Effect of Auditory Interference on Visual Simple Reaction Time

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ABSTRACT

Background

Reaction time is the time between the application of the stimulus and the response. It is a physical skill based on human performance. Various factors like age, gender, distractions, personality, alcohol, etc. can affect the reaction time to a stimulus.

Objective

The objective was to determine whether auditory interference affects the visual simple reaction time or not.

Method

This is a quantitative, observational, cross-sectional study done at Kathmandu University School of Medical Sciences, Pre-Clinical Basic Science Block, Chaukot from April 2017 to June 2017. Total 120 participants who fulfilled the inclusion criteria and who were willing to participate in the study were included. Visual simple reaction time task was estimated alone without any interference followed by auditory interference using a software Deary Liewald reaction timer v3.10 in the laptop. The task was to press the spacebar as soon as the stimulus appeared in the screen of the laptop. Visual Reaction Time was recorded 20 times and the average of 20 recordings was given by the software itself which was later considered for statistical analysis. Then difference between the two values was reviewed using paired t-test since the data was normally distributed.

Result

The mean of visual simple reaction time for our study population was 298.93±37.12 milliseconds and the visual simple reaction time after auditory interference was 299.77±40.15 milliseconds. The difference between visual simple reaction time alone and after auditory interference was not significant (p=0.993).

Conclusion

This study shows that auditory interference doesn't affect the simple visual reaction time; so the person can perform daily activities even if there is some kind of auditory interference at the same time.

KEY WORDS

Auditory interference, Reaction time, Visual simple reaction time

INTRODUCTION

Reaction time is the time between the application of the stimulus and the response. It is a physical skill based on human performance. According to the number of stimuli in a task, if the number of stimuli is equal to one, this kind of reaction time task is called simple reaction time task; if higher than one, it is defined as choice reaction time task. These tasks need to be responded with a specific motor reaction.[1] The mean simple Visual reaction time for age between 18 to 25years as stated by the Deary Liewald and Nissan is 243.1±17.6 milliseconds (msec) for light stimulus.[2] There are various factors like age, gender, distractions, personality, alcohol, etc. which can affect the reaction time to a stimulus.[3]

It is often noted among students, drivers, or at work place that auditory interference like listening to music improves concentration ability. Listening to stimulating music can influence certain factors like arousal which shows that music shortens reaction time.[4,5] However, there are studies which consider music as distracter in performing cognitive tasks requiring attention and concentration which has a negative effect and deteriorate cognitive performance.[6,7] In addition, some studies reveal indifference to the effect of music on simple visual reaction time(VRT).[8] Nevertheless, its effects are debatable.

The present study elucidates whether auditory interference affects the visual simple reaction time or not. Since there is a much needed requirement of spontaneous reflex action in our various daily activities, reaction time and accuracy to perform any task are very important in physical activities like sports which may make the difference between winning and losing.

METHODS

This is a quantitative, observational, cross-sectional study conducted at Pre- Clinical Science, Basic Science Block, Kathmandu University School of Medical Sciences (KUSMS) from April 2017 to June 2017. One hundred and twenty healthy male and female students studying at KUSMS Pre-clinical science Block who had normal vision (or normal corrected vision) and normal hearing were included in the study. Ethical approval for the study was obtained from the Institutional Review Committee (IRC) of KUSMS. The participants were explained about procedure of the study in detail and they had given informed written consent for participation.

The participants thus selected were tested for simple reaction time for visual stimulus. The instrument used was Deary-Liewald reaction time tester v 3.10, a software displaying reaction time in milliseconds.

Visual stimulus was a cross (X) which appeared in the box on the screen of a computer. Each time it appeared the participant should press any key as quickly as he/she could. First of all they had a practice session. A cross appeared in the box on the screen randomly (x8) times and they were told not to hold the key down, but press and release it when the cross appears. They were asked to use the index finger of preferred hand to press the key throughout the test. When they were ready, they were asked to press any key to start. VRT was recorded 20 times and the average of 20 recordings was given by the software itself which was later considered for statistical analysis.

The study was conducted in a quiet room of Physiology Laboratory in Physiology Department, KUSMS, Chaukot. VRT was recorded of each participant initially without interference and later with auditory interference in the form of music played on the background. The background music played in a laptop was presented with fixed medium volume to all participants.

The recordings were entered in MS-EXCEL worksheet and later exported to SPSS 20.0. The data was tested to see whether it was normally distributed or not. Since it was normally distributed, paired t-test ($p<0.05$) was applied to note whether there was significant difference between simple VRT and VRT with auditory interference.

RESULTS

One hundred and twenty students (Male: 55, Female: 65) aged between 18 to 24 years were included in this study as shown in the Figure 1 below. The mean age (in years) of the participants was 20.32±1.69. Majority of the participants (97%) used right hand as their dominant hand as shown in Figure 2.

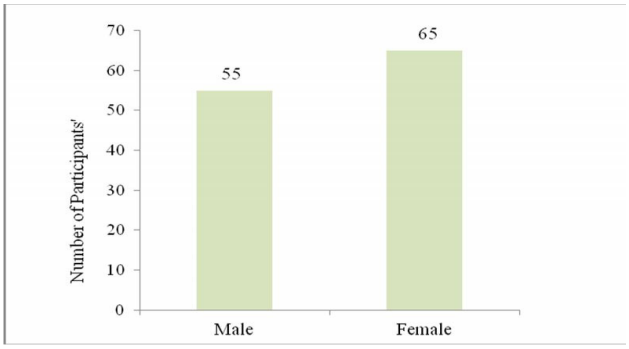

Figure 1. Comparison of participants' based on gender.

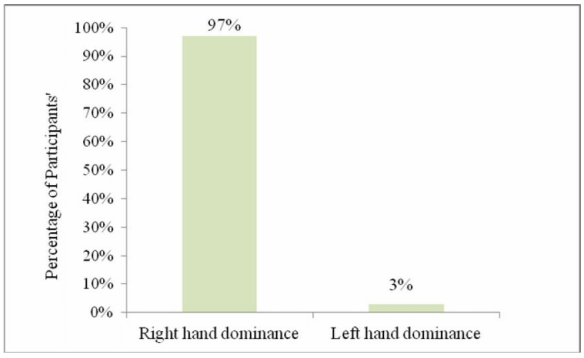

Figure 2. Comparison of Hand Dominance among the participants'

The mean of visual simple reaction time for our study population was 298.93±37.12 msec and the visual simple reaction time after auditory interference was 299.77±40.15 msec. The difference between these two values was not significant (p=0.993) as shown in Table 1.

Table 1. Comparison of Visual simple Reaction Time (VRT) alone and VRT after auditory interference

	Number	Mean (msec)	Std. Deviation	p-value
Visual simple Reaction Time(VRT)	120	298.93	37.12	0.993
VRT after auditory interference	120	299.77	40.15	

DISCUSSION

Reaction time to a stimulus was said to be affected by various factors like age, gender, distractions, personality, alcohol, etc.[3]

In the present study, the simple VRT was found to be 298.93±37.12 msec and with auditory interference it was found to be 299.77±40.15 msec. When we compared our result with studies done previously it revealed that the simple VRT value we obtained was less than the values obtained from previous study done by Shenvi and Balasabramaniam who found the simple VRT to be 470±140 msec for male and 420±80 msec for female.[9] In other studies the VRT values obtained by Shah et al. and Karia et al. were less than the values we had obtained.[7,10] Shah et al found simple VRT to be 272.3±177.7 msec for male and 254.6±162.9 msec for female.[7] And Karia et al. found it to be 139.9±26.4 msec for male and 159.9±26.4 msec for female.[10] In the other hand our value for VRT was similar as that of the value derived by the study done by Ghuntla et al. which was 299.7±74.6 msec.[11]

A study by Welford and Broadbent stated that reaction time was shorter at a higher level of arousal.[8,12] Nevertheless our study also showed that the auditory interference given in the form of music at the normal volume was one of the factors that contributed to a stimulating effect of music on Simple VRT. Similar to our study, a study done by Strick also concluded that listening to music did not improve reaction time but loud music hindered it.[13]

In contrary to our present study, a study by Meško et al. showed that music at a higher volume (85 decibels) diverts an individual's attention to lyrics or musical rhythm and there was less attention to their surroundings.[14] Similarly in a study by Anderson et al, it had been reported that there was increased reaction time to cognitive distraction.[6] This showed that brain overload occurs when other stimuli are given while doing a task.

The research results were probably affected by various confounding factors like the participants' gender or their involvement in activity like sports. In our study, we have not compared VRT on the basis of the participants' gender which might have influenced our findings. In addition, reduced reaction time had been reported in individuals inclined to sports in various literature which was not addressed in our study.

CONCLUSION

The study shows that auditory interference doesn't affect the simple VRT so the person can listen as well as perform the daily activity at the same time. But for further research, more participants should be involved in order to obtain results which could be generalized so that it can be applied for a broader population.

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