

IMPACT OF BODY MASS INDEX ON ISOTONIC MUSCULAR ENDURANCE OF SOCCER PLAYERS

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Abstract

The purpose of this study was to Impact of Body Mass Index and Isotonic Muscular Endurance of Soccer Players. A total of Thirty (N=30) district level soccer players were selected in the study. The age of the subjects ranged from 18-21 years. The investigator collected data from various football academies located in Nadia and Kolkata districts. Three variables of muscular endurance i.e., (Muscular Endurance of Upper Extremity (Shoulder muscle), Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle), and Muscular Endurance of Abdomen) and Body Mass Index were selected for find out the relationship of Body Mass Index and Isotonic Muscular Endurance of Soccer Players. In order to analysis the collected data, Pearson's Product Moment Correlation of Co-efficient was applied to find out the association between Body Mass Index and Isotonic Muscular Endurance of Soccer Players. On the basis of the findings, the researcher noted that there was no significant relationship of body mass index with muscular endurance of upper extremity (Shoulder muscle), and inverse relationship of body mass index with Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle) and Muscular Endurance of Abdomen of soccer players.

Keywords: Muscular Endurance of Upper Extremity (Shoulder muscle), Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle), Muscular Endurance of Abdomen, Body Mass Index and Soccer Players.

I. Introduction

Soccer is a high-intensity, fitful game that requires players to perform repeated bouts of speed, explosive leg strength, agility, cardiovascular and muscular endurance. Optimal physical fitness is therefore essential for performance, and body composition plays a critical role in determining a player's physiological efficiency and functional capacity. Among the commonly used indicators of body composition, Body Mass Index (BMI) remains a practical and widely accepted measure for classifying weight status in sports person and sedentary populations.

In competitive football, muscular contractions especially isotonic contractions (Eccentric & Concentric) characterized by dynamic contractions involving changes in muscle length under constant tension are fundamental to movement execution. Activities such as kicking, sprinting, tackling, and repeated accelerations primarily involve isotonic contractions of major lower-limb muscle groups. The efficiency of these movements depends on muscular strength, endurance, and optimal body mass relative to height.

While body mass index is often used to evaluate general weight categories, its relationship with sports performance, particularly isotonic exercise capacity, remains a topic of on-going inquisition. In soccer players, superfluous body mass may impair speed, agility, and endurance due to increased mechanical load, whereas inadequate body mass may limited muscular strength and power output. Therefore, understanding the relationship between BMI and isotonic muscular exercise is essential for optimizing training protocols, injury prevention strategies, and overall sports person development.

II. Methodology

For the current study, male soccer players were selected as the subjects. A total of Thirty (N=30) district level soccer players were selected in the study. The age of the subjects ranged from 18-21 years. The investigator collected data from various football academies located in Nadia and Kolkata districts.

III. Criterion Measure

Table – 1

Criterion Measures of Selected Variables

Sl. No.	Variables		Tools
1	Isotonic Muscular Endurance	Muscular Endurance of Upper Extremity (Shoulder Muscle)	Pull up
		Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of Muscle)	Half-squat jump
		Muscular Endurance of Abdomen	Bent knee sit-ups
2	Body Mass Index	Body Mass Index	Quetelet Index (Adolphe Quetelet 1830)

IV. Design of the Study

The researcher was adopted single group design for find out Impact of Body Mass Index on Isotonic Muscular Endurance of Soccer Players. Random sampling technique was applied for selection of the subjects for current research.

V. Statistical Procedure

To analysis the obtained data, mean and standard deviation were calculated as descriptive statistics. Furthermore, Pearson's Product Moment Correlation Coefficient was employed to determine the relationship between body mass index on isotonic muscular endurance of soccer players. Prior to the analysis, the raw scores were converted into standard scores to ensure uniformity in measurement. For the purpose of the present study, the level of significance was set at 0.05, which would be deemed reasonable for the study.

VI. Analysis of Data and Findings of the Study

The mean, SD and Correlation of coefficient were calculated from the obtained data on selected variable such as Body Mass Index and Isotonic Muscular Endurance of soccer players are presented and discuss in below through tables.

Table – 2

Descriptive Statistics of Body Mass Index and Muscular Endurance of Upper Extremity (Shoulder Muscle) and correlation of coefficient between the Parameters of soccer players

Variables	Mean	SD	r Ratio
Body Mass Index	21.61	2.46	0.281^{NS}
Muscular Endurance of Upper Extremity (Shoulder muscle)	37.07	4.83	

Significant value at 0.05 level of significance, $r_{0.05}(28) = 0.361^{NS}$ – Not Significant

According to the table no – 2, the descriptive statistics such as mean and standard deviation of the measured variables i.e. body mass index and muscular endurance of upper extremity (Shoulder muscle) were 21.61 ± 2.46 and 37.07 ± 4.83 respectively. The above table also indicates that there was no significant relationship was found between body mass index and muscular endurance of upper extremity (Shoulder muscle) as the value of coefficient of correlation ($r=0.281$) was lower than the table value [$r_{0.05}(28) = 0.361$] at 0.05 level of significance. Along with that the result also indicates no significant relationship was found between body mass index and muscular endurance of upper extremity (Shoulder muscle) of Soccer players.

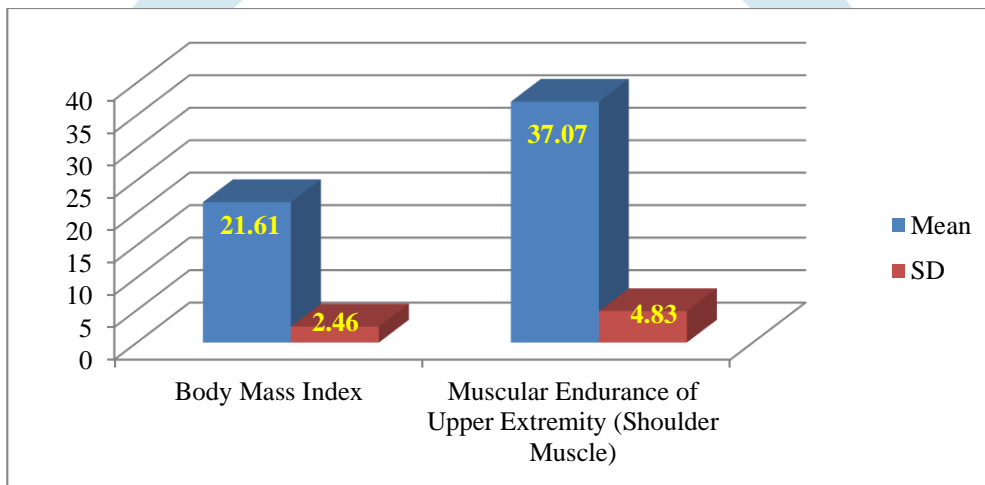


Figure-1: Graphical Representation of Mean and Standard Deviation of Body Mass Index and Muscular Endurance of Upper Extremity (Shoulder Muscle) of soccer players

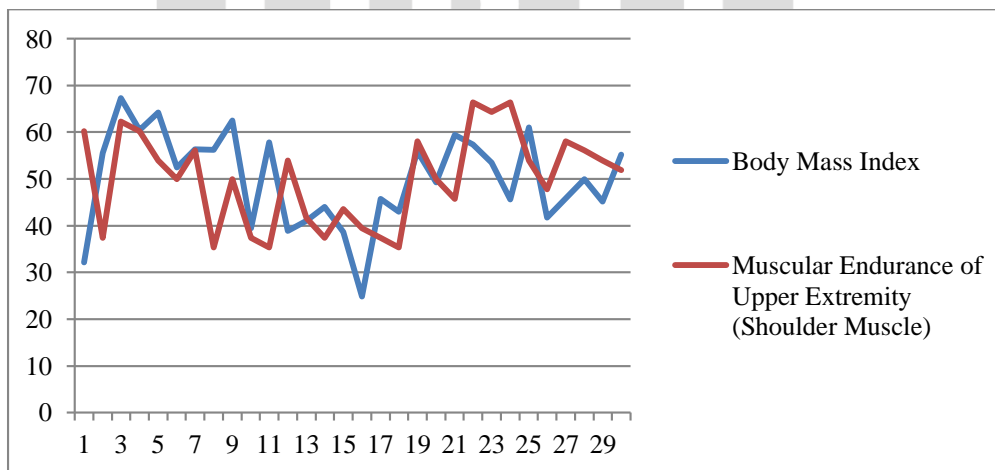


Figure-2: Graphical Representation of Relationship between Body Mass Index and Muscular Endurance of Upper Extremity (Shoulder Muscle) of soccer players

Table – 3

Descriptive Statistics of Body Mass Index and Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of Muscle) and correlation of coefficient between the Parameters of soccer players

Variables	Mean	SD	r Ratio
Body Mass Index	21.61	2.46	-0.081^{NS}
Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle)	45.43	7.97	

Significant value at 0.05 level of significance, $r_{0.05} (28) = 0.361^{NS}$ – Not Significant

The above table no – 3 depicts that the descriptive statistics of Body Mass Index and Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle) as mean and standard deviation of soccer players were 21.61 ± 2.46 and 45.43 ± 7.97 respectively. It also reveals that there was no significant relationship between Body Mass Index and Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle) as the calculated ‘r’ value is -0.081 which was lower than the Table value, $[r_{0.05} (28) = 0.361]$ at 0.05 level of significance. Along with that the result indicates an inverse relation exists between Body Mass Index and Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle).

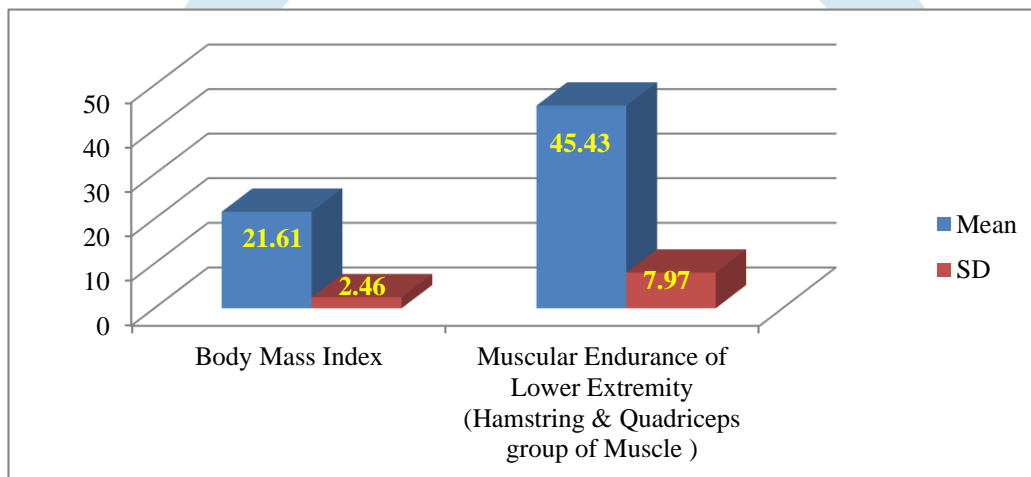


Figure-3: Graphical Representation of Mean and Standard Deviation of Body Mass Index and Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle) of soccer players

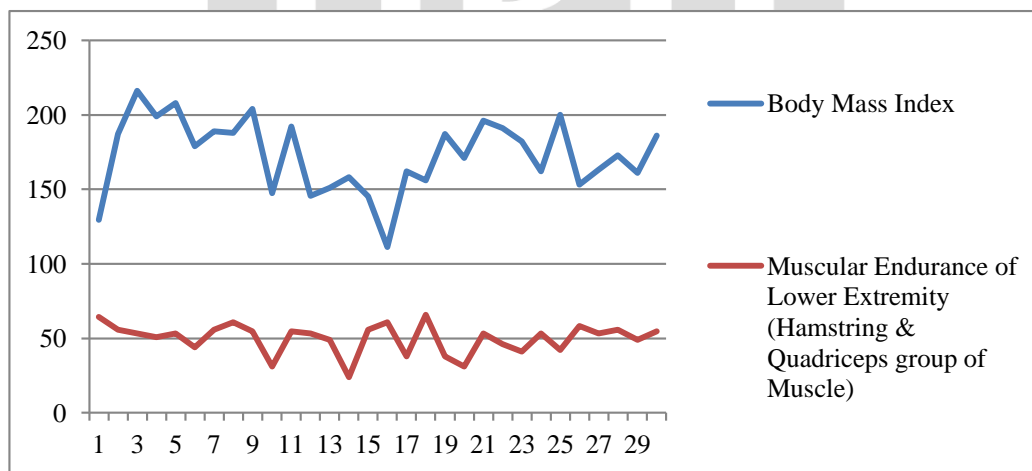


Figure-4: Graphical Representation of Relationship between Body Mass Index and Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle) of soccer players

Table – 4

Descriptive Statistics of Body Mass Index and Muscular Endurance of Abdomen and correlation of coefficient between the Parameters of soccer players

Variables	Mean	SD	r Ratio
Body Mass Index	21.61	2.46	-0.145^{NS}
Muscular Endurance of Abdomen	39.47	5.76	

Significant value at 0.05 level of significance, $r_{0.05} (28) = 0.361^{NS}$ – Not Significant

The above table no – 4 depicts that the descriptive statistics of Body Mass Index and Muscular Endurance of Abdomen as mean and standard deviation of soccer players were 21.61 ± 2.46 and 39.47 ± 5.76 respectively. It also reveals that there was no significant relationship between Body Mass Index and Muscular Endurance of Abdomen as the calculated 'r' value is -0.145 which was lower than the Table value, $[r_{0.05}(28) = 0.361]$ at 0.05 level of significance. Along with that the result indicates an inverse relation exists between Body Mass Index and Muscular Endurance of Abdomen of soccer players.

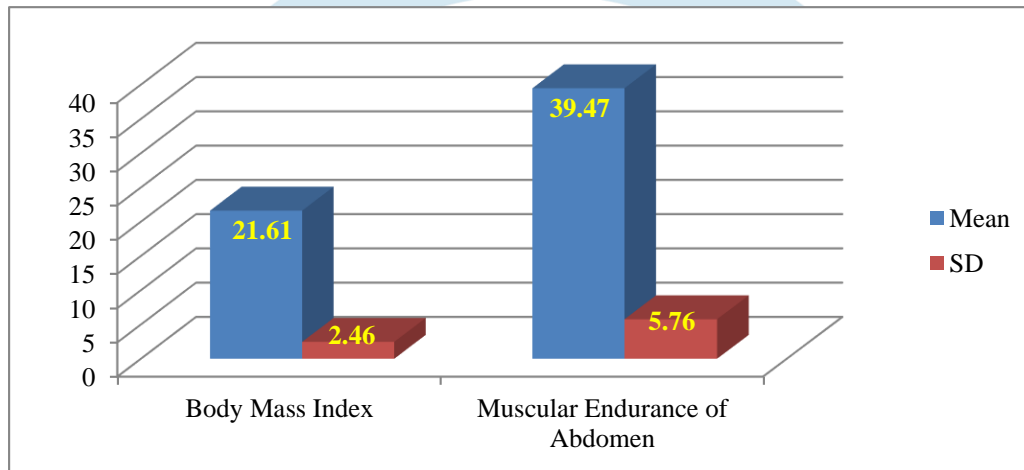


Figure-5: Graphical Representation of Mean and Standard Deviation of Body Mass Index and Muscular Endurance of Abdomen of soccer players

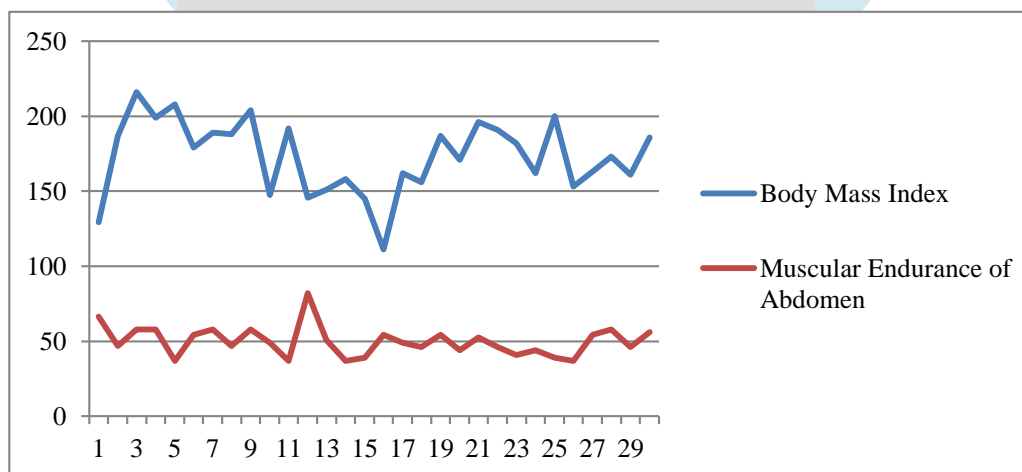


Figure-6: Graphical Representation of Relationship between Body Mass Index and Muscular Endurance of Abdomen of soccer players

VII. Discussion on findings

The researcher was focus to impact of body mass index on isotonic muscular endurance of soccer players. The result findings it was found that there was no significant relationship of body mass index with muscular endurance of upper extremity (Shoulder muscle), and inverse relationship of body mass index with Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle) and Muscular Endurance of Abdomen of soccer players.

The relationship between body mass index and muscular endurance of upper extremity (shoulder muscle) of soccer players is generally characterized as no association, specifically the body mass index levels. Increased body mass index, often representing higher fat mass rather than muscle mass, is associated with

decreased muscular endurance of upper extremity (Shoulder Muscle) of soccer players. Amita Aggarwal et al., (2020) investigated a study and not found between BMI and upper muscular endurance.

Based on research findings, there was inverse relationship between body mass index and muscular endurance of the lower extremities (quadriceps and hamstring group of muscles). While individuals with a higher body mass index may empower greater absolute muscle strength due to the chronic resistance training of carrying more body mass their ability to sustain repeated contractions (endurance) is typically lower.

Higher body mass index is generally associated with lower muscular endurance of abdomen, showing an inverse correlation where increased body fat, particularly around the waist, hinders performance. The study was indicates that individuals with higher body mass index had reduced endurance compared to those with a normal weight, regardless of sex. Feng Sun et al., (2022) was investigated nonlinear negative relationship between BMI and physical fitness with underweight and overweight/obese college freshmen having poorer physical fitness and muscular fitness than their normal BMI peers.

VIII. Conclusions

The following conclusions were impressed by the researcher based on the findings of the present investigation:

- No significant relationship was found between body mass index and muscular endurance of upper extremity (Shoulder muscle) of Soccer players.
- Inverse relationship was found between Body Mass Index and Muscular Endurance of Lower Extremity (Hamstring & Quadriceps group of muscle).
- Inverse relationship was found between Body Mass Index and Muscular Endurance of Abdomen of soccer players.

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