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Influence of Small-Sided Games on Physiological Response in Young Soccer Players

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ABSTRACT

The purpose of this study was to examine, the impact of performed during two different small-sided games. Thirty young soccer players (N=30) age ranged from 17 to 19 years (age: 18 ± 0.9 yrs; body mass: 62.3 ± 15.1 kg; height: 1.65 ± 0.06 m) who must have participated at different format of soccer games in different clubs in few districts of West Bengal participated in the study. Small-sided games included seven-a-side (7 versus 7 players) and nine-a-side (9 versus 9 players) games consisting of 10 bouts of 4 min duration with 3 min active recovery between bouts. Soccer player performance was evaluated using physiological parameter such as V_{O2max} before, in the middle and after the implementation of both game situations. The ANOVA (two-way) analysis indicated that the seven-a-side games displayed significantly higher VO_{2max}, compared with the nine-a-side games ($p < 0.05$). The results of the present study indicated that seven-a-side games provide higher stimulus for physical conditioning and technical improvement than nine-a-side games and their use for training young soccer players is recommended.

Keywords: Soccer, small-sided games, physiological parameter and VO_{2max}.

Introduction

Presently, soccer is on top in all competitive sports, but this game has changed globally in recent times. Motor fitness and coordinative abilities become backbone to develop fundamental skill in soccer. Most definitely believe that in India has abundance of right talent. But it always becomes a question of how talent is identified and nurtured into some of the best in the world. In India we do have to improve a lot and it all start with grassroots where our children start to take up the game. Today, the game has become so advanced and competitive globally that unless our young players are identified and taught the right way from the beginning to develop basic motor abilities which can improve skill performance, it would be impossible for us to make a mark in world football (Bhutia, 2012). According to Frank (1955) Soccer is a game of ball control both individually and in combination with other members of the team. To be able to control soccer ball, a player must master the fundamentals by using any part of his body but his hand and arms should not be used. The fundamentals are kicking, dribbling, trapping, tackling and heading.

Small-sided games are very popular not only in adult soccer players but also in young players and their use begins from an early age. Due to the smaller pitch and the smaller number of participants during small-sided games, each player comes into contact with the ball and deals with common game situations more often (Capranica et al., 2001). These situations require good technical skills such as passing, dribbling and kicking, as well as tactical skills such as running without the ball, unmarking and cooperation with other players.

The assessment and monitoring of a soccer player's current physiological and performance status assume an imperative role for better decision-making during the training process (Drew and Finch, 2016). The relationships between traditional aerobic fitness tests with external and internal training load measures during SSGs, as well as the capacity of SSGs to assess the intermittent aerobic fitness of soccer players (Owen et al., 2020). In an interesting study (Owen et al., 2020) using a 5v5 format, it was found a moderate-to-very large and large-to-very-large associations between external and internal measures, as well as with aerobic performance (in the Yo-Yo Intermittent Recovery test [YYIR], respectively. In that same study, the authors also found low coefficient of variation (CV%) values in external and internal measures, suggesting the potential use of the assessed 5v5 format protocol as an intermittent aerobic fitness assessment tool for soccer players. Furthermore, it seems that YYIR's strongest relationships are with total distance and high-intensity running metrics during soccer matches (Aquino et al., 2020).

Materials and Methods

Participants

Thirty young soccer players (N=30) age ranged from 17 to 19 years (age: 18 ± 0.9 yrs; body mass: 62.3 ± 15.1 kg; height: 1.65 ± 0.06 m) who must have participated at different format of soccer games in different clubs in few districts of West Bengal. A minimum of five years of training experience and no history of injury in the last six months were the main criteria for participating in the study.

Study Design

The purposive sampling technique was used to select the required sample. The subjects were randomly assigned to three groups. Group 1 (n = 10) performed only the three-a-side game situation. Group 2 (n = 10) performed only the six-a-side game situation while Group 3 (n = 10) served as controls. Testing of each group was performed on separate occasions. Field tests were performed in a random order before (pre) the games, in the middle (after the 5th bout) and after (post) the games. The control group performed only the field tests without a game intervention.

Each game had an overall duration of 80 min and it consisted of 10 bouts of 4 min duration with 3 min active recovery between exercise bouts. The recovery between the 5th and the 6th bout was 16 min. The mean heart rate collected throughout the ten bouts of small-sided games was calculated to provide an indication of the intensity of the small-sided games.

Measures

Physiological response of participants was measured with VO_{2max} test using the Yo-Yo test is a maximal aerobic endurance fitness test, involving running between markers placed 20 meters apart, at increasing speeds, until exhaustion. The test was developed in the 1990s by the Danish soccer physiologist Jens Bangsbo and his colleagues, and is now one of the most commonly conducted fitness test around the world.

Statistical Analysis

To compare the selected Physiological variables and coordinative abilities a two-way mixed-model ANOVA design (Time x Group) was applied to examine the differences in each field test score between the three groups of subjects (five-a-side group, seven-a-side group, controls) performed before, in the middle and after each small sided game. When required, comparisons of group means were performed using a hoc test (Least Significance Test). The significance level was set at 0.05 ($p < 0.05$). Lastly, all statistical analyses were computed on MS Windows software (Version: 11).

Outcome and result tables

Table: 1 Two-Way Analysis of Variance Mixed-Model Design (Time X Group) of Different Format of Soccer and through the Time on Vo_{2max}

Source of Variation	SS	df	MS	F	P-value	F crit
Sample	*516.06*	*2.00*	*258.03*	**8.96*	*0.00*	*3.09*
Columns	*8.91*	*2.00*	*4.45*	*0.15*	*0.86*	*3.09*
Interaction	*2.04*	*4.00*	*0.51*	*0.02*	*1.00*	*2.46*
Within	*2850.70*	*99.00*	*28.79*			
Total	*3377.70*	*107.00*				

The findings however disclose that the interaction and columns effect is not significant on VO_{2max}, since the obtained *P* value is greater than the significant value of 0.05. Since sample effect is significant on VO_{2max}, since the obtained *P* value is less than the significant value of 0.05.

It indicates that there is a significant difference exits among the means of different format of soccer playing on VO_{2max}. To find out which of the three paired means had a significant difference, the LSD post-hoc test was applied and the results are presented in Table 2.

Table:2 LSD Test for the Differences Between the Paired Means of Different Format of Soccer on Vo_{2max}

Mean values			Mean Differences	Confidential Interval
Seven-a-Side	Nine-a-Side	Control		
40.93	35.97		*4.96	2.50
40.93		36.70	*4.23	
	35.97	36.70	0.73	

The result of the study indicated that there is significant difference exists between the seven-a-side and nine-a-side and seven-a-side and control group on VO_{2max}. However, the mean value of seven-a-side was found to be higher than nine-a-side and control group on VO_{2max}.

Discussion

In the present study SSG displayed no changes in the VO_{2max}, on pre during and post games of soccer players. The VO_{2max} level of the seven-a-side players were to the optimal level and statistically higher was to elicited. Studies proved that VO_{2max} is the strong predictor for physical performance, players with optimal fat and lean body mass are closely linked with maximal oxygen uptake and muscle strength (Hogstrom, Pietila, Nordstrom, & Nordstrom, 2012). The greater number high-intensity running bouts per minute of play observed during SSGs of the present study than during match-play. Due to high-intensity running being performed during the SSGs, the anaerobic energy turnover would be expected to contribute more to the muscle metabolism in SSGs as compared to match-play.

Earlier studies had proved that high intensity endurance training significantly reduce the percent body fat level (Coker et al. 2009; Janssen 2001; Ballor et al. 1990; Slentz et al. 2004, 2005). However, VO_{2max} in the SSGs may well be explained by the fact that the high-intensity running bouts were shorter in duration in the SSGs causing a higher reliance on ATP and CP breakdown rather than anaerobic glycolysis. Furthermore, resynthesis of PCr, reloading of oxygen in myoglobin and haemoglobin during the 3 min-periods of passive recovery (Christmass, Dawson, & Arthur, 1999; Dupont, Blondel, & Berthoin, 2003).

In contrast, Schwartz and his colleagues (1991) proved that young men failed to show changes due to endurance training, but slight changes in elder men. Similarly, Chittibabu (2014) showed high intensity interval training enhanced VO_{2max} but no changes in body composition of handball players, these two results are in line with the present finding. The frequency, duration and training load adapted in the present study was not sufficient enough to bring desirable changes in body composition. Other than this age and morphological characteristics of the players play a vital role in handball players, these players were found to be low when compared to elite level. All these physiological responses provided some interesting elements but it is important to link these physiological results with time–motion characteristics and technical activity.

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