

Color difference on simple visual reaction time in young volunteers

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Abstract

Simple reaction time is used to evaluate the processing speed and the co-ordination between the sensory and motor systems. Reaction time is influenced by various factors. Therefore, the effect of color stimulus in modulating the reaction time among young Indian males has been investigated in this study. A total of 50 healthy volunteers (young males) of age group 18–28 years were included in the study. The subjects were presented with two visual stimuli viz.; red and green light by using an audio visual reaction time apparatus. Using paired t-test for comparison of visual reaction time between red and green color in young males, it was observed that the response latency for red color was significantly less compared to green color ($P < 0.05$). From the present study, it could be suggested that the color stimulus has an impact in modulating the visual reaction time.

Key words: Color of the stimulus, Indian population, visual reaction time

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INTRODUCTION

Reaction time is a reliable indicator of the speed of processing of sensory stimulus and its execution in the form of motor response by central nervous system (CNS).^[1] Reaction time has been defined as the time interval between the application of a stimulus and the response by the subject.^[2] It is an indirect index of the processing ability of CNS and simple means of determining sensory motor association and performance of an individual.^[3] Reaction time can be used to detect the level of arousal of CNS, to determine sensorimotor performances,^[4] to measure the speed of decision making and response selection^[5] and also for assessing the aspects of the planning and execution of voluntary movements.^[6]

Visual reaction time (VRT) is a physical skill closely related to human performance. It represents the level of

neuro-muscular coordination in which the body, through different physical, chemical and mechanical processes decodes visual stimuli which travel via afferent pathways and reach the brain as sensory stimuli.^[7-10] Simple VRT can be determined when an individual is asked to press a button as soon as a light appears.^[11] Study done by Thompson *et al.*, has documented that the mean reaction time to detect the visual stimuli is approximately 180–200 ms.^[12]

Various factors affect VRT such as stimulus, age, gender and fatigue. Further it has been reported that visual reaction time with red color elicits a faster response when compared to green.^[13] On contrary other study shows, reaction time for green color was shorter.^[14] In view of conflicting reports about the VRT in response to red and green, in this study the effect of VRT with respect to green and red light stimuli was assessed.

MATERIALS AND METHODS

The present study was conducted in the Department of Physiology, SMS Medical College, Jaipur, after obtaining the ethical clearance from Institutional Ethics Committee. 50 young healthy male volunteers of age group (18–28 years) were recruited from SMS Medical College, Jaipur. All the subjects included in the study were

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healthy, nonalcoholic, nonsmoking and had clinically normal vision. Informed consent was taken from all the subjects. Reaction time experiment was done in the morning, between 10 a.m. to 12 noon. After noting the relevant history and thorough clinical examination each participant was explained about the study protocol and sufficient trials were given for proper understanding. After demonstrating the procedure, subjects were asked to respond to visual stimuli by pressing the response key with the index finger of their dominant hand and three consecutive readings of stimulus were recorded, using an audio VRT apparatus (Medisystems Pvt. Ltd., Mumbai, Maharashtra). The interval between the stimuli was randomly varied from 2 to 5 s. The time taken by the trainer is called as VRT. The least reading of three was taken as the value for VRT.

Statistical analysis of data

Data were expressed as mean \pm SD. Results from the comparison of VRT between green and red color were analyzed by using Student's paired *t*-test. SPSS version 13 (SPSS Software Inc., Chicago, IL, USA) was used for statistical analysis of data and a *P* > 0.05 was considered significant.

RESULTS

Average values of simple VRT in males are 0.194 \pm 0.085 s for red colour and 0.256 \pm 0.135 s for green colour [Table 1].

DISCUSSION

Reaction time is an important component of motor movements. It is one of the important methods to study a person's central information processing speed and the fast coordinated peripheral movement response. Reaction time is the interval between the onset of a stimulus and the commencement of a movement response.^[15] Singer *et al.*, defined reaction time as being composed of four stages, namely: The start of eye movements, eye movement time, decision time and muscle contraction time.^[16] In the present study, as Table 1 depicts, VRT for red color stimuli is significantly less compared with green color stimuli among young males aged 18–28 years. This can be explained on the

Table 1: Comparison of VRT for red colour versus green colour among young males

Young males (18-28 years)	Parameters	Mean \pm SD (s)	P
n=50	VRT (red light)	0.194 \pm 0.085	0.010
	VRT (green light)	0.256 \pm 0.135	

Statistical analysis was done using paired *t*-test and the *P*<0.05 was considered statistically significant. SD: Standard deviation, VRT: Visual reaction time

basis of relative number of cones activated in response to a particular color of light on the basis of trichromatic theory of color vision, which shows that sensation of any given color depends on relative frequency of impulses being sent from each of the cone systems. It has been reported that when the retina was illuminated with microelectrode penetration of single cones, 16% of the units peak in blue spectrum, 10% in the green and 74% in the red. Thus, maximum number of cones are activated for red color, followed by blue and least response was for green color.^[17] Our observations are consistent with the previous reports.^[13,18]

CONCLUSION

The VRT for red color stimuli was significantly less compared to green color stimuli, which can be explained on the basis of trichromatic theory. Thus, from the present study it can be concluded that there is an impact of color of stimulus in modulating VRT.

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