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Original Research Article

# Assessment of Visual Reaction time in Shift Duty Drivers of Rajasthan Roadways

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**Abstract:** Reaction time (RT) is an index of the processing ability of central nervous system and is a simple mean of determining sensory-motor associations and performance of an individual. How quickly a person responds to a stimulus depends on his reaction time, thus it determines the alertness of a person, which is a prerequisite in certain occupations like driving. The objective is to assess and compare Visual Reaction Time in Bus drivers and matched healthy controls. 50 drivers and 50 age - sex matched controls were enrolled into two groups as per inclusion criteria. A self-administered questionnaire to record personal data was given. The reaction time for both the red and green visual stimuli was significantly longer in the night duty drivers than the day duty drivers and controls. The reaction time to red light was observed faster as compared to the green light in the study groups. Our finding suggests shorter visual reaction time in drivers for red light, thus reflecting the need of using the red light for danger sign as a better safety measure while driving.
**Keywords:** Reaction time, Shift Duty Drivers, sensory-motor

## INTRODUCTION:

In day to day life, a modern man has to respond often to a numerous diverse situations instantaneously for his survival. The quickness by which a person responds to a stimulus depends on his intact sensory skills, cognitive processing and motor performance (Woodworth and Schlosberg) [1].

Reaction time (RT) is an index of the processing ability of central nervous system and is a simple mean of determining sensory-motor associations and performance of an individual [2]. How quickly a person responds to a stimulus depends on his reaction time thus it determines the alertness of a person, which is a prerequisite in certain occupations like driving. Although there are abundant studies conducted on the Audio-visual reaction time in healthy subjects, in different age groups, in athletes and other sports, smokers, tobacco chewers, shift workers like doctors and nurses, however studies in case of drivers regarding Audio-Visual reaction time appear to be meager (Harpreet Kour) [3].

A number of studies have identified sleep disturbances, ischemic heart diseases, peptic ulcers, reproductive hazards and hypertension to be the main health problems of shift workers. Reaction time can be taken as a parameter to measure the efficiency of shift workers in day and night duties [4]. Therefore, the present study was undertaken to find out the effect of shift working: night and day duty driving on their Visual reaction time in bus drivers of Rajasthan Roadways driving for long distances.

## MATERIAL AND METHODS:

The present study was conducted in the Department of Physiology, S.M.S. Medical College, Jaipur, Rajasthan, after obtaining approval from the Institutional Review Committee and consent from all the subjects. 100 adult males of age 20-40 years were enrolled for the study and grouped as follows:

Group 1: 50 Matched healthy adults working as clerical staffs in various Departments of S.M.S Medical College, Jaipur.

Group 2: 25 Day shift Drivers {at least for five day's day duty (driving for 6-8 hours)}

Group 3: 25 Night shift Drivers {at least for five day's night duty (driving for 6-8 hours)}

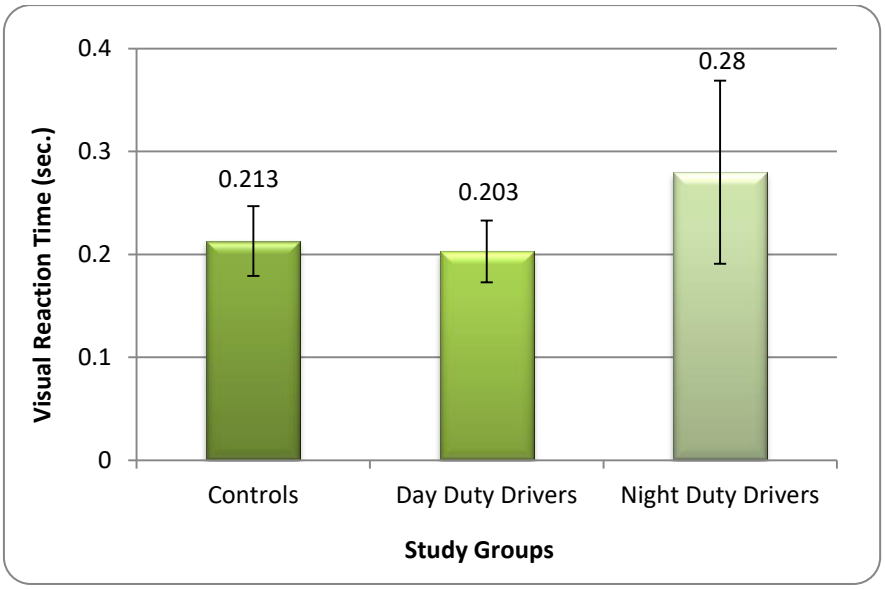
Drivers working for 5 years were included in the study while individual having BMI < 18.5 $Kg/m^2$and BMI ≥ 30 $Kg/m^2$, history of any acute or chronic illness, on any type of medications or habit forming substances which can affect reaction time like smokers, tobacco chewing and alcohol were excluded from the study. Reaction Time was recorded with the help of Audio-Visual Reaction Time apparatus supplied by Medisystem, Yamunanagar. It has a display accuracy of 100% and resolution is 0.1%. In this study, visual reaction time was assessed for both red and green stimuli. All the subjects were right handers and used their sign hand to press the switch to stop the quartz clock of the apparatus. From the auto-display, reaction time was noted.

Subjects were presented randomly with 2 visual stimuli, red and green. Three readings of each stimulus were noted after giving three practical trials and the lowest was taken as the reaction time. Mean±SD values for red and green visual reaction time among the three groups were compared using one way ANOVA test with post-hoc Tukey's HSD test. For significance p value less than 0.05 was considered to be significant. Analyses were processed using Graph Pad Instat software for Windows (version 3.1, GraphPad Software, Inc., San Diego, CA).

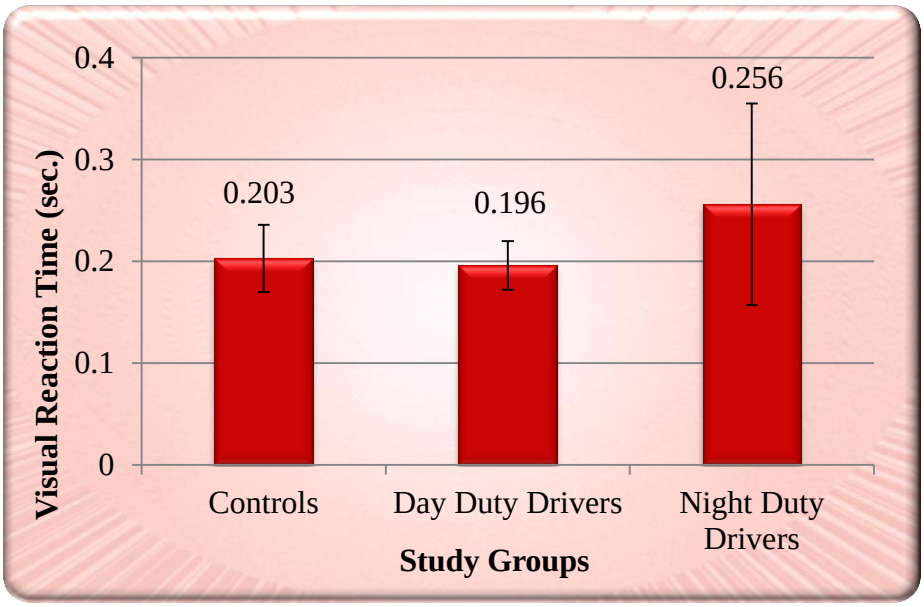
**OBSERVATION AND RESULTS:**

Graph 1 and Graph 2 show the Comparison of Visual Reaction time (in seconds) for green light and red light, respectively, between controls, day duty divers and night duty drivers by one way ANOVA. On analysis, a highly significant ($p<0.0001$) difference was observed in Visual reaction time (second) for both green and red light between the study groups. The reaction time for both the red and green visual stimuli was longer in the night duty drivers than the day duty drivers and controls.

On Tukey's Post Hoc test, a significant difference of Visual reaction time for both green and red light stimuli between Controls and Night duty drivers, Day duty drivers and Night duty drivers was observed but no significant difference was observed between Control and Day duty drivers.




**Graph 1: Comparison of Visual Reaction time (in seconds) for Green light between controls, day duty divers and night duty drivers by one way ANOVA**




**Graph 2: Comparison of Visual reaction time (in seconds) for Red light between the study groups by one way ANOVA**

**DISSCUSION:**

Vision, being one of the most important sense for safe driving and many studies suggest that up to 80% of all crashes can be avoided with better vision skills. About 90% of the information we use when driving is gathered by our vision and the other senses such as hearing, touch, feel, balance and smell provide the remaining information [5]. Present study was carried out keeping in the view that the impact of Visual reaction time can serve as an effective and preventive measure for Road traffic accidents, as this test is important for the assessment of quickness & coordination of visual and auditory responses. In drivers, the number of accidents can be reduced by measuring quicker level of response with the aid of the audio-visual analyzer.

In the present study, it was observed that the reaction time to red light is faster as compared to the green light in the entire study group. This is in agreement with the findings of Shenvi DH and Balasubramanian PA (1994) [6], and has been explained on the basis of the Trichromatic theory of color vision. When Tomita and co-workers (1985) [7], illuminated the retina with micro-electrode penetration of a single cone, they found that 74% of units peaked in the red spectrum, 16% in the blue spectrum and 10% in the green spectrum. Moreover, the reaction time for both the red and green visual stimuli was significantly longer in the night duty drivers than the day duty drivers and controls, possibly due to sleep deprivation and fatigue, as the night duty drivers have to drive for more than 8 hours continuously with increased level of concentration and without adequate rest intervals.

McCarthy ME and Waters WF in 1997 [8] in their study have revealed significant effects on both cognitive and physiological measures, including reaction time due to sleep deprivation. Their findings revealed that the sleep deprivation decreases the subject's attention and responsiveness to the new information and simultaneously there is a reduction in the efficiency of their cognitive processing. According to colour expert and strategist Kate Smith in 2008 [9], the red colour stimulates energy and can increase heartbeat, blood pressure, respiration, and pulse rate more than any other colour and red has the most obvious association as a learned stimulant, especially as a connection to stop signs and traffic lights.

**CONCLUSION:**

In conclusion, this preliminary study revealed that working at night shift affects the reaction time particularly for the visual stimuli which is possible due to sleep deprivation and constant concentration leading to stress and fatigue which in turn causes distractions leading to increased risk of road traffic accidents at nights which may be avoided by adequate rest. Thus, making the travelers safer and avoiding the impairment of sensori-motor performance of the workers engaged in such occupations like driving. Also, as this test is a measure of the quickness and coordination which

should be included for the periodic monitoring of the people engaged in such occupations.

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