), following speed limit (26%) with drunken driving in check (16%). Widening of roads, lane driving, safe and responsible driving were among the other suggestions (9%).

Road safety is not given much importance the way it should be considering the fact that there is growing fatality incidents on Indian roads with 47 road crashes and 18 deaths every hour

[51]. The present study therefore emphasizes on one of the key factor towards road fatalities, the issue of sleepiness among commercial drivers. As a part of intervention, procurement of driving license should be stringent alongwith a dire need to check the habitual offenders by traffic police. In this study, 67% of respondents had a history of traffic violations. There is also a need to check drivers for driving under the influence of drugs (DUI) which could be fatal and is a common practice to combat sleepiness during long hours driving. A national level awareness campaigns for road safety with stringent driving license procedure are the need of the hour along with strict penalties for violating traffic rules. Enough time for sleep should be given that can help reduce the drowsiness related road crashes. Also, fatigue monitoring systems can go a long way in informing or alerting the driver, or even by taking corrective actions in the driving task. On these lines recently, the government is setting standards for 'drowsiness alert system' that

can be installed in cars, buses and trucks [52] warning and alerting the driver if their behaviour shows signs of drowsiness.

There are, however, certain limitations of this study since only a small sample of taxi-drivers could be assessed who were engaged in inter-state driving, therefore it gave an idea about a small proportion of Indian taxi drivers. For future research, a comparative study of taxi drivers plying intra and inter-city could be studied with also an insight into the educational qualification of the driver. More parameters need to be studied with a larger sample size and different age groups. Self-report questionnaires backed with observational data can provide more in-depth information.

Ethical Approvals

The authors declare that this study was conducted as a part of non-interventional research with informed written consent of the participants in question. It does not violate any ethical issues and is in compliance with the national laws.

Conflict of Interest

The authors report that there are no competing interests to declare.

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References

1. Dement WC, Carskadon MA. Current perspectives on daytime sleepiness: the issues. *Sleep*.1982; 5(2): 56–66.
2. Dement WC, Gelb M. Somnolence: its importance in society. *Neurophysiol Clin*. 1993;23(1), 5– 14. Available from:doi: [http://dx.doi.org/10.1016/S0987-7053\(05\)80278-3](http://dx.doi.org/10.1016/S0987-7053(05)80278-3)
3. Dinges DF. An overview of sleepiness and accidents. *J.Sleep Res*. 1995;4(2):4– 14. Available from:doi: [10.1111/j.1365-2869.1995.tb00220.x](http://dx.doi.org/10.1111/j.1365-2869.1995.tb00220.x)

4. Mitler MM, Carskadon MA, Czeisler CA, Dement WC, Dinges DF, Graeber RC. Catastrophes, sleep, and public policy: consensus report. *Sleep*.1988;11: 100– 9.
5. Caldwell JA. Efficacy of stimulants for fatigue management: the effects of Provigil and Dexedrine on sleep-deprived aviators. *Transp. Res. F: Traffic PsycholBehav*. 2001 Mar 1;4(1):19-37.
6. Rau PS. NHTSA's Drowsy driver research program. Washington DC: National Highway Traffic Safety Administration. 1996.
7. Horne JA, Reyner LA. Sleep related vehicle accidents. *Br. Med. J*. 1995; 310(6979): 565–567. Available from: <http://dx.doi.org/10.1136/bmj.310.6979.565>
8. Mitler MM, Miller JC, Lipsitz JJ, Walsh JK, Wylie CD. The sleep of long-haul truck drivers. *N Engl J Med*.1997; 337 (11):755–761. Available from:doi: [10.1056/NEJM199709113371106](http://dx.doi.org/10.1056/NEJM199709113371106)
9. Philip P, Taillard J,Guilleminault C, Quera Salva MA, Bioulac B, Ohayon M. Long distance driving and self-induced sleep deprivation among automobile drivers. *Sleep*. 1999; 22 (4): 475–480.
10. Philip P, Ghorayeb I, StoohsR, et al. Determinants of sleepiness in automobile drivers. *J.Psychosom. Res*. 1996; 41 (3): 279–288. Available from:doi: [10.1016/0022-3999\(96\)00127-4](http://dx.doi.org/10.1016/0022-3999(96)00127-4)
11. Arnold PK, Hartley LR, Corry A, Hochstadt D, Penna F, Feyer AM. Hours of work, and perceptions of fatigue among truck drivers. *Acci Anal Prev*. 1997;29 (4): 471–477. Available from:doi: [http://dx.doi.org/10.1016/S0001-4575\(97\)00026-2](http://dx.doi.org/10.1016/S0001-4575(97)00026-2)
12. Adelaide Centre for Sleep Research. Driver Fatigue is an important cause of road crashes [Internet]. 1997.Available from <http://www.smartmotorist.com/traffic-and-safety-guideline/driver-fatigue-is-an-important-cause-of-road-crashes.html>
13. National Sleep Foundation. Sleep in America poll. summary of findings. 2008. Available from

- <http://www.sleepfoundation.org/sites/default/files/2008%20POLL%20SOF.PDF>.
14. McCartt AT, Ribner SA, Pack AI, Hammer MC. The scope and nature of the drowsy driving problem in New York State. *Acci Anal Prev.* 1996 Jul 1;28(4):511-7.
 15. Maycock G. Driver sleepiness as a factor in car and HGV accidents. *TRL Report.* 1995(169).
 16. Matthews G, Desmond PA, Joyner L, Carcary B, Kirby G. A comprehensive questionnaire measure of driver stress and affect. *Traffic and transport psychology. Theory and application.* 1997.
 17. Matthews G. Individual differences in driver stress and performance. In *Proceedings of the Human Factors and Ergonomics Society Annual Meeting 1996 Oct. Vol. 40, No. 12, pp. 579-583.* Sage CA: Los Angeles, CA: SAGE Publications.
 18. Matthews G, Emo AK, Funke GJ. The transactional model of driver stress and fatigue and its implications for driver training. *Driver behaviour and training.* 2017 Jul 5:273-85.
 19. Broughton J, Baughan C, Pearce L, Smith L, Buckle G. *Work-related road accidents.*
 20. Health and Safety Executive. *Driving at work: managing work related road safety.* 2003. London: Her Majesty's Stationery Office.
 21. Health and Safety Executive. *Reducing At-Work Road Traffic Incidents.* 2001. London: Her Majesty's Stationery Office.
 22. Dimmer AR, Parker D. The accidents, attitude and behaviour of company car drivers. In *Behavioural Research in Road Safety* lx. pa3524/99 1999.
 23. Lynn P, Lockwood CR. The accident liability of company car drivers. *TRL Report.* 1998; 317. Crowthorne: Transport Research Laboratory.
 24. Salminen S, Lähdeniemi E. Risk factors in work-related traffic. *Trans. Res.F.*2002; 5(1): 77–86. Available from/; doi: 10.1016/S1369-8478(02)00007-4
 25. Cooper G. *Psychology: Taxi drivers head aggression league.* The Independent. 1997, Dec 6. Available from <http://www.independent.co.uk/news/psychology-taxi-drivers-head-aggression-league-1289034.html>
 26. Åkerstedt T, Bassetti C, Cirignotta F, García-Borreguero D, Gonçalves M, Horne J, Léger D, Partinen M, Penzel T, Philip P, Verster JC. White Paper:" Sleepiness at the Wheel. ASFA (French Motorways Company) and INSV (National Institute of Sleep and Vigilance). 2013:69.
 27. GillV. *Sleepy truck drivers on road to death.* The Times of India. 2012 June 8. Available from http://articles.timesofindia.indiatimes.com/2012-06-08/gurgaon/32123304_1_deprivation-road-accidents-sleep-related
 28. Burns PC, Wilde GJS. Risk taking in male taxi drivers: Relationships among personality, observational data and driver records. *Pers.Indiv. Differ.* 1995; 18(2): 267–278. Available from: doi: 10.1016/0191-8869(94)00150-Q
 29. Dalziel JR, Soames. Motor vehicle accidents, fatigue and optimism bias in taxi drivers. *Acci Anal Prev.* 1997;29(4): 489–494. Available from: doi: 10.1016/S0001-4575(97)00028-6
 30. Machin MA, De Souza JMD. Predicting health outcomes and safety behaviour in taxi drivers. *Trans. Res. F.* 2004; 7(4-5): 257–270. Available from: doi: 10.1016/j.trf.2004.09.004
 31. Bunn TL, Slavova S, Struttmann, TW, Browning SR. Sleepiness/fatigue and distraction/inattention as factors for fatal versus nonfatal commercial motor vehicle driver injuries. *Acci Anal Prev.* 2005; 37(5): 862-869.
 32. Botes G. A systemic study of the attitudes of minibus taxi drivers towards traffic law enforcement as a basis for the formulation of a management system for the South African minibus taxi industry.
 33. Karrer K, Roetting M. Effects of driver fatigue monitoring—an expert survey. In *Engineering Psychology and Cognitive Ergonomics: 7th International Conference, EPCE 2007, Held as Part of HCI International 2007, Beijing, China, July 22-27, 2007. Proceedings 7 2007 (pp. 324-330).* Springer Berlin Heidelberg.

34. Matthews G, Desmond PA, Joyner L, Carcary B, Gilliland K. A comprehensive questionnaire measure of driver stress and affect. *Traffic and transport psychology: Theory and application*. 1997; 317-324.
35. Murray WJ. A new method for measuring daytime sleepiness: the Epworth Sleepiness Scale. *Sleep*. 1991;14 (6): 540-545.
36. Shen J, Barbera J, Shapiro CM. Distinguishing sleepiness and fatigue: focus on definition and measurement. *Sleep med. rev.* 2006; 10(1): 63-76.
37. Connor J, Whitlock G, Norton R., Jackson R. The role of driver sleepiness in car crashes: a systematic review of epidemiological studies. *Acci AnalPrev.* 2001; 33(1): 31-41.
38. Davenne D, Lericollais R, Sagaspe P, Taillard J, Gauthier A, Espié S, Philip P. Reliability of simulator driving tool for evaluation of sleepiness, fatigue and driving performance. *AcciAnalPrev.* 2012; 45: 677-682.
39. Philip P, Sagaspe P, Taillard J, Valtat C, Moore N, Åkerstedt T., ... Bioulac, B. Fatigue, sleepiness, and performance in simulated versus real driving conditions. *Sleep*. 2005; 28(12): 1511-1516.
40. Kamphuis J, Meerlo P, Koolhaas JM, Lancel M. Poor sleep as a potential causal factor in aggression and violence. *Sleep med.* 2012; 13(4): 327-334.
41. DeArmond S. *Workplace sleepiness: Organizational antecedents and consequences* (Doctoral dissertation, ProQuest Information & Learning).
42. Desmond PA, Matthews G. Individual differences in stress and fatigue in two field studies of driving. *Trans. Res. F: Traffic Psychol.Behav.* 2009; 12(4): 265-276
43. Vinayak S, Assi G S. Motor Stunt Bikers: Living on the edge. *Int. J.Curr. Res.* 2012; 4(4): 315-321.
44. Acheson A., Richards JB, de Wit H. Effects of sleep deprivation on impulsive behaviors in men and women. *Physiol.Behav.* 2007; 91(5): 579-587.
45. Chaumet G., Taillard J, Sagaspe P, Pagani M, Dinges DF, Pavy-Le-Traon A, ..., Philip P. Confinement and sleep deprivation effects on propensity to take risks. *Aviation, space, and environmental medicine.* 2009; 80(2): 73-80.
46. Killgore WD. Effects of sleep deprivation and morningness-eveningness traits on risk-taking. *Psychol rep.* 2007; 100(2): 613-626.
47. Matthews G, Desmond PA, Joyner L, Carcary B, Kirby G. A comprehensive questionnaire measure of driver stress and affect. *Traffic and transport psychology. Theory and application.* 1997.
48. Goel N, Rao H, Durmer JS, Dinges DF. Neurocognitive consequences of sleep deprivation. In *Seminars in neurology.* June 2009; 29(04): 320-339.
49. Thakur B. More than six out of ten are migrants in Chandigarh: Census. *Hindustan Times [Internet]*. 2016. Available from <https://www.hindustantimes.com/punjab/more-than-6-out-of-10-are-migrants-in-chandigarh-census/story-ZTTsnOLaAPYju2WKPeMJuO.html>
50. Vinayak S, Assi GS. Do gender differences really exist when it comes to driving anger? A psychological probe. *International Journal of Current Research.* 2011; 3(9): 194-199.
51. Ministry of Road Transport and Highways. Road Accidents in India. 2021. Available from https://morth.nic.in/sites/default/files/RA_2021_Compressed.pdf
52. Dash D. Soon, government to set standards for 'drowsiness alert system. 2022, Dec 31. Available from <https://timesofindia.indiatimes.com/india/soon-government-to-set-standards-for-drowsiness-alert-system/articleshow/96633281.cm>

Table 1: Intercorrelations of various variables of Driver stress inventory with Sleepiness

| Variable | S | AGG | DD | HM | FP | TS |
|------------|-------|--------|-------|---------|-------|----|
| S | 1 | | | | | |
| AGG | -.142 | 1 | | | | |
| DD | .036 | .193 | 1 | | | |
| HM | .546* | -.417* | -.040 | 1 | | |
| FP | .490* | .507** | .263 | -.709** | 1 | |
| TS | - | .392* | .118 | -.403* | .396* | 1 |

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

VARIABLES: S- Sleepiness, AGG- Aggression, DD- Dislike for Driving, HM-Hazard monitoring, FP- Fatigue proneness, TS- Thrill seeking

Table 2: Demographic Information

| I Personal Information | | | | | |
|-------------------------------|---|-----------------|------------|--|--------------------|
| i | Average age | 33 years | ii | Average earning per month | 14,555 INR |
| iii | Religion | | iv | Other earning member in family? | |
| a. | Hindu | 52% | a. | Yes | 84% |
| b. | Sikh | 45% | b. | No | 13% |
| c. | Christian | 3% | c. | Not responded | 3% |
| V | Native Place | | vi | Total family income | 19038.46INR |
| a. | Punjab | 52% | vii | Marital Status | |
| b. | Himachal Pradesh | 13% | a. | Married | 65% |
| c. | Haryana | 10% | b. | Unmarried | 32% |
| d. | Chandigarh | 10% | c. | Not responded | 3% |
| e. | Uttarakhand | 8% | | | |
| f. | Other states | 7% | | | |
| viii | Do you smoke? | | ix | Do you drink alcohol? | |
| a. | Yes | 52% | a. | Yes | 45% |
| b. | No | 39% | b. | Sometimes | 23% |
| c. | Not responded | 9% | c. | No | 26% |
| | | | d. | Not responded | 6% |
| II Driving History | | | | | |
| i | Driving own taxi or someone | | ii | How did you learn driving? | |
| a. | Someone else | 84% | a. | Self | 39% |
| b. | Own | 13% | b. | Relatives/Uncle/Others | 23% |
| c. | Both | 3% | c. | Taxi stand | 19% |
| | | | d. | Driving school | 10% |
| | | | e. | Not responded | 9% |
| iii | What age you got your permanent driving license? | | iv | Did you appear for any test to obtain Driving License | |
| a. | Below 18 years | 26% | a. | Yes | 35% |
| b. | At the age of 18 years | 16% | b. | No | 65% |
| c. | Above 18 years | 52% | | | |
| d. | Not responded | 6% | | | |

| III Work and Sleep pattern | | | | | | |
|---|--|---------|--------------------------------|--|---------|-----|
| i | Working hours in a day | 13hours | ii | Average time you get for sleep? | 6 hours | |
| iii | Feel sleepy while driving? | | iv | What do you do to keep yourself awake when you feel sleepy while | | |
| a. | Sometimes | 58% | a. | Smoking | 26% | |
| b. | Yes | 10% | b. | Rest | 23% | |
| c. | No | 23% | c. | Tea | 19% | |
| d. | Not responded | 9% | d. | Wash face, freshen up, | 8% | |
| | | | e. | Consume alcohol, drugs | 8% | |
| | | | f. | Nothing | 13% | |
| | | | g. | Stop driving | 3% | |
| IV Challan/Traffic violation history | | | | | | |
| i | Ever been challaned/given ticket by traffic police? | | ii | If challaned/obtained ticket from traffic police, then for what offence? | | |
| a. | Yes | 68% | a. | Red light jumping | 23% | |
| b. | Never | 32% | b. | Accident, side hit | 16% | |
| iii | If challaned/obtained ticket from traffic police, then how many times? | | c. | Without seat belt, dress code | | 13% |
| a. | One time | 19% | d. | Wrong parking | | 10% |
| b. | Two times | 32% | e. | Overspeeding, alcohol, using mobile, wrong turn | | 6% |
| c. | More than two times | 16% | f. | Not responded | | 32% |
| d. | Not responded | 33% | | | | |
| V Ever had an accident? | | | VI Biggest fear while driving? | | | |
| a. | Yes | 16% | a. | Accident | 36% | |
| b. | No | 81% | b. | No fear | 19% | |
| c. | Few times | 3% | c. | Stray cattle | 13% | |
| | | | d. | Wrong overtaking | 10% | |
| | | | e. | Car breakdown | 6% | |
| | | | f. | Not responded | 16% | |
| VII Perspective on Road crashes | | | | | | |
| i | What according to you causes accident on | | ii | What should be done to reduce road accidents? | | |
| a. | Wrong side overtaking | 42% | a. | Follow traffic rules, stringent | | 36% |
| b. | Overspeeding | 39% | b. | Speed limit should be followed | | 26% |
| c. | Drunken driving | 29% | c. | No drunken driving | | 16% |
| d. | Careless driving | 16% | d. | Roads should be widened, lane driving, safe and responsible driver | | 10% |
| e. | Other drivers fault, ego | 6% | e. | Not responded | | 12% |
| *sum is calculating more than 100 since respondent chose more than one response | | | | | | |