International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Influence of Glucose Tolerance Ability on Anaerobic and Aerobic Capacity of Soccer Players

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ABSTRACT
Vast popularity all over the world in soccer and the urge of the coaches grows the interest of the researchers to investigate the new ways and means that can improve the playing ability of the soccer players. Hence the present study was also an initiative to evaluate that whether glucose tolerance ability has any influential role on aerobic and anaerobic capacity of soccer players or not.
Twenty-five (N=25) state level male soccer players were selected from Bengal Football Academy, Kharda, North 24 Parganas, West Bengal. Age of the subjects was ranged from 15 to 17 years.
Glucose tolerance ability was measured by oral glucose tolerance test (OGTT), Anaerobic capacity was measured by 50-yard dash and Aerobic capacity was determined by Vo2max and that was measured through beep test.
To mark the association of glucose tolerance ability with aerobic and anaerobic capacity of soccer players Pearson's product moment correlation of coefficient was applied.
Glucose tolerance ability was significantly associated with aerobic and anaerobic capacity of soccer players. Based on the above findings a conclusion can be drawn that higher aerobic and anaerobic capacity of soccer players was influenced by higher level of glucose tolerance ability.

Keywords : Glucose tolerance ability, Aerobic capacity Anaerobic capacity

Introduction

Now a day, the advanced training methodology has crossed many milestones as a result of various types of researches in general and their application to the sports development in particular. Sports institutes, coaches, trainers, teachers as well as the government are also looking forward towards improvement and progress in different fields of sports arena. That's why different disciplines of sports and games can explore them to worldwide in a new dimension.
Soccer is not just a game, it's a passion, and it's an emotion to among us. Vast popularity in soccer has become a huge motivation to the players. It is a game that send people from all over the world into frenzy, creates national and international heroes too. As like Pele the great player of Brazil, Diego Maradona of Argentina, Zeco of Brazil and like them lots of there in the list. As a result, there is a constantly increasing demand for more knowledge and better training means to the coach about the

game. Sports scientist, coaches and physical education teachers are charged with the responsibility of training and teaching their players soccer techniques and tactics, to develop teams who perform at the maximum label of effectiveness. Unfortunately, we the Indians still believe in magic formulas for transforming limited trained (technically as well as tactically) players into world class champion. The limitation can only be reached through the implication of new research findings. Since it is related with physical, it is important to find out the qualities with the human being for the interest of the progress of the discipline as different individual process, different qualities and abilities which they response in different way.

The recent year greater stress has been laid on the quality rather than the quantity of training. The sports scientists and experts of sports want their sportsman to extract maximum achievement from their training procedures without causing too much strain on them. This is possible only if coaches and teachers of physical education apply the most economical manner for enhancing the performance of athletes.

With the constant demand for 'high sports performance' the concept of soccer, to date, has been changed. The concept of 'total soccer' applies skill development, tactical development, development of all important motor components and physiological parameters which are closely associated and contributes to perform in soccer.

Modern football requires high levels of endurance, speed, strength and coordination skills. Therefore, players need to have well-developed physical fitness. Considering the fact that energy used by football players is mainly produced by aerobic metabolism, it is important for players to have well-developed aerobic fitness (AF). Specifically, a proper level of AF allows players to maintain repetitive high-intensity actions within a football game, to accelerate the recovery process and to maintain their physical condition at an optimum level during the entire game and season. To evaluate AF, maximal oxygen uptake (VO2max) and anaerobic threshold (AT) measures have commonly been used. Glucose tolerance is a most influencer factor in metabolic process for the sports persons. During aerobic activity as well as anaerobic workout, insulin sensitivity of an individual has an indispensable impact in bodily response to perform better.

This study has been focused on soccer as it is most popular game all over the world. Certain fitness parameters are identified as most influential factors for the improvement and also to retain the performance level in the ground. Those factors depend on a number of physiological parameters. That's why the present study was an initiative to find out that whether glucose tolerance ability has any impact or not on aerobic and anaerobic capacity of soccer players and to explore a new dimension in sports arena.

Methodology

Total twenty five (N=25) male soccer players were selected as subjects for this investigation. The respondents for the present study were selected on the basis of their minimum participation in state level. Age of the subjects was ranged from 15 to 17 years. The researcher selected the soccer players from Bengal Football Academy, Kharda, North 24 Parganas.

Criterion Measures :

Variables	Measuring Tools or Techniques	Measuring Unit
Glucose Tolerance Ability	**Oral glucose tolerance test (OGTT)**	**mg/dl**

Anaerobic Capacity	**50 Yard dash**	**Sec.**
Aerobic Capacity	**Beep test**	**lit/min**

Design of the Study

The researcher was adopted single group design for this study to find out the relationship of glucose tolerance ability with anaerobic capacity and aerobic capacity of soccer players. Purposive sampling technique was applied for selection of the subjects for the present investigation.

Testing Protocol : One day prior of the scheduled date for collection of data, all the selected subjects were been explained in details about the testing procedures. All of them signed in a consent form voluntarily that they would like to be as a subject spontaneously. They were been also clearly instructed about the staying at overnight fasting condition until unless the blood was collected for the test in the next morning at 7:00 am. Their blood was collected and recorded as the fasting glucose level by using glucometer. After that, 75 gm glucose with 250 ml water was orally intake by them. Exact 2 hours later, their glucose levels were checked for another time to measure the post prandial plasma glucose level. The whole procedures were conducted under the guidance of a pathological lab technician. At evening session, 50-yard dash for measuring the anaerobic capacity and beep test for measuring the aerobic capacity were arranged personally by the research scholar with the help of other experts.

Statistical Procedure

Mean and Standard Deviation of the selected variables were calculated as descriptive statistics of the sample group. To find out the relationship of glucose tolerance ability with anaerobic and aerobic capacity, Pearson's product moment correlation of coefficient was applied. Prior the calculations of correlation of coefficient, the scores were converted into standard score. The level of significance was set at 0.05 level which would be deemed reasonable for the study.

Analysis of Data and Interpretation of the Results

Table - 1

Descriptive Statistics of Glucose Tolerance Ability and Aerobic Capacity and Correlation of Coefficient Between the Parameters of Soccer Players

Variables	Mean	Standard Deviation	'r' Ratio
Glucose Tolerance Ability (mg/dl)	**36.72**	**13.97**	
Aerobic Capacity (lit/min)	**53.38**	**3.84**	**-0.735****

Significant value at 0.05 level of significance, $r_{0.05}(23) = 0.396$

****- Significant**

The above table no.-1 depicts that the descriptive statistics of glucose tolerance ability and aerobic capacity as mean and standard deviation of soccer players were 36.72±13.97 and 53.38± 3.84 respectively. It also reveals that there was a significant relationship of glucose tolerance ability with aerobic capacity as the calculated 'r' value is 0.735 which was higher than the Table value [$r_{0.05}(23) = 0.396$] at 0.05 level of significance. For better understanding of the nature of relationship between them we need to clarify the hidden fact. If the value of OGTT is low then it can be said that the glucose tolerance ability is better. From that point of view, we can say that an inverse relation exists between the value of OGTT and glucose tolerance ability. So, we can draw a conclusion that the revealing correlation

which indicated negative significant was actually existed as a positive significant relationship between glucose tolerance ability and aerobic capacity. The strength of relationship was high between them.

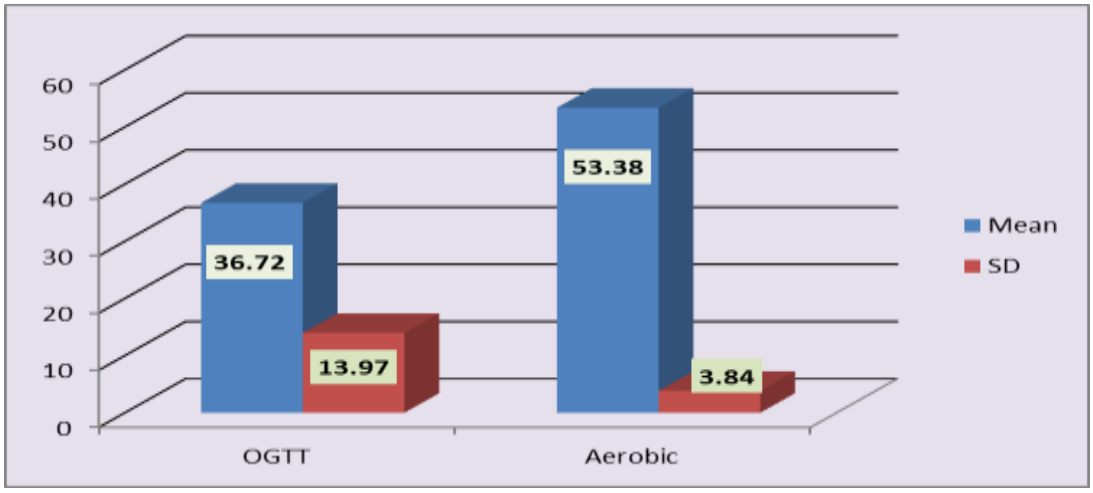

Figure-4: Graphical Representation of Mean and Standard Deviation of Glucose Tolerance Ability and Aerobic Capacity of Soccer Players

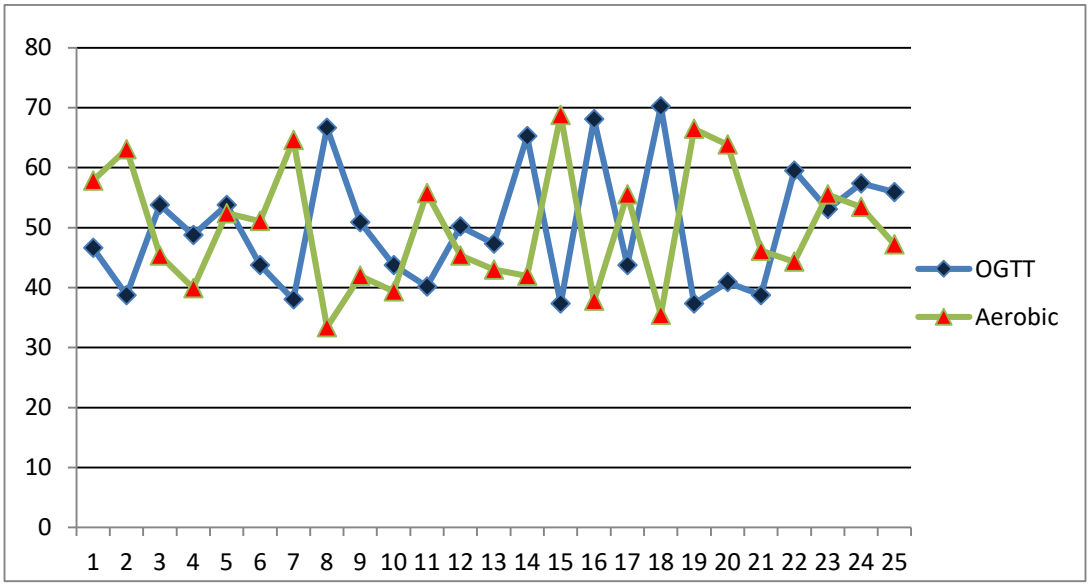

Figure-5: Graphical Representation of Relationship between Glucose Tolerance Ability and Aerobic Capacity of Soccer Players

Table –2

Descriptive Statistics of Glucose Tolerance Ability and Anaerobic Capacity and Correlation of Coefficient Between the Parameters of Soccer Players

Variables	Mean	Standard Deviation	'r' Ratio
Glucose Tolerance Ability (mg/dl)	36.72	13.97	0.633**
Anaerobic Capacity (Sec.)	6.04	0.29	

Significant value at 0.05 level of significance, $r_{0.05}(23) = 0.396$

****- Significant**

According to the table no.-3, the descriptive statistics such as mean and standard deviation of the measured variables i.e., glucose tolerance ability and anaerobic capacity were 36.72±13.97 and 6.04± 0.29 respectively. The above table also indicates that a significant relationship was found between glucose tolerance ability and anaerobic capacity as the value of coefficient of correlation (r=**0.633)** was higher than the Table value [$r_{0.05}(23) = 0.396$] at 0.05 level of significance. Actually, an inverse relation always exists between performance and time in running event. So here the timing of 50 Yard Dash has an inverse relation with anaerobic capacity. On other hand it was already explained that an inverse relation exists between the value of OGTT and glucose tolerance ability. So, it can be concluded that there was a positive significant relationship between glucose tolerance ability and anaerobic capacity. It also reflected that a moderate relationship existed between them.

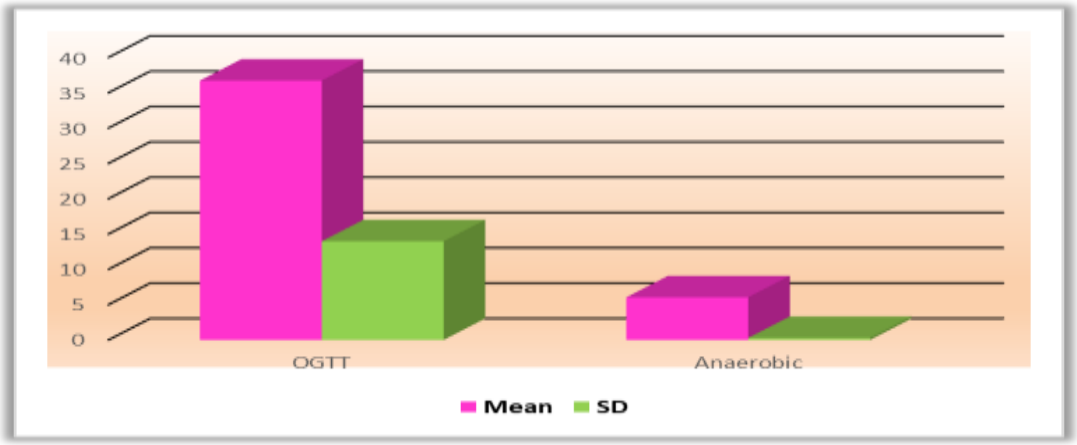

Figure-6: Graphical Representation of Mean and Standard Deviation of Glucose Tolerance Ability and Anaerobic Capacity of Soccer Players

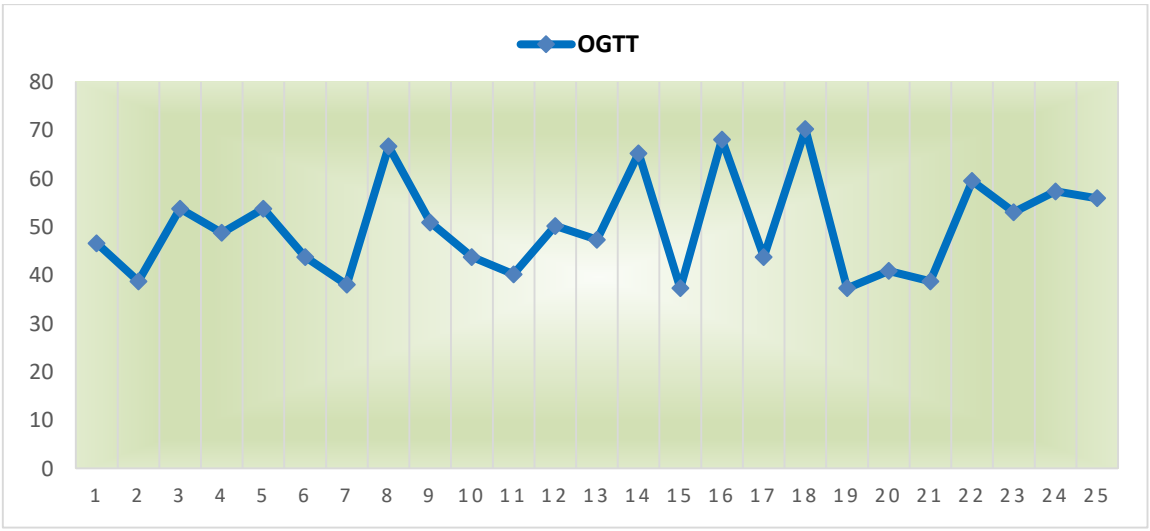

Figure-7: Graphical Representation of Relationship between Glucose Tolerance Ability and Anaerobic Capacity of Soccer Players

Discussion of Findings

The focus of the researcher was to determine about the contribution of glucose tolerance ability which indicates insulin sensitivity on aerobic and anaerobic capacity of soccer players and the data was analyzed in the light of the set objective. The discussion on findings may be attributed as follows.

Fuel is the primary source of any physical exercise and energy system controls the entire function to supply enough fuel to continue the activity. Here insulin plays a major role to transport glucose, the body's primary source of energy from blood to within cells. Many studies provide enough evidence to establish that Exercise enhances skeletal muscle glucose uptake using both insulin-dependent and insulin-independent mechanisms, and regular exercise results in sustained improvements in insulin sensitivity and glucose disposal.

Niakaris et al. (2005) observed in their investigation that there was no significant difference between endurance and sprint runners in terms of insulin sensitivity. Whereas both group of athletes were more insulin-sensitive than the sedentary group. The findings of the present investigation are also on similar direction. The researcher observed a positive significant relationship of glucose tolerance ability with anaerobic and aerobic capacity of soccer players.

This result probably could be that Exercise training has been demonstrated to increases GLUT-4 concentrations in populations with metabolic syndrome and these increases are associated with changes in insulin sensitivity.

Ebeling et al. (1993) examined and found that the mechanisms of insulin sensitivity of athletes are better than the sedentary people. According to the authors, the primary reasons behind their findings were athletes are characterized by enhanced muscle blood flow and glucose uptake. The cellular mechanisms of glucose uptake are increased GLUT-4 protein content, glycogen synthesis activity, and glucose storage as glycogen. A close correlation between glycogen synthesis fractional activity and blood flow suggests that they are causally related in promoting glucose disposal.

Ahn et al. (2011) observed the stronger association between aerobic fitness and insulin resistance. Similar result was also found by Prior et al. (2014) and reported that improvements in insulin sensitivity correlated with following 6 months of aerobic exercise due to increases observed in capillarisation.

While much of the early research into exercise and insulin sensitivity has focused on aerobic exercise, recent exercise interventions using resistance training that can also improve indicators of glycaemic control in a variety of populations.

Eikenberg et al. (2016) found that twice weekly resistance training for 12 weeks improved 2-hour OGTT results in their participants.

Rynders et al. (2014) reported higher intensity exercise to produce greater improvements in insulin sensitivity.

Greater exercise volumes and higher exercise intensities, including high intensity interval training produce greater benefits to insulin sensitivity. Both aerobic and resistance exercise can induce improvements in glycaemic regulation. Exercise could improve glycaemic control via the enhancement of pancreatic beta cell activity, which can become compromised as a consequence of overstimulation and excessive insulin secretion.

Based on the above context it can be suggested that aerobic and anaerobic exercises both were influenced positively by glucose tolerance ability as indicated by OGTT.

Conclusions

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

- Glucose tolerance ability was highly correlated with aerobic capacity of soccer players. Higher aerobic capacity of soccer players was significantly associated with higher level of glucose tolerance

ability.

- Glucose tolerance ability was positively and significantly associated with anaerobic capacity of soccer players. Glucose tolerance ability and anaerobic capacity were moderately correlated.

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