

## Effect of BMI on Visual Reaction Time in School Bus Drivers

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**Received on:** April 14, 2018

**Accepted on:** April 16, 2018

### Abstract

The present study was carried out in the Department of Physiology, MGM Medical College, Indore. *Type of study:* cross-sectional study. *Sample size:* 100 School bus drivers. *Age group:* 20 to 50 years, males. To find out the correlation between BMI and visual reaction time in school bus drivers. There is a positive correlation between BMI and visual reaction time i.e. as BMI increases reaction time becomes longer (statistically not significant  $p > 0.05$ ). *Study Design:* Observational Study.

**Keywords:** BMI; Visual Reaction.

### Introduction

The study of audio-visual reaction time spans more than a century and provided an indicator of the processing capabilities of the central nervous system and also a simple means of determining sensory-motor co-ordination. Reaction time is defined as an interval of time between the application of stimulus and the initiation of appropriate voluntary response under the condition that the subject has been instructed to respond as rapidly as possible [1].

Thus it indicates the time taken by an individual to react to external stimulus. It provides an indirect index of the integrity and processing ability of the central nervous system [1] and a simple, non-invasive means of determining sensory-motor co-ordination and performance of an individual [2].

Importance of audiovisual reaction time in drivers is that driver applying brakes in a fraction of second, quick maneuvering is must and it's life saving It determines the alertness of a person because how quickly a person responds to a stimulus depends on

his reaction time and therefore it should be lesser in certain occupation e.g. drivers, sportsmen, pilots, military people doctors, nursing staff, security guards etc. Various factors influencing human reaction time are age, sex, BMI, left or right handedness, central versus peripheral vision, practice, fatigue, personality types, exercise and intelligence of the subject [6].

The present study was carried out keeping in view that the reaction time is an utmost important test for the drivers, especially school bus drivers who have great responsibility towards many children as road traffic accidents can be reduced by simply measuring the audio visual reaction time in drivers and taking measures accordingly.

Studies regarding relation of BMI and visual reaction time in school bus drivers are meager and that's why we have chosen this topic.

### Objective

To find out the correlation between BMI and visual reaction time in school bus drivers.

## Materials and Methods

### Site of Study:

The present study was carried out in the Department of Physiology, MGM Medical College, Indore.

### Type of Study:

Cross-sectional study.

### Sample size:

100 School bus drivers.

### Age group:

20 to 50 years, males.

Study was performed after taking permission from the ethics and scientific review committee MGM Medical College & M.Y. Hospital, Indore and permission letter from the Head of Department of Physiology MGM Medical College, Indore and from respective school authorities.

We had selected 100 school bus drivers of age group 20-50 years.

An informed written consent had been taken from these subjects after explaining the study procedure and a self-made questionnaire had been administered to every participant regarding their personal, present, past, family, socioeconomic and medical history in detail. Special information about the duration of bus driving, shift, duty hours, history of any addiction and history of any medicine which can affect central nervous regulation was obtained. Then after the assessment of related visual function test we had done choice reaction time test by reaction time analyzer.

### Material:

The apparatus used in this study was reaction time apparatus, RTM-608 supplied by Medicaid system Chandigarh.

It is an electronic reaction time meter equipped with very sensitive quartz clock which has a resolution of .001 sec. and Accuracy of  $\pm 1$  digit.

It has two modes of providing stimulus- auditory stimulus (continuous sound on speaker of high, medium and low pitch) and Visual stimulus (soothing red, yellow and green lights) .

Only those participants were taken into the study that fulfilled our inclusion criteria.

### Inclusion

1. School bus drivers of age group 20-50 years.
2. School bus drivers driving the vehicle for more than one year.

3. All subjects included were healthy males.
4. All subjects with no visual disturbances.
5. Individuals giving consent for test participation in the study.
6. Those who were not taking any sedative or hypnotic or anti-allergic medicine.

### Exclusion:

1. Individuals of age group <20 and >50 years.
2. School bus drivers driving the vehicle for less than one year.
3. Individuals with visual disturbances.
4. Individuals taking any sedative or hypnotic or anti-allergic medicine.
5. Individuals not giving consent for test participation in the study.

These subjects were assessed for various physiological parameters mentioned below and a standardized protocol was followed while taking the measurements:

- Height
- Weight
- Pulse
- Blood pressure
- Clinical examination (general and systemic)
- Visual acuity (near vision and far vision)
- Color vision
- Visual reaction time (for red color, yellow color and green color).

### Procedure:

Each subject was made familiar with the apparatus and procedure is explained.

### For Visual Reaction Time:

Three practical trials were given each time before taking the observation. Before presenting a stimulus a ready signal or warning in the form of a verbal instruction READY was given. In visual reaction time task, the subjects sat to one side and examiner sat to other side of instrument. When examiner pressed switch, visual stimuli appear on screen which is in front of the subject. The instrument automatically starts counting the time. Subject had to react to three different colors of light i.e. red, green and yellow by pressing the respective key for the color as soon as that respective color is presented on the screen which

may be red, green or yellow. When subject pressed the key as a response to visual stimuli, instrument stops counting the time. This time was directly taken as visual reaction time. Three practical trials of visual stimuli were given to each subject and the best (i.e. the lowest) was taken as the visual reaction time of that subject.

#### Statistical Analysis:

Data thus obtained were compiled, tabulated and analyzed statistically, by using one way ANOVA test with the help of SPSS–20 (Software Package used for Statistical Analysis) software.

### Observation and Result

The table 1 shows the comparison of visual reaction time for color in relation to BMI in the drivers.

The mean visual reaction time for red color in the normal weight group was  $0.88 \pm 0.31$ , in the overweight group it was  $0.91 \pm 0.26$  and in the obese group it was  $1.23 \pm 0.00$ . this shows that as BMI increases visual reaction time for red color also increases but the results obtained were statistically not significant ( $p > 0.05$ ).

The mean visual reaction time for green color in the normal weight group was  $0.84 \pm 0.32$ , in the overweight group it was  $0.92 \pm 0.35$  and in the obese group it was  $1.03 \pm 0.00$ . It shows the same finding as for red color but the results obtained were statistically not significant ( $p > 0.05$ ).

The mean visual reaction time for yellow color in the normal weight group was  $0.90 \pm 0.28$ , in the overweight group it was  $1.15 \pm 1.66$  and in the obese group it was  $1.31 \pm 0.00$ . it shows that with increase in BMI reaction time increases but the values were found to be statistically not significant ( $p > 0.05$ ).

### Discussion

As shown in our study that overweight individuals react slower than those individuals having normal weight. Possible explanation for this could be obesity induced vascular diseases, secretions of adipose tissue like hormones, cytokines, and growth factors affecting brain health [4]. Different neurophysiological studies have shown influence of obesity and elevated body mass index on cognitive functions, memory deficits and executive dysfunction in young as well as middle aged individuals [5,6]. Therefore, the need for a healthy lifestyle, good eating habits and regular exercise undoubtedly requires emphasis all the more. As it is clear from above study that increase in BMI increases the reaction time and slows the reflex action which is a very important aspect in driving so we can advice drivers to maintain their physical health as it might affect the lives of so many children. Our findings match with the following study of: *Nikam et al. (2012)* [7] who showed the effect of age, gender, and body mass index (BMI) on audio visual reaction time in Indian population. They found that there was significant positive correlation between BMI and visual reaction time in both males and females irrespective of age group.

### Conclusion

There is positive correlation between BMI and visual reaction time i.e. as BMI increases reaction time becomes longer (statistically not significant  $p > 0.05$ ).

**Table 1:** Comparison of mean visual reaction time for color in drivers in relation to BMI (N=100)

Color	BMI	N	Mean $\pm$ SD	F Value	P Value
Red color	Normal Weight	59	$0.88 \pm 0.31$	0.794	0.455, NS
	Overweight	40	$0.91 \pm 0.26$		
	Obese	1	$1.23 \pm 0.00$		
Green color	Normal Weight	59	$0.84 \pm 0.32$	0.816	0.445, NS
	Overweight	40	$0.92 \pm 0.35$		
	Obese	1	$1.03 \pm 0.00$		
Yellow color	Normal Weight	59	$0.90 \pm 0.28$	0.685	0.507, NS
	Overweight	40	$1.15 \pm 1.66$		
	Obese	1	$1.31 \pm 0.00$		

One-Way ANOVA applied. p value < 0.05 was taken as statistically significant

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