

Comparative Study of Simple and Choice Visual Reaction Time in Young Adults

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ABSTRACT

Background: Reaction time is defined as interval of time between presentation of stimulus and appearance of appropriate voluntary response in a subject. It is usually expressed in milliseconds. Reaction time is very important for our everyday lives and needs intact sensory system, cognitive processing, and motor performance. Reaction time is a good indicator of sensorimotor coordination and performance of an individual. Reaction time determines the alertness of a person. There are 3 different types of reaction time experiments, simple, recognition, and choice reaction time experiments. In simple reaction time experiments, there is only one stimulus and one response. In recognition reaction time experiments, there are some stimuli (the “memory set”) that should be responded to and others (the “distracter set”) that should not be responded to. In choice reaction time experiments, there are multiple stimuli and multiple responses and subject must give a response that corresponds to the stimulus.

Aim: The aim of our study was to compare the simple and choice visual reaction time of 1st year medical students of our college.

Material and Method: The present study was undertaken on 100 subjects consisting of equal number of males and females. The tests were done using Deary-Liewald Reaction time software version 310. All the subjects were thoroughly acquainted with the procedure and practice trial was given to every subject before taking the test. A comparison was made between simple visual reaction time (VRT) and choice visual reaction time (CRT).

Results: The present study was undertaken on 100 students. The Mean±SD of VRT was 252.99±17.53 while as Mean±SD of CRT was 368.91±18.82. Paired T-test was done to know the significance. The statistical analysis of the results show that there is highly significant difference (P<0.0001) between the two and the VRT is faster than the CRT.

Conclusion: From our study we conclude that Simple visual reaction time (VRT) is shorter than choice reaction time in healthy young adult subjects. The cause of CRT being slower than VRT may be due to processing time required in CRT.

Key Words: Simple reaction time, Simple visual reaction time, Choice reaction time, Deary-Liewald.

INTRODUCTION

Reaction is a purposeful voluntary response to an external stimulus. There is certain time period between application of external stimulus and appropriate motor response to the stimulus called the reaction time. Reaction time is defined as interval of

time between presentation of stimulus and appearance of appropriate voluntary response in a subject. [1,2] It is usually expressed in milliseconds. It reflects the speed of the flow of neurophysiological, cognitive, and information processes which are created by the action of stimulus on the

person's sensory system. The receipt of information (visual or auditory), its processing, decision making, and giving the response or execution of the motor act are the processes which follow one another and make what we call the reaction time. [3-5]

Reaction time is very important for our everyday lives and needs intact sensory system, cognitive processing, and motor performance. Reaction time is a good indicator of sensorimotor coordination and performance of an individual. Reaction time determines the alertness of a person.

Many factors have been shown to affect reaction time including gender, age, physical fitness, level of fatigue, distraction, alcohol, personality type, limb used for test, biological rhythm, and health and whether the stimulus is auditory or visual. [5] Prolonged reaction time denotes decreased performance. [6]

There are 3 different types of reaction time experiments, simple, recognition, and choice reaction time experiments. In simple reaction time experiments, there is only one stimulus and one response. In recognition reaction time experiments, there are some stimuli (the "memory set") that should be responded to and others (the "distracter set") that should not be responded to. In choice reaction time experiments, there are multiple stimuli and multiple responses and subject must give a response that corresponds to the stimulus. [7] It has been reported that the time for motor preparation (e.g., tensing muscles) and motor response was the same in all three types of reaction time tests, implying that the differences in reaction time are due to processing time. [5,7]

The choice reaction time can be studied by using visual inputs or by using auditory inputs. When studied using visual inputs it is called visual choice reaction

time. In this study we compared the simple and choice visual reaction time of 1st year medical students of our college.

MATERIALS AND METHODS

The study was conducted in the Department of Physiology, Government Medical College, Srinagar. 100 1st year medical students consisting of equal number of males and females formed the subjects of the study. Participation in the test was voluntary and informed written consent was taken from every participant. Detailed history and physical examination of each subject was done and those with any history of hearing or visual disorder, smoking, alcoholism, cardiovascular and respiratory disease, on any medication affecting cognitive performance were excluded.

The tests were done using Deary-Liewald Reaction time software version 310. [8] For simple visual reaction time, a cross appeared in the box on the screen (x) times and each time it appeared the subject had to press any key as quickly as possible (Figure. 1). For Choice reaction time (CRT) Four Choice Reaction Time test was performed. In this test there were four boxes on the screen. A cross appeared on one of them and the subject had to press the correct key for that box as quickly as possible (Figure. 2). All the subjects were thoroughly acquainted with the procedure and practice trial was given to every subject before taking the test.

By default, the response range was between 200-1500ms and Inter Stimulus Interval was between 1000-3000ms. The key configuration was CRT Key Box 1 – z, CRT Key Box 2 – x, CRT Key Box 3 - 'comma', CRT Key Box 4 - 'full-stop'. The numbers of Experiment Trials given were 10 and fastest reaction time was noted in milliseconds (ms).

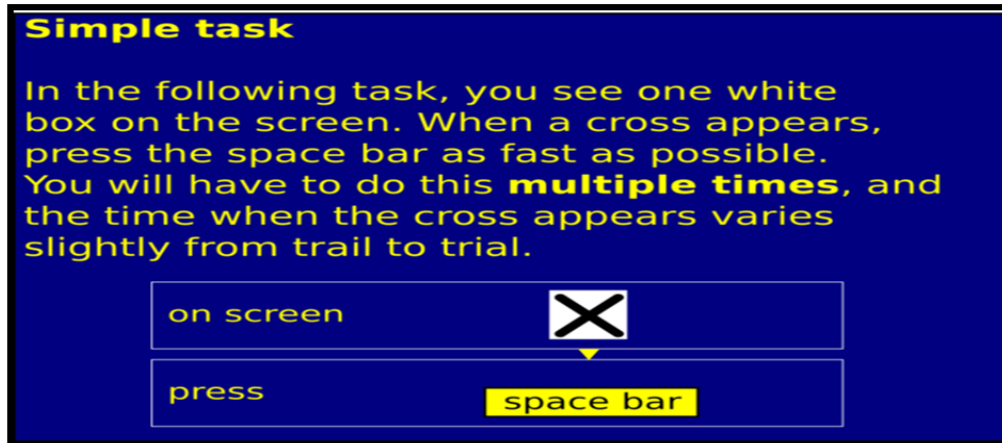


Figure. 1: Simple visual Reaction Time test

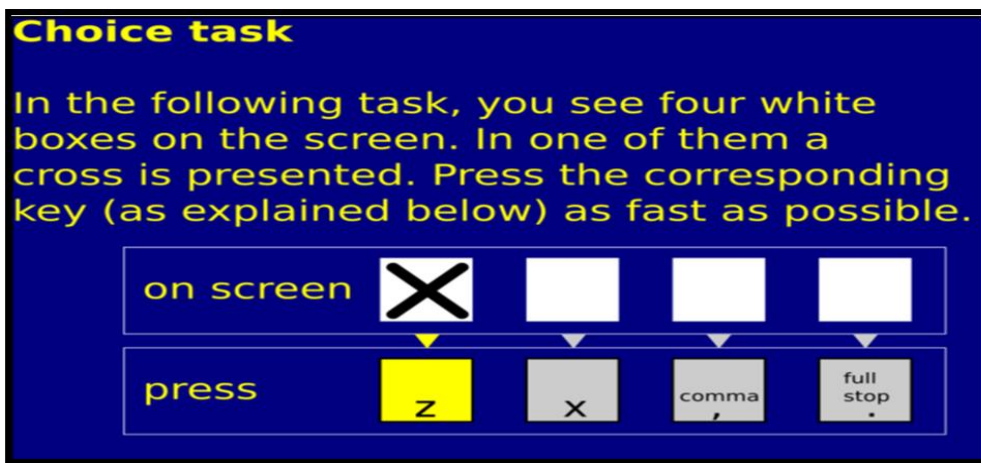


Figure. 2: Four Choice Reaction Time test

A comparison was made between simple visual reaction time (VRT) and choice visual reaction time (CRT). The statistical analysis was carried out with Statistical Package for Social Sciences version 24.0 manufactured by SPSS Inc. (Chicago). $P < 0.05$ was considered to be statistically significant.

RESULTS

The present study was undertaken on 100 students. Table 1 shows anthropometric data of all 100 subjects.

Table 1: Overall anthropometric data

N	100
AGE (Mean±SD) (Years)	19.49±0.7977
WEIGHT(Mean±SD) (KG)	61.05±9.24
HEIGHT(Mean±SD) (M)	1.65±0.09
BMI(Mean±SD)	22.12±3.61

Table 2 shows comparison between VRT and CRT of all 100 subjects. Paired T-test was done to know the significance. The statistical analysis of the results show that there is highly significant difference ($P < 0.0001$) between the two and the VRT is faster than the CRT.

Table 2: Comparison between VRT and CRT

Reaction time	n	Mean±SD	P
VRT	100	252.99±17.53	
CRT	100	368.91±18.82	<0.0001

DISCUSSION

Our study comprised of 100 young adults in the age group of 19 to 21 years. The mean visual reaction time (VRT) was 252.99±17.53 which was significantly faster than Choice reaction time (CRT) 368.91±18.82.

Our study is in accordance with various studies published in literature.

Teichner et al in their study titled "Laws of visual choice reaction time" had also observed that VRT is faster than CRT. [9]

Donders, Luce, and Brebner et al in their studies had also observed similar results. [10,11,12]

Karia RM et al in their study also observed that VRT is faster than CRT. [13]

The cause of CRT being slower than VRT may be due to processing time required in CRT. Miller et al in their study determined that the time for motor preparation and motor action was the same in all types of reaction time test and that the differences in reaction time are due to processing time. [14] Henry and Rogers in their study proposed the "memory drum" theory according to which more complex responses require more stored information, and hence take longer time. [15]

CONCLUSION

From our study we conclude that Simple visual reaction time (VRT) is shorter than choice reaction time in healthy young adult subjects.

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