A Study of Correlation between Auditory and Visual Reaction Time in Healthy Adults

Jayesh Solanki, Naisargi Joshi, Chinmay Shah, H.B Mehta, P.A Gokhle

Dept. of Physiology, Govt. Medical College, Bhavnagar

ABSTRACT

Aims and Objectives: Reaction time is a good test to study conduction along nervous pathway and reaction time to auditory and visual stimuli is decisive factor for animal s survival. **Methodology:** This study was carried out in 92 healthy medical students of both the sexes. Low and high frequency pure sounds were used for auditory reaction time (ART). Green and blue monochromatic light were used for Visual reaction time (VRT). It was carried out with simple and test options under standard conditions. **Results and interpretation:** The observations revealed prolonged reaction time (RT) to visual stimuli as compared to auditory stimuli, Female disadvantage in reaction time in all tests & prolonged response time for choice test as compared to simple test.

Key words: Auditory; choice; reaction time; visual

INTRODUCTION

Reaction time is duration between application of a stimulus to onset of response. Psychologists have named three basic kinds of reaction time experiments: simple, choice and recognition.[1,2] RT acts as a reliable indicator of rate of processing of sensory stimuli by central nervous system and its execution in the form of motor response. Time response is supposed to be the best factor for the management of homeostasis in animal. Reaction time is a useful physiological parameter which is affected by many physiological and pathological parameters.[3] Type of stimulus,[4–9] type of test[1,10–13] and gender difference,[2,14–21] intelligence,[28,29] distraction[2,30,31] and exercise[2,32–35] were ruled out for present study. For about 120 years, the accepted figures for mean simple reaction times for college-age individuals have been about 190 ms for light stimuli and about 160 ms for sound stimuli[2,4,6]. Reaction time of medical students who are the cream of the society help to have a generalized idea about the RT of this region and comparison with other studies can be done.

Address for correspondence: Dr. Chinmay Shah
Asso. Professor
Dept. of Physiology, Govt. Medical College
Bhavnagar

E-mail: cjshah79@yahoo.co.in

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METHODOLOGY

The present study was conducted in department of Physiology, Govt. Medical College, Bhavnagar, Gujarat, India from October 2009 to December 2009. The research protocol was approved by local ethical committee and informed consent obtained from each subject prior to inclusion in the study. It included 92 healthy medical students of age group 17 to 19 years of both sexes (44 males and 48 females). After getting written consent they were undertaken for study. Any visual or auditory abnormalities were ruled out by history and examination. It was carried out in reaction time lab with adequate light and in silent atmosphere. ART & VRT were measured by 'Audio-Visual Reaction Time Apparatus RTM-608' of RMS Company. It has sensitivity of 0.001 second which means that it measures time in milliseconds from the point of application of stimulus by examiner to the point of pressing response button by subject. For ART low and high frequency sounds were given. For VRT green and blue coloured monochromatic light were presented. For simple test one stimulus and for choice test two stimuli were given. Subjects were first explained the procedure

and familiarized with the test & response were taken after adequate practice. Subjects were asked to press the response button on application of stimulus as fast as they can. Mean values were calculated for each tests. Out of three the lowest reading was taken for record profile. Statistical significance of various differences were analyzed by students t-test using software using software Sigma Stat 2.0 The statistical probability limit was P <0.001.

RESULTS

Reaction time with regard to type of test, type of stimulus and sex are given comparatively in following table 1 to 3.

Comparison of types test (Table 1) shows prolonged RT for Choice test as compared to Simple test regardless the type of stimuli with statistical significance (P<0.001).

Comparison of types of stimuli (Table 2) shows prolonged VRT as compared to ART regardless the type of test with statistical significance (P<0.001) for simple test but not in the choice test.

Reaction time for female was more than male in every test which was statistically significant (P<0.001) for both types of VRT but not for both types of ART.

DISCUSSION

While comparing two types of stimuli, VRT was more than ART which is in line with previous such studies.[2,5,6,36] This can be attributed to the number of synapses in visual pathway as compared to auditory pathway. Vision takes 20–40 ms to travel in visual pathway[37] while sound takes just 8–10 ms to travel in auditory pathway.[38] This time difference is observed in both the varieties of test.[9]

With regard to type of test, Choice RT was more than Simple RT. This observed difference is due to prolonged motor processing time in choice test while motor preparation time and motor response time remains the same.[39] Out of three varieties of RT tests value for Simple RT is shortest and choice RT is longest in every study.[1,10,12,13,36] This observation is in line with Lamming who found that Simple VRT 220 msec & Recognition VRT 384 msec.[11]

Females are slower to react as compared to male in each of the reaction time test. This female disadvantage can not be reduced by practice.[2, 11, 14] Bellies found that VRT in male was 220 msec versus of female 260 msec while ART in male 190 msec versus of female 200 msec.[18] This is very similar to our observation that gap for gender difference is more in VRT as compared to ART. This is due to more involvement of males in driving and fast action sports,[2]

Table 1: Comparison of Simple RT and Choice RT (In milliseconds) (Mean ± SD)

Group	Number	Simple RT	Choice RT	Statistical Significance
VRT Male	44	175.12±52.61	323.39±103.71	Yes(P<0.001)
VRT Female	48	202.90±47.93	366.67±88.76	Yes(P<0.001)
ART Male	44	126.27±31.82	344.00±109.44	Yes(P<0.001)
ART Female	48	131.27±26.20	372.13±77.56	Yes(P<0.001)

Table 2: Comparison of results for VRT and ART (In milliseconds) (Mean ± SD)

Group	Number	VRT	ART	Statistical Significance
Male(Simple)	44	175.12±52.61	126.27±31.82	Yes(P<0.001)
Female(Simple)	48	202.90±47.93	131.27±26.20	Yes(P<0.001)
Male(Choice)	44	323.89±103.71	344.00±109.44	No(P value 0.295)
Female(Choice)	48	366.67±88.76	372.13±77.56	No(P value 0.543)

Table 3: Effect of gender difference on reaction time (In milliseconds) (Mean ± SD

Test	Male(n=44)	Female(n=48)	Statistical Significance
Simple VRT	175.12±52.61	202.90±47.93	Yes(P value 0.009)
Choice VRT	323.39±103.71	366.67±88.76	Yes(P value 0.033)
Simple ART	126.27±31.82	131.27±26.20	No(P value 0.408)
Choice ART	344.00±109.44	372.13±77.56	No(P value 0.154)

the lag between the presentation of the stimulus and the beginning of muscle contraction,[40] a more complex strategy used by male as compared to female,[14] effect of sex hormone on nerve conduction velocity in female.[41]

CONCLUSION

Thus VRT is more than ART. Simple RT is less than Choice RT. Females are slower to react as compared to males. After removing age and intelligency factors study of reaction time in medical students with regards to test type, stimulus type, gender difference show similarity with other such studies done elsewhere. Reaction time still remains an age old golden test to check subjective responsiveness of an individual to various stimuli that is essential for the survival of human race.

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