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## Effect of six months vigorous football training on the 30:15 ratio (heart rate response from lying to standing test) of male football players

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### Abstract

It was hypothesized that "there will be positive effect of vigorous football training on the 30:15 Ratio Heart Rate Response from Lying to Standing Test of male football players, age ranging from 18 to 25 years". Hence, after the pretest the vigorous football training (treatment variables) and post-test after the vigorous football training for six months were conducted to collect the data on selected parasympathetic reactivity variable namely 30:15 ratio (heart rate response from lying to standing) recorded in beats/minute. To test the effect of vigorous training on football layers the test retest design was adopted, for comparison between the data collected at pre-test and post-test, the collected data needed to be described. Hence, the mean and standard deviation (SD) were selected as descriptive statistics. Thereafter the comparison between pre-test and post-test of selected parasympathetic reactivity variables have been done by computing 't' test. The drawn hypothesis was tested at 0.05 level of significance. The samples of the study were 30 (15 pre and 15 post-test). 30:15 ratio was calculated as the ratio between the longest R-R interval at or around the 30<sup>th</sup> beat and the shortest R-R interval at or around the 15<sup>th</sup> beat. At post-test, 30:15 ratio (heart rate response from lying to standing) recorded in beats/minute, have  $1.48 \pm 0.38$  as mean and standard deviation. The calculated 't' ratio was 10.95 which was significantly different at 0.5 level with mean difference (MD)  $-0.11$ , where the mean value increased from pre-test to post-test.

**Keywords:** Lysing to standing, parasympathetic, R-R interval, vigorous

### Introduction

Football is the most popular sport worldwide. It is also called "soccer" in some countries. It is an outdoor game that requires absolute athleticism as players have to hustle and run across the field with the ball throughout the game. The name of the sport was derived by the way it is played. Football players need to be physically fit and possess excellent technical and coordination skills. To achieve those goals and do their coaches proud, they need to train all season long to stay fit and perform well on the pitch. Fitness training is essential for players. It is recommended that they train at a steady pace with their team and on their own and also do fitness exercises (with and without the ball) to work on their cardio, speed and strength and to guarantee a good level of performance.

A good background support to any fitness training programmed may be provided by regular alternative sports such as squash and rugby football. Long distance running is also excellent, provided it is varied, with alternate bursts of jogging, striding and sprinting, running backwards and sideways straddle jumping etc.

Almost all function of the Cardio-vascular system are regulated or modulated by the autonomic nervous system. It is well known that not only do athletes respond to exercise differently than non-athletes but they also have a lower resting heart rate. The lower heart rate may be caused by any combination of three factors, a reduction in the intrinsic rate of the heart, decreased sympathetic tone, and increased parasympathetic tone. There is considerable uncertainty about the relative contributions of these factors. The both sympathetic and parasympathetic influences is reduced by exercise in humans.

Training effect on fitness components for football performance are well documented along with improvement of fitness componential changes, the changes in physiological system particularly cardio respiratory system including the metabolic process are well documented.

Autonomic nervous system change in autonomic functions take place along cardiovascular fitness improvement particularly system of recovery. It is postulated that the football training will lead to identical adaptation and changes in autonomic functions particularly parasympathetic reactivity of football players.

### Hypothesis

It was hypothesized that there will be positive effect of six months vigorous football training on the 30:15 Ratio (Heart Rate Response from Lying to Standing Test) of Football Players age ranging from 18 years to 25 years.

### Materials and Methodology

#### Selection of Subjects

1. Keeping in view the purpose of the study 15 (fifteen) male football players of University of Delhi were selected. ( $N = 30$  i.e., at pre test  $n_1 = 15$  and at post test  $n_2 = 15$ )
2. The age of the subjects ranged from 18 years to 25 years.
3. 15 subjects were recorded thrice at Pre-Test as well as at Post-Test and then the recorded test scores were averaged hence; data samplings were 45 each for pre test and post test.

**Table 1:** Sample Statistics for Experimentation

S. No	Test Measured			Proposed Statically Compared
1.	Pre-test	15	13	11
2.	Post-test	15	15	11
	$\Sigma N$	30	28	22

**Selection of Variables:** The research scholar gleaned through the available scientific literature from physiology, sports medicine, journals, magazines and periodicals etc. Keeping in view the feasibility criteria, availability of the instruments and purpose of the study, following variable was selected:

- 30:15 Ratio (Heart Rate Response from Lying to Standing) recorded in beats/minute

#### Reliability of Data

- The investigator had under gone a special training under the guidance of an expert for measuring and recording the blood pressure, height, weight and heart rate, expiratory inspiratory ratio (beats/minute), (beats/minute) and the proper use of various physiological equipments.
- After training and being acquainted with the use of various equipments, testing devices, number of subjects were examined and measured to test the reliability and competency of the research scholar before actual data collection for the study.

#### Reliability of Instruments

The latest scientific instruments and devices, imported, installed and calibrated by the International level companies. Before starting the test, the equipments were also calibrated.

#### Administration of the Tests and Collection of Data

The study was conducted at University of Delhi. The subject visited the laboratory on the dates and times given to them. The following instructions were given to the subject in advance:

1. No consumption of tea, coffee or other caffeinated beverages at least, two hours before the recording.

2. No consumption of food stuff, two hours before the recording.
3. No use of medicines 24 hours before the recording.

30:15 Ratio (Heart Rate Response from Lying to Standing)

Stimulus	Change of posture from lying to standing
Afferents	Baroreceptors and cranial nerve IX & X
Efferent	Sympathetic (adrenergic), Parasympathetic (cardio vagal, cholinergic)
Normal Response:	Initially increase in heart rate followed by decrease in heart rate. Fall in blood pressure

#### Protocol

The patient was instructed about the test. The test was conducted after 10 minutes of supine rest. Then he was told to attain the standing posture within 3 seconds and recordings were taken.

#### Recording

The blood pressure and heart rate were recorded at baseline and serially. 30:15 ratio calculated from ECG.

#### Normal Values

30:15 ratio -  $\geq 1.04$  normal

1.01–1.03 borderline  $\leq 1.0$  Abnormal

#### Calculations

30:15 ratio- it was calculated as the ratio between the longest R-R interval at or around the 30<sup>th</sup> beat and the shortest R-R interval at or around the 15<sup>th</sup> beat.

#### Physiology of the Test

The change of the posture from lying to standing puts hydrostatic stress on the venous return. The venous decrease due to pooling of blood in the lower limbs results in decrease in the blood pressure. The decrease in blood pressure activates the baroreflex resulting in rise of the heart rate (between 10 – 20 seconds). The rise of heart rate raises the blood pressure towards the resting values. The recovery of blood pressure results in the decrease in the heart rate later (25-30 seconds)

#### Precautions

- a. It should be ensured that subjects stand- up in 3 seconds. Proper instructions and signal should be given in this respect.
- b. Subject should also be told to inform the investigator if he/she feels dizziness or is uncomfortable during standing.
- c. Subject should not hold anything during standing.
- d. The time interval for the BP measurement during the test should be appropriately followed.
- e. If subject feels dizzy and not able to stand more, subject should be comfortably requested to sit/lie down.

#### Statistical Procedure

The data obtained was analyzed by computing the following statistics: Mean, Standard Deviation (SD), A two tail 't' test by difference method was applicable to these paired observations of a single- group experiment.  $H_0$  proposes that there is no significant difference between the paired observations; any observed difference being due to the chance alone. In the present study the research hypothesis was tested by using the following formula:

$$t = \frac{\sum D}{\sqrt{\frac{N\sum D^2 - (\sum D)^2}{N-1}}}$$

Where,

N- Sample size;  $\sum D$  - Sum total of differences between pre-test and post-test of selected parasympathetic reactivity variable;  $\sum D^2$  - Sum total of square of differences between

pre-test and post-test of selected parasympathetic reactivity variable;  $(\sum D)^2$  - Whole square of sum total of differences between pre-test and post-test selected of parasympathetic reactivity variable.

The level of significance chosen was 0.05 for testing the hypothesis.

## Results

**Table 2:** Descriptive Statistics of Six Months Vigorous Football Training on the 30:15 Ratio (Heart Rate Response from Lying to Standing Test) Recorded at Pre Test of Male Football layers

	Variables	Mean	SD	Max. Score	Min. Score
1	Age (years)	21.00	1.92	25	19
2	Weight (kilogram)	62.54	9.35	81	50
3	Height (centimeter)	167.54	9.23	182	152
4	30:15 Ratio (beats/minute)	1.25	0.42	1.94	0.29

Sample size ( $n_1$ ) - 13; SD- Standard Deviation; Min. Score - Maximum Score; Max. Score - Minimum Score

The table 2 documents the mean, standard deviation (SD), maximum score and minimum score of age (year), weight (kilogram), height (centimeter), expiratory inspiratory ratio, valsalva ratio and 30:15 ratio recorded at pre test. according to table 1 age (year) have  $21 \pm 1.92$  as mean and standard

deviation; likely weight (kilogram) have  $62.54 \pm 9.35$  as mean and standard deviation; height (centimeter) have  $167.54 \pm 9.23$  as mean and standard deviation; 30:15 ratio (heart rate response from lying to standing) recorded in beats/minute, have  $1.25 \pm 0.42$  as mean and standard deviation.

**Table 3:** Descriptive Statistics of Six Months Vigorous Football Training on the 30:15 Ratio (Heart Rate Response from Lying to Standing Test) Recorded at Post Test of Male Football Players

S. No	Variables	Mean	SD	Max. Score	Min. Score
1	Age (years)	21.27	2.02	25	19
2	Weight (kilogram)	64.27	9.86	84	50
3	Height (centimeter)	168.87	7.83	182	158
4	30:15 Ratio (beats/minute)	1.48	0.38	2.40	1.02

Sample size ( $n_1$ ): 15; SD- Standard Deviation; Min. Score- Maximum Score; Max. Score - Minimum Score

The table 3 documents the mean, standard deviation (SD), maximum score and minimum score of age (year), weight (kilogram), height (centimeter), and 30:15 ratio recorded at post test. according to table 3 age (year) have  $21.27 \pm 2.02$  as mean and standard deviation (SD), likely weight (kilogram) have  $64.27 \pm 9.86$  as mean and standard deviation; height (centimeter)  $168.87 \pm 7.83$  as mean and standard deviation (SD), as mean and standard deviation; and 30:15 ratio (heart rate response from lying to standing) recorded in beats/minute, have  $1.48 \pm 0.38$  as mean and standard deviation.

The analysis of the data in table-4 documented that the

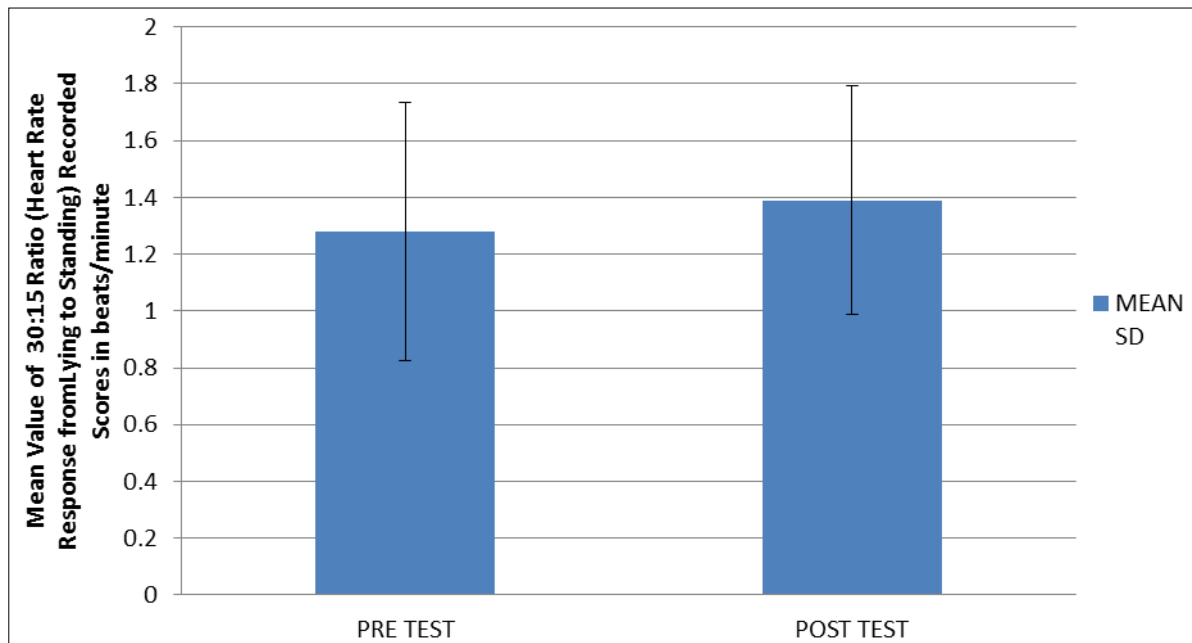
calculated 't' of 30:15 ratio (heart rate response from lying to standing) recorded in beats/minute, the calculated 't' ratio was 10.95 which was significantly different at 0.5 level with mean difference (MD)  $-0.11$ , where the mean value increased from pre-test to post-test. The selected variables collectively which demonstrated the positive effect of vigorous football training in regard to selected parasympathetic reactivity variables of male football players. The findings have been graphically illustrated in figure 1, which demonstrated the positive effect of football training in regard to selected parasympathetic reactivity variables of male football players.

**Table 4:** Comparison between Pre Test and Post Test in Regard to Six Months Vigorous Football Training on the 30:15 Ratio (Heart Rate Response from Lying to Standing Test) of Male Football Players

S. No.	Variables (Beats/minute)	Test	Mean	SD	MD	SED	$\sum D$	$\sum D^2$	t' Ratio
1	LSHR	Pre Test	1.28	0.45	$-0.11$	0.18	4.58	3.50	10.95*
		Post Test	1.39	0.40					

\* Significant at 0.05 level of significant; Sample Size (N)- ( $n_1 + n_2 = 22$ ); SD- Standard Deviation; MD

Mean differences between pre test and post test of selected parasympathetic reactivity variables; SED- Standard error of differences between pre test and post Test of selected parasympathetic reactivity variables;  $\sum D$ - Sum total of differences between pre test and post test of selected parasympathetic reactivity variables;  $\sum D^2$  - Sum total of square of differences between pre-test and post-test of selected parasympathetic reactivity variables; LSHR- 30:15 Ratio (heart rate response from lying to standing) recorded in beats/minute



**Fig 1:** Comparison between Pre and Post Test Mean Values of 30:15 Ratio Scores (Heart Rate Response from Lying to Standing) Recorded in beats/minute

### Discussion

It was hypothesized that there will be positive effect of Six Months Vigorous Football Training on the 30:15 Ratio (Heart Rate Response from Lying to Standing Test) of Male Football Players age ranging 18- 25 years. The analysis of the data in table-4 documented that the calculated 't' 30:15 ratio (heart rate response from lying to standing) recorded in beats/minute, the calculated 't' ratio was 10.95 which was significantly different at 0.5 level with mean difference (MD)  $-0.11$ , where the mean value increased from pre-test to post-test. The selected variables collectively which demonstrated the positive effect of six months vigorous football training in regard to 30:15 Ratio (Heart Rate Response from Lying to Standing Test) of male football players. The findings have been graphically illustrated in figure 1, which demonstrated the positive effect of six month vigorous football training in regard to 30:15 Ratio (Heart Rate Response from Lying to Standing Test) of male football players. Hence, accepted the drawn hypothesis at 0.05 level of significance.

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