

## Full Length Review Article

# RELATIONSHIP BETWEEN BODY MASS INDEX AND SIMPLE REACTION TIME OF PLAYERS

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### ABSTRACT

#### INTRODUCTION

Reaction time is the interval time between the presentation of a stimulus and the initiation of the muscular response to that stimulus. A primary factor affecting a response is the number of possible stimuli, each requiring their own response, that are presented. Reaction time is an indirect index of processing capabilities of the central nervous system.

**Purpose:** The present study was carried out to determine if there is any influence of body mass index (BMI) on simple reaction time (SRT) in healthy young male sportspersons.

#### MATERIALS AND METHODS

**Subjects:** This study was carried out in the district of Murshidabad in West Bengal, India with 30 College students of age group 22 to 25 years, who were participating Football and Cricket games in regular basis.

**Group Design:** The subjects were divided into 2 groups each of them consisted with 15 subjects, that is, those who were participating in the game of Football (FG) and those who were participating in the game of Cricket (CG) in regular basis and had participated minimum state level in respective games and sports. The height (in Cm.) and weight (in Kg.) of the subjects were recorded and the BMI was calculated accordingly. The simple reaction time of the subjects were measured with the help of Ruler Drop Test.

**Statistical Design:** The mean and s.d. of weight, height, BMI and reaction time of the subjects were calculated by using simple descriptive statistical formula. Then relationship between BMI and Simple Reaction Time was calculated by using Pearson Correlation Coefficient formula. Again the comparison between two groups regarding BMI and reaction time was done by using t-test.

#### RESULTS AND DISCUSSION

Findings show that the mean height and weight of Football group (FG) are greater than the mean height and weight of Cricket group (CG) respectively. It is also found that mean and s.d. of BMI of FG are 22.54 Kg/m<sup>2</sup> and 0.7679 Kg/m<sup>2</sup> respectively and for CG these are 22.167 Kg/m<sup>2</sup> and 1.1273 Kg/m<sup>2</sup> respectively. At the same time, mean and s.d. of Simple Reaction Time for CG are 0.198 sec. and 0.0086 sec. respectively and the same for FG are 0.2040 sec. and 0.0051 sec. respectively.

#### ANALYSIS AND INTERPRETATION

It is found that in case of footballers correlation coefficient between BMI and simple reaction time is negative as well as low. Which depicts that there is no relationship between BMI and simple reaction time in case of football players, as well as high BMIs are showing low simple reaction time also, which is unpredictable. At the same time, cricket players are showing positive high relationship between BMI and simple reaction time. Which means that, in case of Cricket group, high BMI indicates high in reaction and vice versa. But it is to mention that, most of the subjects show perfect or appropriate BMI as per their height and weight, and they are showing average performance in simple reaction time without major influence of height and weight. t-test between BMI of FG and CG shows no significant difference between the two groups. At the same time t-test is showing significant difference between two groups so far as simple reaction time is concerned.

#### CONCLUSION

Cricket players are showing more significant relationship between BMI and Simple Reaction time in comparison to Football players of same level. At the same time, as mean BMI of CG is low, they show less Reaction time on an average in comparison to FG. Result shows that there is no significant difference between FH and CH in respect of BMI, but there exists a significant difference between FG and CG so far as Simple Reaction time is concerned. It is to mention that CG take less time to react in a known visual stimulus of falling ruler at the time of 'Ruler drop test'

**KEY WORDS:** Football Group, Cricket Group, BMI, Simple Reaction Time

### INTRODUCTION

Reaction time is the interval time between the presentation of a stimulus and the initiation of the muscular response to that stimulus. A primary factor affecting a response is the number of possible stimuli, each requiring their own response, that are presented.

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Reaction time is an indirect index of processing capabilities of the central nervous system. The present study was carried out to determine if there is any influence of body mass index on simple reaction time in healthy young male sportspersons. If there is only one possible response (simple reaction time) it will only take a short time to react. If there are several possible responses (choice reaction time) then it will take longer to determine which response to carry out. An early study (Galton, 1899) reported that for teenagers (15-19) mean reaction times were 187 msec for light stimuli and 158 ms for sound stimuli. Reaction times may be getting slower, because we hardly ever see a Clemson freshman (or professor) who is

that fast. Simple reaction time shortens from infancy into the late 20s, then increases slowly until the 50s and 60s, and then lengthens faster as the person gets into his 70s and beyond (Welford, 1977; Jervas and Yan, 2001; Luchies *et al.*, 2002; Rose *et al.*, 2002; Der and Deary, 2006). Exercise can affect reaction time. Welford (1980) found that physically fit subjects had faster reaction times, and both Levitt and Gutin (1971) and Sjoberg (1975) showed that subjects had the fastest reaction times when they were exercising sufficiently to produce a heartrate of 115 beats per minute. Kashihara and Nakahara (2005) found that vigorous exercise did improve choice reaction time, but only for the first 8 minutes after exercise. Exercise had no effect on the percent of correct choices the subjects made.

Nakamoto and Mori (2008) found that college students who played basketball and baseball had faster reaction times than sedentary students. At least for baseball, the more sports experience the students had, the faster their reaction times were to baseball-specific stimuli. Davrancheet *al.* (2006) concluded that exercise on a stationary bicycle improved reaction times. On the other hand, McMorris *et al.* (2000) found no effect of exercise on reaction time in a test of soccer skill, and Lemmink and Visscher (2005) found that choice reaction time and error rate in soccer players were not affected by exercise on a stationary bicycle. Pesce *et al.* (2007) concurred that exercise did not improve the reaction time of soccer players. Hick (1952) discovered that the reaction time increases proportionally to the number of possible responses until a point at which the response time remains constant despite the increases in possible responses (Hick's Law). The neurophysiological studies suggest a relationship of the BMI with the cognition, attention and the memory.

## MATERIALS AND METHODS

### Subjects

This study was carried out in the district of Murshidabad in West Bengal, India with 30 College students of age group 22 to 25 years, who were participating Football and Cricket games in regular basis.

### Group Design

The subjects were divided into 2 groups each of them consisted with 15 subjects. Those who were participating in the game of Football (FG) and those who were participating in the game of Cricket (CG) in regular basis and had participated minimum state level in respective games and sports. The height (in Cm.) and weight (in Kg.) of the subjects were recorded and the BMI was calculated accordingly. The simple reaction time of the subjects were measured with the help of Ruler Drop Test.

### Experimental Design

Height and weight of the students were first of all taken by using Stadiometer and Weighing machine respectively. Then BMI of both the groups were then calculated by using the following formula.

$$BMI = \frac{Wt.}{(Ht.)^2}$$

Here, weight was taken in Kilogram and height was taken in meter. After that, the 'Ruler Drop Test' was conducted to measure the Simple Reaction Time of the subjects. To find the average simple reaction time of the subjects, the test is conducted 10 times for each subject and after calculating 10 reaction times for each individual the average SRT was taken for each person.

### Statistical Design

The mean and s.d. of weight, height, BMI and reaction time of the subjects were calculated by using simple descriptive statistical formula. Then relationship between BMI and Simple Reaction Time was calculated by using Pearson Correlation Coefficient formula. Again the comparison between two groups regarding BMI and reaction time was done by using t-test.

## RESULTS AND DISCUSSION

Table 1 showing the mean and s.d. of the two groups in respect of height, weight, BMI

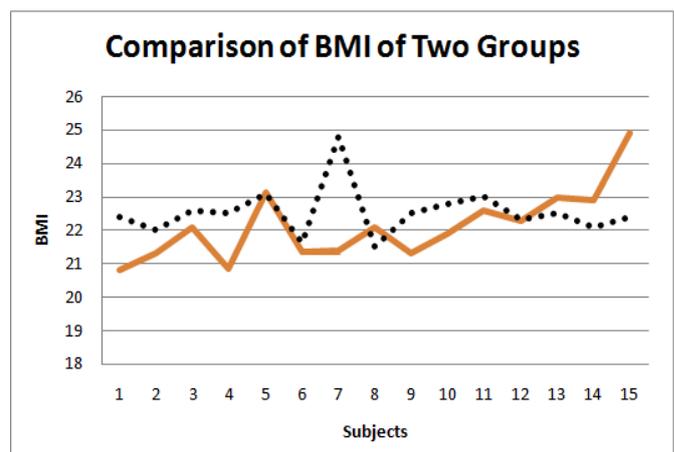
**Table 1. Mean and S.D. of Height, Weight, B.M.I. and R.T. of two groups**

Group	Height (mt.)	Weight (Kg.)	BMI Kg/(mt.) <sup>2</sup>	Reaction Time (Sec.)
FG	1.654	60.66	22.54±0.7679	0.2040±0.0051
CG	1.655	61.83	22.167±1.1273	0.1980±0.0086

Table 2 shows the correlation coefficient between BMI and Simple Reaction time of two groups.

**Table 2. Correlation coefficient between B.M.I. and R.T.**

Group	Correlation
FG	-0.0528
CG	0.6382



**Fig. 1. Comparison of BMI between FG & CG (Dotted line for Football group)**

Table 3 shows t-test between two groups in respect of BMI and Table 2 shows t-test between two groups in respect of Reaction time.

Table 3. t-test relating to B.M.I.

Group	Mean(Kg./m. <sup>2</sup> )	S.D.	SEM	MD	95% CI of diff.	Df	T	P	SED
FG	22.540	0.7679	0.1983	-0.3727	-1.0941 to 0.3487	28	1.0582#	0.2990	0.352
CG	22.167	1.1273	0.2911						

# = Not Significant

Table 4. t-test relating to S.R.T.

Group	Mean (sec.)	S.D.	SEM	MD	95% CI of diff.	Df	t	P	SED
0.0013	0.2040	0.0051	0.0025	-0.0060	-0.0113 to 0,0007	28	2.3238*	0.0276	0.003
CG	0.1980	0.0086	0.0022						

\* = Significant

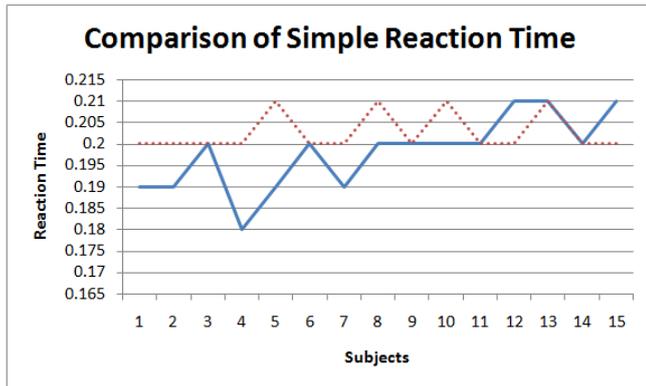


Fig. 2. Comparison of Reaction Time between two groups (Dotted line for Football Group)

From Table 1, it is found that the mean height and weight of Football group (FG) are greater than the mean height and weight of Cricket group (CG) respectively. It is also found that mean and s.d. of BMI of FG are 22.54 and 0.7679 respectively and for CG these are 22.167 and 1.1273 respectively. At the same time, mean and s.d. of Simple Reaction Time for CG are 0.198 and 0.0086 respectively and the same for FG are 0.2040 and 0.0051 respectively. Table 2 shows the relationship between BMI and Simple Reaction time (SRT) of both groups. It is found that in case of footballers correlation coefficient between BMI and simple reaction time is negative as well as low. Which depicts that there is no relationship between BMI and simple reaction time in case of football players, as well as high BMIs are showing low simple reaction time also, which is unpredictable. At the same time, cricket players are showing positive high relationship between BMI and simple reaction time. Which means that, in case of Cricket group, high BMI indicates high in reaction time and vice versa. But it is to mention that, most of the subjects show perfect or appropriate BMI as per their height and weight, and they are showing average performance in simple reaction time without major influence of height and weight. Table 3 and 4 are showing the t-test to find the significant difference between FG and CG in respect of BMI and SRT. t-test between BMI of FG and CG shows no significant difference between the two groups. At the same time t-test is showing significant difference between two groups so far as simple reaction time is concerned.

### Analysis and Interpretation

In present study Cricket players are showing more significant relationship between BMI and Simple Reaction time in comparison to Football players of same level.

At the same time, as mean BMI of CG is low, they show less Reaction time on an average in comparison to FG. Result shows that there is no significant difference between FH and CH in respect of BMI, but there exists a significant difference between FG and CG so far as Simple Reaction time is concerned. It is to mention that CG take less time to react in a known visual stimulus of falling ruler at the time of 'Ruler drop test'. In a study by Skurvydas, A. et al. concluded that participants from the group with greater body mass index reacted significantly slower than others. In another study, conducted by Deore, D.N. et al., concluded that visual as well as auditory reaction time was longer in subjects having higher and lower BMI than normal. Visual reaction time was significantly longer in subjects with lower BMI as compared to that of subjects with normal BMI ( $P < 0.05$ ). Thus body mass index of an individual affects sensory motor association. The present study is very much familiar to the above studies.

### CONCLUSION

The present study concludes that,

1. The mean height and weight of Football group (FG) are greater than the mean height and weight of Cricket group (CG) respectively.
2. There is no relationship between BMI and simple reaction time in case of football players, as well as high BMIs are showing low simple reaction time also, which is unpredictable.
3. Cricket players are showing positive high relationship between BMI and simple reaction time. Which means that, in case of Cricket group, high BMI indicates high in reaction and vice versa.
4. It is to mention that, most of the subjects show perfect or appropriate BMI as per their height and weight, and they are showing average performance in simple reaction time without major influence of height and weight.
5. Cricket players are showing more significant relationship between BMI and Simple Reaction time in comparison to Football players of same level. At the same time, as mean BMI of CG is low, they show less Reaction time on an average in comparison to FG.
6. Result shows that there is no significant difference between FH and CH in respect of BMI, but there exists a significant difference between FG and CG so far as Simple Reaction time is concerned. It is to mention that CG take less time to react in a known visual stimulus of falling ruler at the time of 'Ruler drop test'

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