

Uniform Driver Evaluation in India: A Mandatory Requirement for Road Safety

Neelima Chakrabarty*, Reetesh Riku**

* Principal Scientist, Traffic Engineering & Safety Division, Central Road Research Institute, Mathura Road, P.O. CRRI

** Psychologist, IDAC-The Training and Assessment Institute, New Delhi, India

Abstract- Road traffic crashes are still a major cause of death, injuries and economic loss in India due to increasing number of old and unmaintained vehicles, inexperienced drivers and increasing the number of aggressive and impulsive road users. But, unfortunately road safety is still not considered as a major priority for a sustainable transport system. So there is an urgent demand to develop comprehensive Road Safety Policies. The key components of such policies should be based on strong commitments in increased acceptance of road safety as a problem, development of safety culture in society and coordination of all the policy makers.

To inculcate safety culture within the society, dynamic safety standards should be introduced in all components of the transport system to stimulate continuous development. In particular this applies to: a) vehicle component for developing safety awareness among consumers and manufacturers, b) road component for introducing compulsory Road Safety Audits of Roads at the construction stage and develop safety assessment methods for existing roads and c) driver component for continuous development of effective testing and evaluation system with awareness plan for driver licensing, education and testing of professional drivers.

A case study conducted by Central Road Research Institute for driver components highlight that the specially trained drivers had significantly give superior performance in different evaluation criteria (tests) as compared to the normally trained group of the drivers. Present paper emphasizes the urgent demand of an effective and uniform driver testing and training system for inculcating safety culture in India.

I. INTRODUCTION

India's economy is rapidly growing and with it increasing the car ownership rate and related congestion problems. The growth of the economy has been accompanied by a growing expectation of improved road safety and security by citizens, which includes all the users related road infrastructure components and good attributes among the drivers who have the mechanical power to facilitate the rapid movements of people and goods between one location and another.

Throughout the world, India has one of the largest highway and road network second only to road network of United States. Presently, out of the worldwide average of 7, 00,000 RTA, 10% is in India (WHO, 2004). The latest annual statistics indicate over 80,000 are killed 3 Lakh people sustain injuries every year on Indian roads. If current trends continue The total road length exceeds 3 million it is predicted that by 2050, 267 million

vehicles will be on Indian roads, number of people killed and injured on roads will rise > 60% between 2000 and 2020. Over 95% of road crashes (MVAs, in the USA, or Road Traffic Crashes, RTAs, in Europe) involve some degree of driver behavior combined with one of the other three factors. Drivers always try to blame road conditions, equipment failure, or other drivers for those road crashes. When the facts are truthfully presented, however, the behavior of the implicated driver is usually the primary cause. Most are caused by excessive speed or aggressive driver behavior. Review of related literature (Amett et al, 1997; Barkley et al, 2002, Cox et al 2000) highlight that deficits in cognitive abilities found evidence for inattentiveness, particularly visual inattentiveness and impulsiveness correlating with problem driving outcome. Slow processing and distractibility and problems with visual memory are also associated with negative driving outcomes. Impulsivity leads to excessive speed and problems disengaging from risky strategic maneuvers which when combined with attention problems lead to late counter measures that would likely transact to magnify risk. These factors would likely vary depending on driving experience and the cognitive demands of the prevailing road conditions and the in-car situation, e.g. cell phone use, the number of passengers, etc. Particularly risky environments may be ones of monotonous highways although convincing data about possible mechanisms and the relationship to changing road conditions is not yet available.

Like any other disease, road crashes too are caused by interaction between host and environment. Human factors include age, (road crashes most common between 10-24 years), sex, education, medical conditions (heart attack, impaired vision), fatigue, influence of alcohol and other drugs, lack of bodily protection (like helmets, seat belts) and psychosocial factors like lack of experience, impulsiveness, aggressiveness, defective judgment and delay in decisions. A comprehensive study of road safety (Treat et al., 1977) found that human error was the sole cause in 57% of all road crashes and was a contributing factor in over 90%. In contrast, only 2.4% were due solely to mechanical fault and 4.7% were caused only by environmental factors.

This paper highlights the current needs of the driver evaluation tests and processes to screen drivers having safe driving related ability traits and to provide good practices to those who lacks in certain safety related traits with an urgent need to provide uniformly a system for driver evaluation as a regulatory act. To inculcate safety culture within the society, dynamic safety standards should be introduced to all components of the transport system to stimulate continuous development. In particular this applies to following factors:

1.1. VEHICLE COMPONENT

In depth analysis of these four factors highlights that human behaviour and act is involved behind all these four factors e.g. in majority of the cases except some exceptional cases, equipment failure are caused due to poor maintenance and improper synchronized mechanical maneuvering and fittings of mechanical parts, poor quality of the mechanical and accessory parts, failure in annual maintenance, vulnerability against high voltage fluctuations etc. Similarly, improper and improperly maintained road ways designs caused more man-machine conflicts and resulting into congestions and road rage cases.

1.2. ROAD COMPONENT

A **Road Safety Audit (RSA)** is defined as "the formal safety performance examination of an existing or future road or intersection by an independent, multidisciplinary team. It qualitatively estimates and reports on potential road safety issues and identifies opportunities for improvements in safety for all road users."

A key feature of a road safety audit is the use of a team of professionals with varied expertise. The team should include highway safety engineers, highway design engineers, maintenance personnel, and law enforcement. Additional specialties should be added to the team as needed. The team members must not be involved in the design or maintenance of the facility being examined, so that they can have an objective point of view. The road safety audit may investigate general safety conditions, or it may focus on specific concerns of the users. Walkability audits concentrate on pedestrian safety and accommodation, and transit audits focus on safety of bus and train users. RSA uses audit techniques to make simple but effective safety improvements in conjunction with road resurfacing projects. Also RSA helps to prevent future incidences of crashes.

1.3 DRIVER COMPONENT

Driving is a complex tasks in which a driver has to face various types of complex situations in the form of obstacles or hazards while driving, straight ahead or in or outside their peripheral visual field (e.g.; sudden appearance of a person crossing the road), consider the possible reactions of this person, estimate the distance, and decide whether they have to slow down or stop and then react accordingly. People driving are bombarded with information. Mostly visual – road, other vehicles, pedestrians, passing scenery and signs; auditory – listening to radio, talking on cell phone, carrying on conversation with co-passenger. Internal – thinking what to make for dinner and so on. Drunken driving is another important risk factor. Under the influence of alcohol, the driver & car have the potential for becoming most lethal weapons. An Indian estimate shows 25% of RTA to be alcohol related. Alcohol causes poor judgment, slowed reaction time, loss of concentration and impaired vision. So a continuous development of effective testing and evaluation system with awareness plan for driver licensing, education and testing of professional drivers is urgently required. The various driver psychomotor stages can be summarized as follows:

- Perception Central ⇒ Fixation towards oncoming stimuli

- Peripheral ⇒ Scanning according to the relevance of the stimuli
- Interpretation ⇒ Interpretation of the stimuli according to their past experiences i.e. "Emotion"
- Decision & Reaction Time ⇒ Driver decision to take action , releasing the present action and staring new action e.g. time between releasing accelerator and pressing brake
- Volition ⇒ Wiliness to act with the drivers motor abilities

Multipurpose driving task also depends on following human characteristics and their interactions with the external road environmental factors as well as on the condition of the driver:

- **Visual Characteristics Of The Oncoming Stimuli** on road and the related drivers decision and reaction .This decision and reaction depends on drivers accuracy of vision, synchronization of the eye to hand and foot movements and related vehicle movement .
- **Visual field:** Visual field depends on the driver's ability to observe side and straight oncoming and static objects; also the road side environment plays a large role .Clear view ahead and side of the driver help the driver to take accurate decision and reaction in time.
- **Driver Distraction through Irrelevant information:** Due to publicity Age various road side advertisements attracts the drivers attention which in turn create conflicts on road also various types of distracted driving behaviour like cell phone use, talking to passengers, anxiety causes increase risk and hazards on road.
- **Various Factors Affecting Visibility of The Driver** Research has shown that road crashes occur for one of three main reasons. The first is perceptual error. Sometimes critical information was below the threshold for seeing, poor lighting at night time, adverse weather conditions due to fog, rain etc., poor visual acuity of the driver, the driver was blinded by glare, or the pedestrian's clothes had low contrast. In other cases, the driver made a perceptual misjudgment (a curve's radius or another car's speed or distance). The second, and far more common cause, is that the critical information was detectable but that the driver failed to attend/notice because his mental resources were focused elsewhere. Often times, a driver will claim that she/he did not "see" a plainly visible pedestrian or car. This is entirely possible because much of our information processing occurs outside of awareness. Mack and Rock (1998) have amazingly shown that driver may be less likely to perceive an object if he/she is looking directly and the oncoming stimulus falls outside the center of the visual field. This causes "intentional blindness" phenomenon which is proved to be major cause for many road crashes.
- **Fatigue, Alcohol, drugs and medication** Several driver characteristics and driving behaviors due to age, diet, alcohol consumption, circadian rhythms, drug intake and diseases may contribute to a reduced

alertness and induce drowsiness with dangerous consequences on driving ability thus increasing the risk of car crashes. It can be estimated that human factors concerning the psychophysical condition of the driver are involved in 60-80% of road crashes (Taggi F, Giustini et al 1997).

• **Risk Taking Practices Among Drivers**

Most road crashes involve subjects under 25 years (35%), whereas subjects aged over 70 years are involved in approximately 3% of car crashes, as expected considering that the percentage of drivers over 70 years of age is small compared to other age groups Ryan GA et al 1998.

II. COMPARATIVE ANALYSIS OF PERFORMANCE BETWEEN TWO GROUPS OF DRIVERS

Present study was conducted at CRRRI on two groups of the drivers under controlled laboratory conditions (photo 1& 2). Specially trained group A (special protection group, SPG) and drivers from group B from Delhi Transport Corporation (D.T.C.) were randomly selected for this study. All the drivers were belonging to almost similar education level, age group and economic status. The following test battery was administered to see the performance levels of these two groups of drivers (table-1).

Identify the constructs of a Journal – Essentially a journal consists of five major sections. The number of pages may vary depending upon the topic of research work but generally comprises up to 5 to 7 pages. These are:

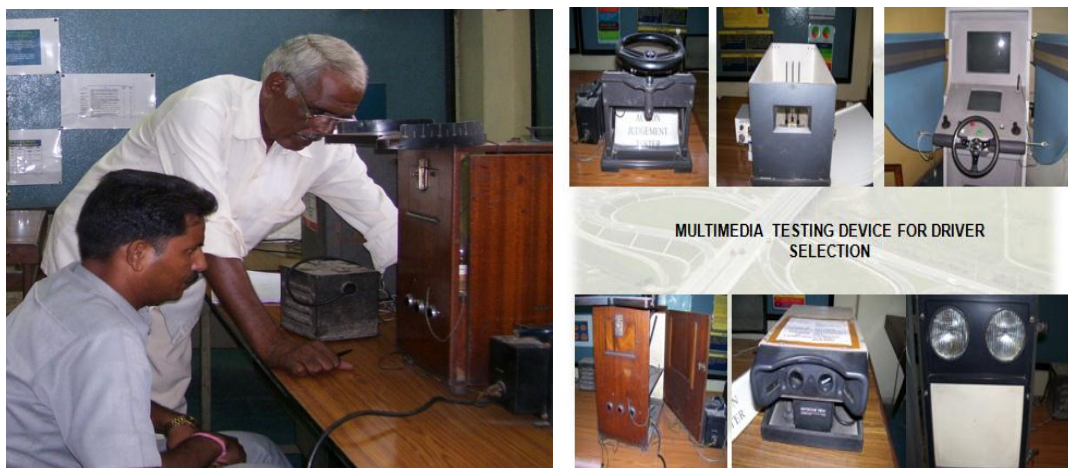


Photo 1&2 Driver Testing and Evaluation Laboratory

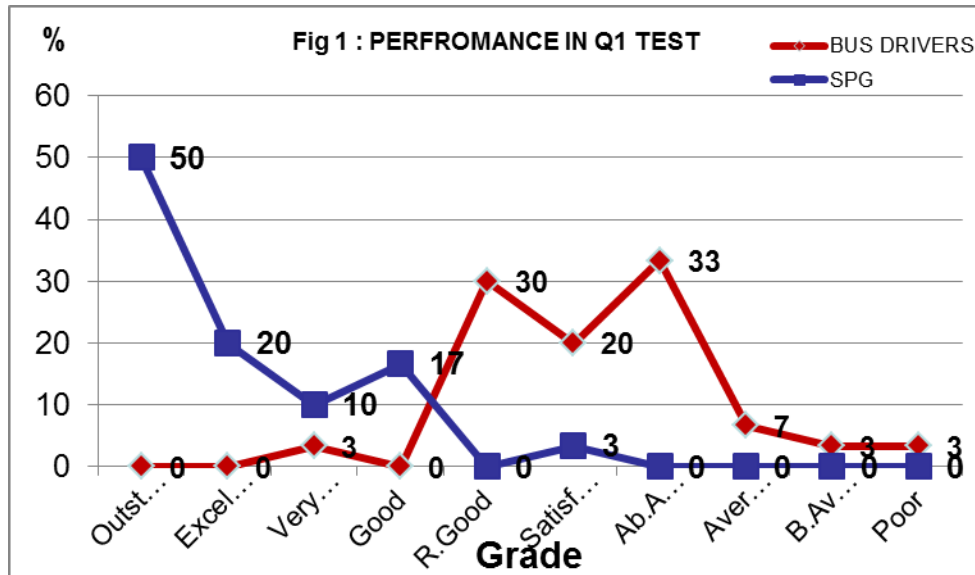
Table 1: Selected Test Battery for Testing Psychomotor Ability Traits

S.No.	Traffic Psychological Test	Parameters Measured by the Test
1	Concentration Test (Q1)	Quantity and quality of subject's attention performance under monotonous conditions
2	Visual Structural Ability (LL5)	Visual Structuring ability and development of irritation under increasingly difficult driving task
3	Speed and Distance ability test (DEST)	Ability to judge the speed and distance of oncoming stimuli
4	Depth Perception Test (DEPT)	Three Dimensional Special Vision

2.1 Q1 Test Under Monotonous condition

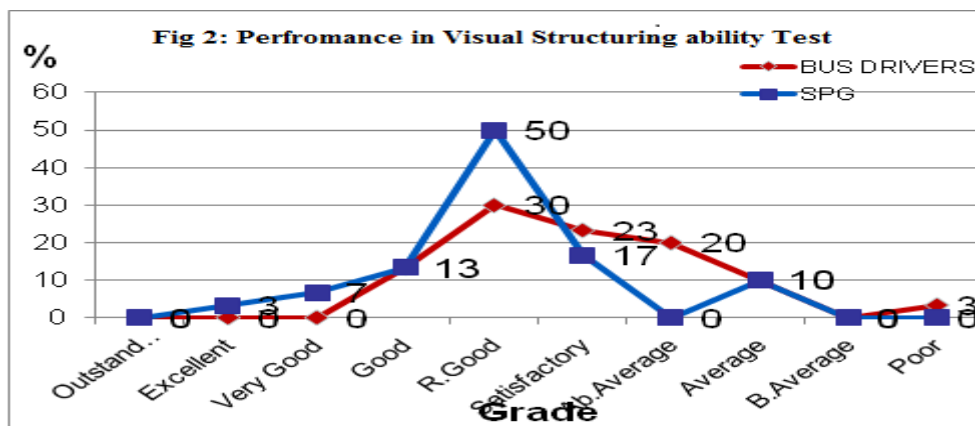
When the monotony test was performed on the selected sample of drivers of i.e. SPG drivers (referred as Group-A) it was noted that these drivers performed significantly better in

exhibiting their concentration levels under monotonous conditions as compared to the drivers of the normal group of bus drivers (as shown in Figure 1). 60% drivers from SPG performed outstandingly better as compared to the normal drivers.



2.2 LL5 Test Visual Structuring ability / Vigilance Test

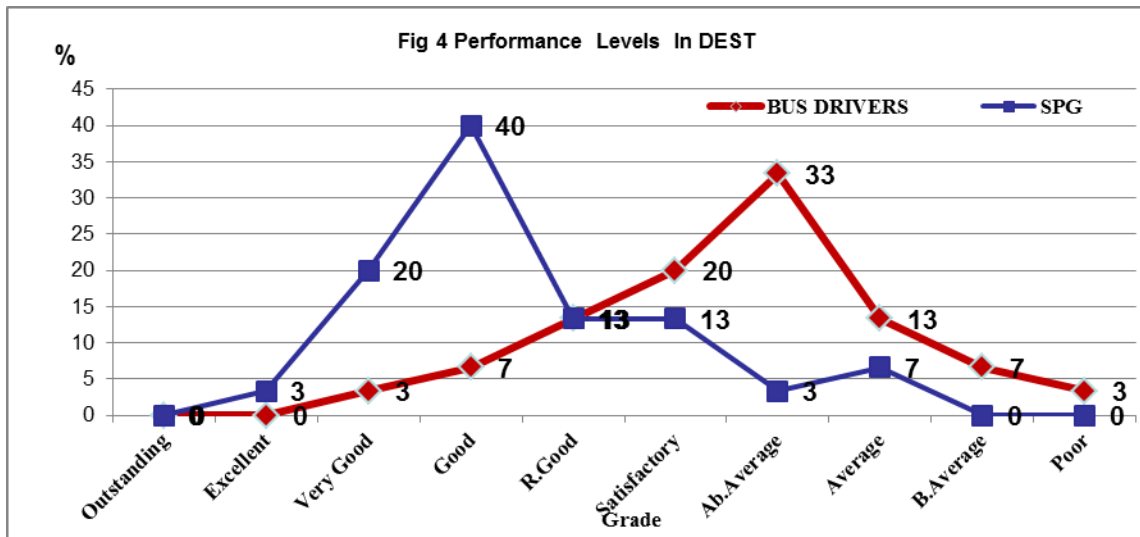
In this test also, SPG drivers performed far better compared to normal drivers.



2.3. DEST Test Speed and Distance Judgment ability Test:

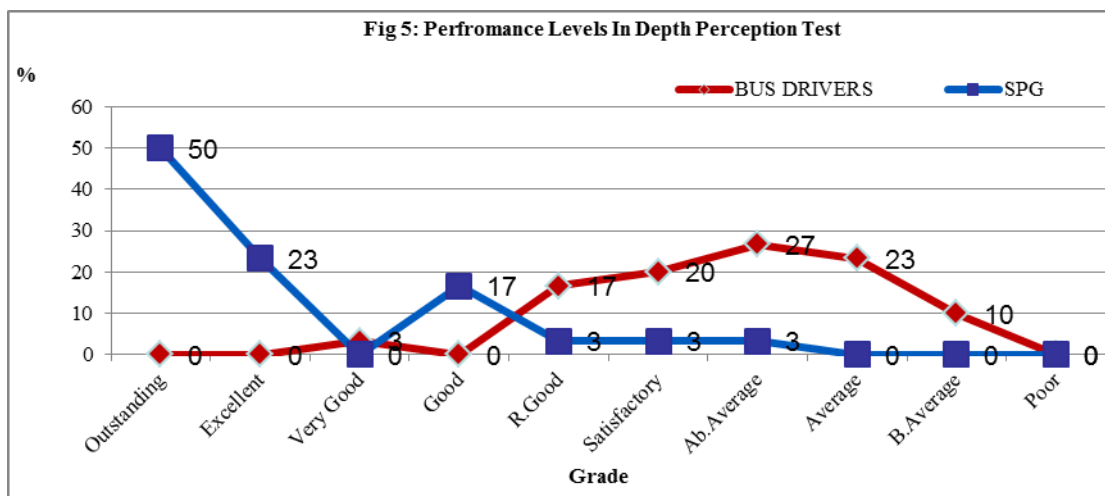
This test helps in measuring the speed and distance perception of the drivers in respect of the approaching vehicles

while driving. In this test SPG drivers again have demonstrated better performance as compared to the normal group of bus drivers (refer Figure 2)



3% performed excellent, 20% very good and 40% drivers of Group A performed good in this test while 0% driver of Group B performed excellent, 3% very good and 7% good in this test.

2.4. Depth Perception Test Performance



In the Depth perception test, 50% of SPG drivers performed “Outstanding”, 23% performed “Excellent” as compared to 0% of the normal bus drivers (refer Fig 5).

III. CONCLUSION

All the above results confirmed that special training required for the drivers specially those who are driving school buses, heavy commercial vehicle drivers, drivers plying with hazardous goods for improving psychomotor ability traits as these traits are essential for developing safe driving abilities.

IV. RECOMMENDATIONS

To accomplish this, uniform Driver Evaluation and Testing Facility is required to be mandatory at the National Level. The salient aspects essentially required to be part of such kind of facilities are mentioned as below:

- ❖ Testing track for testing drivers with all traffic signals and road signs
- ❖ Training laboratory with a well coordinated research team
- ❖ Standardized training materials for all categories of drivers i.e. drivers of motorized two wheelers, light motor vehicles for public and commercial use, bus drivers, drivers for school transportation, heavy vehicle drivers, drivers of vehicles carrying hazardous goods
- ❖ Training sessions should be fully interactive and participants should be encouraged to interact
- ❖ Relevant films, photographs and animations should be projected to make the drivers relate to actual driving conditions which they face regularly
- ❖ Refresher courses should be conducted on a periodic basis for drivers as well as for trainers with subsequent refresher courses to highlight different micro level problems which would enhance their skills, and also for re-capping of essential areas

- ❖ Additional special courses should be introduced to enhance different skill levels of weaker drivers up to the

REFERENCES

- [1] Arnett JJ, Offer D, Fine MA. Reckless driving in adolescence: 'state' and 'trait' factors. *Accident Analysis and Prevention*. 1997;**29**(1):57–63.
- [2] Barkley RA, Murphy KR, DuPaul GJ, Bush T. Driving in young adults with attention-deficit/hyperactivity disorder: knowledge, performance, adverse outcomes, and the role of executive functioning. *Journal of the International Neuropsychological Society*. 2002;**8**:655–672
- [3] Cox DJ, Merkel RL, Kovatchev B, Seward R. Effect of stimulant medication on driving performance of young adults with attention-deficit hyperactivity disorder: a preliminary double-blind placebo controlled trial. *Journal of Nervous and Mental Disease*. 2000;**188**(4):230–234.
- [4] Mack, A. and Rock, I. (1998) *Inattention Blindness*. MIT Press: Cambridge.
- [5] Ryan GA, Legge M, Rosman D. *Age related changes in drivers' crash risk and crash type*. *Accid Anal Prev* 1998;**30**:379.
- [6] Taggi F, Giustini M, Fondi G, Macchia T, Chiarotti M. *L'epidemiologia degli incidenti stradali (I): i dati di base e i fattori di rischio*. In: Atti della 53a Conferenza del Traffico e della Circolazione, Stresa, 1-4 ottobre 1997, pp. 67-79.

required standards.

- [7] Treat JR, McDonald NS, Shinar D, Hume RD, Mayer RE, Stansifer RL, et al. *Tri-Level Study of the Causes of Traffic Accidents, Vol. I: Causal Factor Tabulations and Assessment*. Washington D.C.: U.S. Department of Transportation; 1977. (Publication Number DOT-HS-805-085)
- [8] World Health Organization: World Report On Road Traffic Injury Prevention, WHO 2004

AUTHORS

First Author – Neelima Chakrabarty, Principal Scientist, Traffic Engineering & Safety Division, Central Road Research Institute, Mathura Road, P.O. CRRI, Email: neelima.chakrabarty@gmail.com

Second Author – Reetesh Riku, Psychologist, IDAC-The Training and Assessment Institute, New Delhi, India, Email: reetesh_riku@yahoo.co.in