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The Comparison of Aerobic Fitness and Anaerobic Power of Iranian Soccer Players in Different Playing Positions during Competitions Season

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ABSTRACT

The purpose of this study was to compare anaerobic power and aerobic fitness profiles of Iranian soccer players in different playing positions during competitions season. This was a quasi-experimental research with three experimental groups. In this research 24 players of Pasargad soccer team; defenders (N=8), middles (N=8) and Attackers (N=8) were selected randomly as statistical sample. Using Astrand Treadmill Test and Running-based Anaerobic Sprint Test (RAST), aerobic fitness and anaerobic power were measured in the initial competitions season and after the 15th match during competitions season. Finally, using paired sample T Test (t-student) and ANOVA data were analyzed. Middle and attacker players showed a significant increase in aerobic fitness or VO_2max ($p<0.05$). Furthermore, defender and attackers showed a significant increase in anaerobic power during competitions season ($p<0.05$). Based on the results of conducted research, anaerobic power and aerobic fitness profiles in soccer players changed during competitions season.

Key Words: Aerobic Fitness, Anaerobic Power, Iranian Soccer Players.

INTRODUCTION

Football is the most favorite sport in the world. Its popularity is to such extent that millions of interested people play football at different levels. So there is football league in most of the countries and many players are engaged in it. Since one full football season usually lasts 11 months, the training exercises should be designed in a way to enable players to meet physiological demands of play. In modern football in which competition season continues for seven or eight months, the main objective is to maintain fitness throughout the competition season [20]. Conditioning and preparing a team to enter the playing field requires different factors [17]. In this situation, the activation of both energy systems, the aerobic and the anaerobic, is needed to fulfill the muscle energy demands during the game. It is also suggested that energy demands and physiological characteristics are related to the field position of the player [1]. Rily & et.al and Bangbow showed that player's fitness is maintained during competition season, while Helper & et al suggested that optimal fitness may not be remained during the whole season. However when it is spoken about a sport team, the accuracy of these results may be influenced, because in addition to individual difference and various adaptation responds, the amount of work and physiological pressure of players differ from one post to another one [2,10,20].

Lately, elite athletes have been seeking the latest scientific evidence in sport and exercise physiology in order to persistently develop and apply innovative effective training [23]. Researches show that players in different posts (goal keeper, defender, half back and attacker) have specific needs [9,20].The events of competition season can probably cause remarkable changes on physical and physiological fitness of players in different posts in long period.

Most of cross-sectional researches concerning aerobic fitness and anaerobic power of players showed differences in various positions. So as goal keepers have the most fat percentage, middle players have the best aerobic fitness and defenders and attackers have the most anaerobic power [6,15,24]. On contrary, some studies have not reported significant difference[4,11].In other word, some researchers have shown that players′ fitness remain the same during competition season, whilst some other studies suggest that optimal fitness may not maintain during the whole season [22,10].In a research by Casajus on 15 professional players in a Spanish sport club, it was found that average values of vo_{2max} and vertical jump of players remained fix during season[5].

Since the influence of playing post on fitness indices has not been studied directly in most of researches, this research, observing changes in aerobic power and anaerobic power in different positions during match season, efforts to specify players of which posts lose their fitness during match season and players of which posts maintain or improve their fitness level during mentioned period. As a result, determining the changes of aerobic and anaerobic fitness in various posts during competition season can contribute to assessment of training before and during season and evaluation of team gains during competition season. With respect to fitness level of players and also determining the effect of post roles on aerobic fitness, and anaerobic power during the season the requirements for improving qualitative design and planning exercise during competition season can be provided.

MATERIALS AND METHODS

The method of this research was quasi-experimental with three groups and pretest and post test.

Participants

In this study 24 players (8 defenders with age mean of 25.25 years and playing past record of 9.5 years, 8 middle players with age mean of 26 years and playing post record of 9 years and 8 attackers with age mean of 25.38 years and playing post record of 8.6 years) from Passargad soccer team attending in Iran football league were selected by use of accessible sampling. According to the health questionnaire all the subjects were healthy and did not have any cardiovascular, pulmonary diseases and skeletal and physical deformities.

Measurement Tools

Astrand tread mill test[1] arranged on Technogym treadmill for measurement of aerobic fitness. In this test at first subjects performed warm up stage for 8 minutes with velocity of 5 KMs and after that they continued running with fixed velocity of 8.05 KM so as every 2 minutes inclination of thread mill increased by 2.5%. When the subject exhausted the test ended. Hearth rate was measured with Sunto[2] (short wave) set and at the end $vo_{2\ max}$ was calculated in ML /KG. Mints-1[2]. Running based anaerobic sprint test (RAST[3]) was used for measuring anaerobic power. In this test every player ran a 35 meters distance with maximum velocity 6 times. Between every set there was a 10 - second rest. The time was recorded in second and hundredth of second and power was estimated using [power = weight · (distance) / (time)] formula [2]. In RAST test four components i.e. minimal, maximal and average power and fatigue index are measured. So highest and lowest velocity relates to maximum and minimum power. In this research average power was measured according to Watt per k.g. as a criteria for anaerobic power. Before conducting test players did warm up and stretch exercise for 10 minutes prior to test in order to participate with more readiness in test.

Data Analysis

Data were analyzed using SPSS. After making sure about natural distribution of data by use of kolmogrov – Smirnov test, for comparison of within and between group changes paired sample T-test and one way ANOVA and post hoc LSD test were applied respectively and hypotheses were tested at significant level ($P<0.05$).

RESULTS

Table 1 shows that during the competitions mean of aerobic fitness of defenders decreased significantly and that of middle players and attackers increased significantly ($P<0.05$). Anaerobic power mean of defenders and attackers also had a significant increase ($P<0.05$).

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[1]. Astrand Treadmill Test
[2]. Suunto
3. Running-based Anaerobic Sprint Test (RAST)

Table 1- Statistical description and within group changes of aerobic fitness and anaerobic power of players in different positions

Variable(s)	Groups	Pre test	Post test	Within group change	
		Mean ± S.D	Mean ± S.D	t	P- Value
Aerobic Fitness (ml/kg/min)	Defenders	49.0±3.38	46.12±2.90	3.286	**0.013***
	Middles	49.50±1.60	51.12±0.99	-3.870	**0.006***
	Attackers	49.25±1.38	51.12±1.72	-8.275	**0.001***
Anaerobic power (w/kg/m)	Defenders	810.7±83.4	827.2±85.2	-8.682	**0.001***
	Middles	780.0±82.6	780.0±81.8	0.027	**0.979**
	Attackers	760.8±87.3	765.5±87.2	-7.697	**0.001***

**Significant at 0.05 level*

Table 2 - statistical description and between group changes of aerobic fitness and anaerobic power of players in different positions

Variable(s)	Groups	Pre test	Post test	Between group change	
		Mean ± S.D	**Mean ± S.D**	**F-Value**	**P- Value**
Aerobic Fitness (ml/kg/min)	Defenders	49.0±3.38	46.12±2.90	21.582	**0.001***
	Middles	49.50±1.60	51.12±0.99		
	Attackers	49.25±1.38	51.12±1.72		
Anaerobic power (w/kg/m)	Defenders	810.7±83.4	827.2±85.2	49.94	**0.001***
	Middles	780.0±82.6	780.0±81.8		
	Attackers	760.8±87.3	765.5±87.2		

**Significant at .05 level*

Table 3 - results of post hoc test for aerobic fitness and anaerobic power of subjects during competition season

Dependent Variable(s)	Paired groups		Mean difference	SD of Error	P- Value
Aerobic Fitness (ml/kg/min)	Defenders	Middles	-4.5	0.813	**0.001***
	Defenders	Attackers	-4.75	0.813	**0.001***
	Middles	Attackers	-0.25	0.813	**0.761**
Anaerobic power (w/kg/m)	Defenders	Middles	16.818	1.737	**0.001***
	Defenders	Attackers	12.14	1.737	**0.001***
	Middles	Attackers	-4.678	1.737	**0.14**

** Significant at .05 level*

Table 2 & 3 indicate that between group changes of aerobic fitness was significant during matches (P<0.05). The origin of these changes was significant difference between mean of aerobic fitness of defenders and middle players and attackers [Figure1].

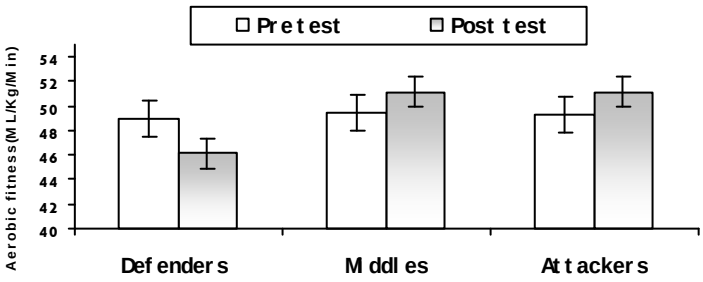

Figure 1- Mean differences of players' aerobic fitness in different posts during competition season

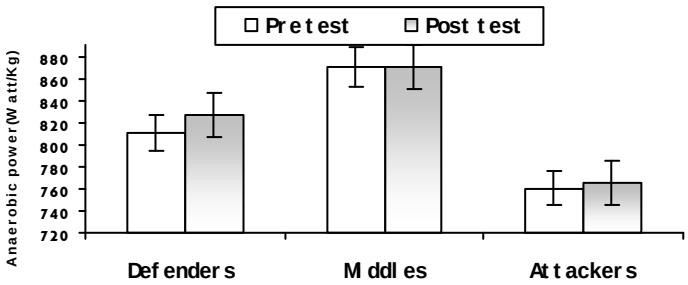

Figure2. Mean differences of players' anaerobic power in different posts during competition season

Also the results suggest that between group changes of anaerobic power were significant during matches. According to post hoc test these changes were resulted from significant difference between anaerobic power of defenders and middle players and attacker [Figure2].

DISCUSSION AND CONCLUSION

Soccer players need a high level of fitness in order to use their own technical skills. Therefore observation of players' fitness changes in different positions during competition season is of high importance.

While some researches emphasize on increase of players Vo_{2max} during season [3, 7] Casajus (2001), Edwards & et.al (2003) and Silvester & et.al (2006) have shown that players' Vo_{2max} regardless of their posts, is constant during competition season [5,8,19]. The measured amount of Vo_{2max} in this research for defenders, middle players and attackers was 46.12, 51.12, 51.12 ml/kg.mints in post test. The result of present study indicated that defenders' Vo_{2max} has decreased by 2.88 ml/kg.mints respectively in post test in comparison to pretest. Since different researches have shown that defenders tolerate less physiologic pressure during match as a result of less running and less average heart rate (155 beats per minute as compared with 170 beats per minute for middle players and 171 beats per minute for attackers) and regarding the fact that in this research training intensity for all players was identical during training season prior to match, probably decrease of defenders' Vo_{2max} can be assigned to less physiologic pressure during match. The claim was proved with respect to defenders' Vo_{2max} as compared with that of other posts. Furthermore, in the present study a significant increase in middle players' and attackers' Vo_{2max} was observed during the match season that is in accordance with results of Metex & et. al (2006) [12]. Romus & et al. (1999), Rudrigviz & et al (1994) observed an increase in players' Vo_{2max} [14, 16]. In general middle players have the highest amount of Vo_{2max} (53 ml/kg.mins) . Side defenders, central attackers and goal keepers have the later places respectively in this regard. With respect to the connecting role of middle players between defenders and attackers which leads to more physiologic pressure and more work amount (distance) and consequently more running with respect to higher level of Vo_{2max} during match as compared with other posts [20,13,16,18] and there is a correlation between the covered distance and Vo_{2max}, this relation justifies the large amount of work done by middle players. The result of present study concerning anaerobic changes in players of different posts indicated that participation in match season brings about a significant increase in anaerobic power of defenders and attackers and no changes in anaerobic power of middle players. Anaerobic power in this research for defenders, middle players and attackers was respectively 827.25 - 870.01 and 765.55. These amounts are in accord with result of some other researches which have studied these changes regardless of Posts. The probable reason for increase of defenders and attackers anaerobic power in this research may be related to their post and also direct approach of play.

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