

**EXERCISE AND REACTION TIMES**Varun Malhotra<sup>1</sup>, Neera Goel<sup>2</sup>, Ushadhar<sup>3</sup>, Yogesh Tripathi<sup>4</sup>, Rinku Garg<sup>5</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: OBJECTIVES:** Physical exercise provides multiple benefits to an individual. It is known that exercising regularly can prevent coronary heart disease, hypertension and obesity and improve flexibility. The effect of exercise on visual reaction time needs to be studied, as the existing data on the benefit of aerobic exercise on psychomotor functions is insufficient. **MATERIALS AND METHODS:** Online Visual reaction time is measured before and after exercise. Subjects were instructed to run on the spot with a springy step in exaggerated motion for 50 to 60 counts at 2 counts per second, maintaining a constant rhythm. **RESULTS:** We observed that reaction time was significantly lower after performance of exercise. Individuals reported improved mental alertness, feel good factor, better mood and increase circulation. **CONCLUSION:** Improving reaction times in sports can help the athlete to optimize his performance in making decisions and increasing attention span for example getting off the starting blocks sooner or successfully making contact with the ball. In addition this study shows that use of physical exercise helps improve cognitive function. Exercise proves to be a cheap non pharmacological alternative to improve cognitive performance.

**KEYWORDS:** Exercise, Visual Reaction Time.

**INTRODUCTION:** Reaction speed is the ability to quick motor response to definite stimulus, while the time that elapses between the sensory stimulation and the motor reaction time is called reaction time.<sup>(1)</sup> This is the time that elapses between a stimulus and response. This process consists of sensory and perceptual process. After a stimulus is perceived by our receptors (In our eyes, and ears), identification and recognition in the central nervous system begin. If we recognize a certain stimulus to be significant for us, we respond, in the opposite case we ignore and do not respond. The speed of identifying the stimulus is an essential factor in this process. The last stage of the response to the stimulus is a motor reaction which involves clicking the computer mouse.<sup>(2)</sup>

Today, a sedentary life style, lack of vigorous physical activity has lead to increase in incidence of cardiovascular diseases and psychological stress. It is known that exercising regularly can prevent coronary heart disease, hypertension, obesity and improve flexibility.<sup>(3)</sup>

Act of exercising has been shown to enhance numerous aspects of mental functioning such as moods, self-esteem and general psychological well-being.<sup>(4)</sup> Several studies have shown that physical exercises improve and protect the brain function. This suggests that physically active individual have better cognitive function and are at lower risk to develop disorders of the mind as compared to those who have a sedentary life style.<sup>(5)</sup>

The effect of exercise on visual reaction time needs to be studied, as the existing data on the benefit of aerobic exercise on psychomotor functions is insufficient. <sup>(6-10)</sup>

Indian data on this subject is very limited. Hence, we designed this study to see the effect of exercise on visual reaction times on healthy subjects.<sup>(11)</sup>

## ORIGINAL ARTICLE

We tested the effect of exercise on reaction time. From previous knowledge we knew that increased heart rate produces adrenaline which prepares the body for fight or flight response and in addition causes pupil dilation. Increased pupil dilation is a defense strategy, to enable one to see farther, and a faster response to stimuli. We hypothesized that increased heart rate has an effect on reaction time.

**MATERIAL AND METHODS:** Baseline record of Visual Reaction time test was taken using Computer online Windows.<sup>(7)</sup> The Online Reaction Time Test consists of a traffic light signal of red, yellow and green. The subject is instructed on to click on a button to begin when ready, to wait for the stoplight to turn green, and click when it turns green quickly.<sup>(12)</sup>

Subjects were instructed to run on the spot with a springy step in exaggerated motion for 50 to 60 counts at 2 counts per second, maintaining a constant rhythm. The arms are bent at the elbow and were stationary during the exercise.

Reaction times were taken before and after exercise.

Subjects who were smokers, alcoholics, who had abnormal vision, any cardiorespiratory diseases were excluded from the Study.

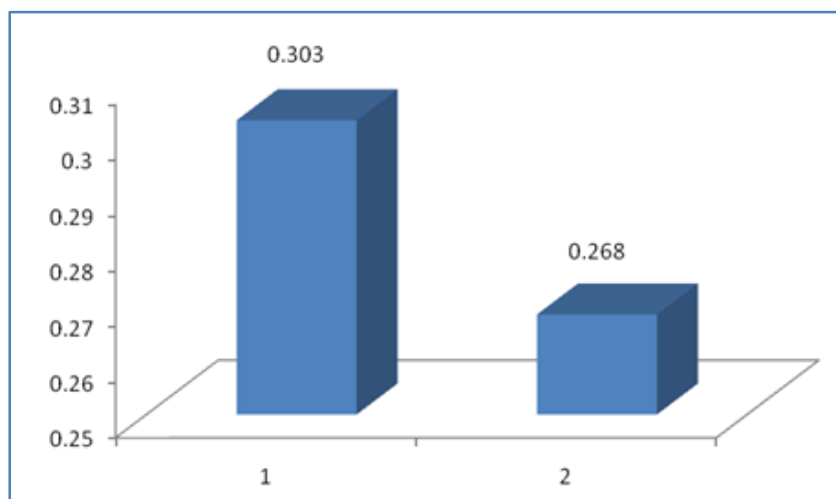
**STATISTICAL ANALYSIS OF DATA:** The data obtained was analyzed using SPSS software (version 13.0). The parameter including visual reaction times was assessed. Student's paired "t" test was used for analysis of comparison. Results are expressed as Mean+ S.D. P<0.05 was considered as significant.

### RESULTS:

N=30	Before Exercise	After Exercise	P Value
Mean ± SD	0.303 ± 0.06	0.268 ± 0.024	<0.0106

**Table 1: Reaction times before and after exercise in seconds**

**Figure 1:** Reaction times before and after Exercise in seconds.



**Fig. 1**

## ORIGINAL ARTICLE

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We observed that reaction time was significantly lower after performance of exercise.

Exercise was mild to moderate in nature with pulse rate ranging from 90 to 125 beats per minute.

Individuals reported improved mental alertness, feel good factor, better mood and increase circulation.

**DISCUSSION:** Concentration is focusing the mind through interest and determination on one line of thought. Exercise helps to relax the mind and achieves perfect concentration. Real concentration is the one pointed focusing of the mind on a particular thought by means of definite scientific technique. Every activity requires certain amount of concentration and no effective action may be performed without deep concentration. Businessmen, artists and students in school must know the art of focusing all powers of attention upon a single point in order to succeed in their respective vocation. Concentration as seen by a decrease in visual reaction time denotes withdrawal of the attention from objects of distraction and then focusing all attention upon one thing at one time for example the changing light in the online reaction test in the study.<sup>(13)</sup>

Reaction time study is an important method used for central information processing speed and fast coordinated peripheral movement response. It is an external indicator of the ability of the nervous system to receive process and initiate response to incoming stimuli. Responses that take more time to initiate are assumed to require longer information processing times. Measurement of reaction Time is a common method to evaluate psychomotor fitness.<sup>(3)</sup> There are several factors that influence the reaction time such as age, gender, left vs right handedness, practice, exercise, type of personality, the use of stimulant drugs, hypothyroidism and hyperthyroidism, brain injury and illness.<sup>(14)</sup>

Other studies showed trends in reaction time due to arousal or state of attention. This state of attention also includes muscular tension that can be generated by exercise.<sup>(6, 8)</sup> They found that muscular tension allowed the brain to work faster, although muscular tension did not affect movement time.

Though, numerous studies by Welford (1980) showed that reaction time deteriorates when the subject is either too relaxed or too tense.<sup>(6)</sup> We found that immediately after exercise the reaction times were fastest, owing to an alert aroused response similar to fight, flight response due to adrenaline. However, as time passed the individual tends to relax and reaction time deteriorates. The RTs were faster than the basal values but slower than the values obtained immediately after exercise. Fastest reaction times were observed when the subjects were exercising sufficiently to produce a heart rate of 115 beats per minute.<sup>(7)</sup> One plausible mechanism for this decrease in reaction time is that an increased heart rate due to moderate exercise increases cortical blood flow and enhances cognitive function due to a greater state of arousal.<sup>(15)</sup> Another study reported an improvement in reaction times irrespective of age and gender when subjects regularly exercised for 30 minutes in gymnasium.<sup>(3)</sup>

Exercise training increases mitochondrial content of exercising muscles delaying fatigue.<sup>(16)</sup> Aerobic physical exercise also protects the Central Nervous system against damages caused by reactive oxygen species.<sup>(17)</sup> Exercise also increases blood circulation in the brain that improves neurological functioning.<sup>(18)</sup> This helps increase nutrients like glucose and oxygen, alter levels of neurotransmitters such as serotonin, norepinephrine and dopamine. Frequent exercise results in enhancement of memory, cardiovascular activity and sustained cognitive aptitude.<sup>(19)</sup>

**CONCLUSION:** Improving reaction times in sports can help the athlete to optimize his performance in making decisions and increasing attention span for example getting off the starting blocks sooner or successfully making contact with the ball. In addition this study shows that use of physical exercise helps improve cognitive function. Exercise proves to be a cheap non pharmacological alternative to improve cognitive performance. Just 30 minutes of physical activity each day offers substantial benefits to your health.<sup>(20)</sup>

**LACUNAE AND FURTHER STUDIES:** It has been shown performing reaction time to an auditory stimulus rather than a visual stimulus eliminated higher variability that can accompany visual stimulus like color of light used and background light. We intend to measure auditory reaction times and the effects of exercise on it.

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## ORIGINAL ARTICLE

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