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Short Communication

A Comparative Study of Audiovisual Reaction Time in Female Athletes and Controls

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ABSTRACT

Background and purpose: Reaction time is one of the important non- invasive methods used to study a person's central information processing speed and coordinated peripheral movement response. The purpose of the study was to compare the auditory and visual reaction time in young female athletes and controls.
Methodology: 25 female athletes aging between 18-22 years along with 25 age and sex matched controls were studied for auditory and visual reaction time using reaction time apparatus.
Results: Results were assessed by using unpaired t test. The athletes performed significantly better than their controls.
Conclusion: It can be concluded that the auditory and visual reaction time is better in athletes than in non-athletes.

Keywords: auditory reaction time, visual reaction time, female athletes

INTRODUCTION

Reaction time is the time elapsed between the presentation of a sensory stimulus and the subsequent behavioral response. Simple reaction time is usually defined as the time required for an observer to detect the presence of a stimulus. It is a physical skill closely related to human performance. It represents the level of neuromuscular coordination in which the body through different physical, chemical and mechanical processes decodes auditory and visual stimuli which travel via afferent pathways and reach the brain as sensory stimuli. [1]

There are various factors that affect the reaction time to a stimulus. Factors like intensity and duration of the stimulus, age and gender of the participant, and effect of practice can affect the reaction time of an individual to a particular stimulus. [1]

Much is known about the beneficial effects of exercise on various systems and overall health, little research being done on effect of exercise on mental functions. [2] Athletes tend to be leaner than their non-athlete counterparts. This lesser BMI in athletes is also shown to be related with decrease in audiovisual reaction time. [3]

A study in female athletes was undertaken because there are very few studies on reaction time in female athletes. Auditory and visual reaction times were measured in 25 young female athletes of 18-22 years of age and compared with 25 females of the same age group who were having sedentary lifestyle.

MATERIALS AND METHODS

This study was carried out in the Department of Physiology, Government Medical College, Aurangabad, Maharashtra, India. The study was approved by Institutional Ethical committee. It involved 25 female athletes aging between 18 to 22 years (mean age 20± 2 years) who were doing three hours exercise like running, jogging etc. daily since last two years. They were chosen from Police Training Institute, Hudco and Sports Authority of India, Aurangabad. 25 age matched females with sedentary lifestyle were chosen from students of first year BPMT and Nursing at Government Medical College, Aurangabad as controls. Those having psychological diseases or other factors which may be a confounding factor for reaction time was excluded. A self administered questionnaire was given for obtaining the medical history and a thorough general and systemic examination was done. The procedure was explained.

Informed written consent was taken from each participant.

The test was carried out in a quiet room. These tests were done with the subject sitting comfortably in a chair. The Auditory and Visual reaction time were measured by using a reaction time instrument which was supplied by Medicaid systems RTM 604 (Chandigarh, India). It was equipped with a sensitive quartz clock which measured time up to $1/10^{th}$ of a millisecond. The accuracy of this instrument was ± 1 digit. All the subjects were right handed and used their right hand to press the switch to stop the quartz clock of the apparatus.

Before measuring the visual reaction time, each subject was asked to identify the flashing of red, green, and yellow lights. She was then instructed to press the corresponding colored button as soon as she saw the light. Mean of three readings was taken.

Before measuring the auditory reaction time, she was asked to identify sound 1, 2 and 3 and press the corresponding button to stop the sound. Mean of three readings was taken.

Statistical analysis: Results were expressed as mean ± S.D. the results were analyzed using unpaired t test using online t test calculator graph pad. P value of < 0.01 was set as cut off.

OBSERVATIONS AND RESULTS

It was observed that for all the three choices of colors as well as sounds, the reaction time of the athletes was lesser than the females with sedentary lifestyle and the difference was extremely statistically significant.

Refer table 1 Auditory reaction time in female athletes and controls. Our study is in accordance with similar studies by Prabhjout Kaur, [4] Vandana Daulatabad, [5] and Ajay Gavkare. [6]

Table 1. Auditory reaction times in female athletes and controls

Auditory reaction time Seconds	Athletes Mean± S.D.	Controls Mean± S.D.	T value	P value
Sound 1	0.6232±0.2269	1.1496±0.2421	7.9333	P<0.0001 S
Sound 2	0.7176±0.4464	1.0944±0.2732	3.5998	P=0.0008 S
Sound 3	0.5784±0.3431	1.1624±0.3297	6.1364	P<0.0001 S

The auditory reaction time is lesser in female athletes as compared to controls and for all the three sounds, the difference is highly significant.

In the study by Prabhjout Kaur, [4] the auditory reaction time in athletes was 0.1699± 0.180 while in controls it was 0.1802± 0.167 and the difference was statistically significant. The visual reaction time in athletes was 0.1751± 0.192 while in controls it was 0.1899±0.201 and the difference was statistically significant.

In the study by Vandana Daulatabad, [5] the reaction time in athletes for auditory stimulus was 98.4 msec and 106.4 msec for right and left hand respectively, while controls had longer reaction time of 135.4 msec and 143.9 msec. Thus it is evident that the auditory reaction time was highly significant in athletes. The visual reaction time in athletes was 99.7 msec and 107.3 msec while the values in controls were 130 msec and 145 msec for right and left hand respectively. These were again highly significantly lower in athletes than the controls.

In the study by Ajay Gavkare, [6] the auditory reaction time in athletes was (129.24± 9.46) msec while in controls it was (134.16± 12.08) msec and the difference was statistically highly significant. The visual reaction time for athletes was (136.14± 16.63) msec while in controls it was 142.28± 10.16) msec and the different were statistically significant.

The results of our study are also in tune with reaction time studies done in other sports like table tennis, [7] and basketball [2,8] etc.

Table 2. Visual reaction time of female athletes and controls

Visual reaction time seconds	Athletes Mean± S.D.	Controls Mean± S.D.	T value	P value
Yellow light	0.4244±0.1187	0.6612± 0.0767	8.3784	P<0.0001 S
Red light	0.3880±0.1131	0.6500±0.0545	10.4383	P<0.0001 S
Green light	0.4216±0.1101	0.6080±0.0912	6.5177	P<0.0001 S

The visual reaction time in female athletes is lesser as compared to controls and the values for all the three colours are statistically highly significant

The quicker reaction time in athletes as compared to controls is due to better concentration as well as alertness in athletes. Also, arousal which supports increased awareness to external stimuli. This arousal may be a result of neurophysiological changes like levels of plasma catecholamines. Athletes also tend to have better muscular coordination resulting in improved performance in tasks involving speed and accuracy. Athletes also have a decreased level of psychological tension, and better contact of mind and body resulting in better performance. An adaptive increase in mitochondrial content and respiratory capacity of skeletal muscles, increase in enzymatic activity of skeletal muscles, prolonged work time and delay in fatigue are also responsible. On the cardiac front, improved cardiac efficiency due to increased stroke volume and increased vagal tone contribute. [6]

Exercise increases activation of central nervous system and facilitates cognitive process. [4]

Although all the mechanisms behind exercise and improved human information processing are not very clear, the most popular idea is that those individuals who exercise at moderate to intense levels have higher rates of cerebral blood flow. This increases cognitive functioning due to increased supply of necessary nutrients. [7]

CONCLUSION

It can be concluded that the reaction time can be a useful tool to indicate performance in sports.

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