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A COMPARATIVE STUDY: DIFFERENCES BETWEEN EARLY ADOLESCENT MALE INDOOR TEAM SPORTS PLAYERS' POWER, AGILITY AND SPRINT CHARACTERISTICS

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Abstract

Objective: There has been lack of information on a comparative study of the early adolescent male (mean age= 13) indoor team sport players with special reference to power, agility and sprint (PAS) values. Hence, the purpose of this study was to compare the differences between PAS values of handball, basketball and volleyball players who are the champions in their province at school leagues.

Design and Settings: Over two separate consecutive days in a week which following the completion of match sessions, a test battery including counter movement jump for power, zig-zag run for agility and 20 m sprint run was used to obtain information concerning of the values of early adolescent male handball (n=12), basketball (n=11) and volleyball (n=11) players. ANOVA was used to determine differences between values of team players.

Results: There was no difference between the values of agility. However, there were significant differences between the team sport players for anaerobic power and sprint values. The volleyball players had higher power values as compared with the basketball and handball players ($p<0.05$), but there was no difference between the handball and basketball teams. Although the basketball and volleyball players had similar sprint values, the basketball players were faster than the handball players ($p<0.05$).

Conclusion: The comparative study showed that in spite of negligible little differences in agility abilities, there were significant differences between team players' anaerobic power and sprint values which important criterions of performance at team sports. We concluded that these differences between adolescence male indoor team sports players could be changeable in terms of the variables of selection criterion, training and match intensity. Hence, there is a need for more studies on this subject.

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Introduction

Basketball, handball and volleyball are complex intermittent team sport which is including similar motor characteristics that performed a lot of multidirectional movements such as, jumping, sprinting and shuffling at high or maximal velocities and intensities during the game.

These movements depend on most players' agility, speed and power abilities or characteristics that are considered as important aspects of the game and contribute to the high performance of the players (S.E. McInnes, 1995, M.T. Woolstenhulme et al., 2006). Successful performance is dependent upon several fitness components.

Speed, agility, and vertical jump height are important physical characteristics of game performance that are anaerobic in nature and also are predominantly under prevailing influence of genetic factors.

Growth would appear to contribute significantly to enhanced motor performance with age (P. Bale et al 1992). Anaerobic power of male develops from 12 to 17 ages during adolescence, with an increased rate of improvement at the onset of puberty (K. Pearson, et al, 2006).

Explosive power or jumping ability, sprint speed and agility improve to a great extend during adolescence, with the highest rate of increase at the age of 14 and 16 (R. Malina, 2004).

Explosive power is the main determinant of performance in sport activities requiring one movement sequence to produce high velocity at release including jumping, throwing and striking activities.

These activities are frequently occurs during such as rebounding, jump shot, spiking and blocking actions in basketball, handball and volleyball games (T.J. Gabbett, 2008, B. Abdelkerim, 2007, M.B. Wallace and M. Cardinale, 1997).

In addition, sudden bursts of power are needed when rapidly changing direction during those sports activities (R.U. Newton, W.J. Kraemer, 1994).

In basketball, handball and volleyball, athletes are required to accelerate, decelerate and change direction throughout the game.

Often these movements are applied to respond the movements of a ball or the actions of opposition players during such as the shadowing, screening, blocking events (K. Hakkinen, 1993). Highly change of direction or agility action may be much more related with player's sprint ability and explosive power (J.D. Vescovi, 2008).

Power, agility and sprint abilities of athletes may vary according to different sport disciplines because of their specific characteristics. The authors consider to it is generally necessary to determine power, agility and sprint profiles of athletes for a selection criteria and to evaluate whether players in different sport disciplines have different motor characteristics.

However, it has not been found yet a comparative study on power, agility and sprint profiles of basketball, handball and volleyball, especially early adolescent male players.

Therefore, in this study, we aimed to determine and early adolescent basketball, handball and volleyball athletes' power, agility and sprint abilities and to evaluate by making a comparison whether possible differences between athletes who are the champions in their province at school leagues.

And we especially focused on early adolescent ages with probabilities these athletes would represent to profile of an elite player and they would form the composition of top class teams in the future.

Method

Participants

Thirty three early adolescent male (handball, n=12), (basketball, n=11) (volleyball, n=11) athletes voluntarily participated in the study. Informed written consent was obtained from the all athletes and their parents.

Tests were carried out that in respect of ethic rules under the control supervision of a medical practitioner.

Procedures

Participants were requested whether they had prior experience with the tests used. Therefore testing protocol was separately explained to the participants who most hadn't been previously tested on several occasions. Power, agility and sprint measurements were obtained over three separate consecutive days following the completion of season.

Measurement

Demographic Characteristics: Body mass was obtained to the nearest 0.1 kg using a balance beam scale whereas height was measured using a stadiometer to the nearest 0.5 cm

Explosive Power: Vertical-jump height was assessed using the Vertec (Young, 1997). Participants performed three trials with a 60-s rest period between each jumping activity and the best jump was used in the analysis to determine the explosive power (D.L. Johnson and J. Bahamonde, 1996).

Agility: The test zig-zag runs over 24 m to assess agility and speed running assessed using an infrared timing device in an indoor court (B. Mackenzie, 2005).

Sprint Ability: Sprint speed was assessed using an infrared timing device in an indoor court. Three 20 m maximal sprint was run with a 90-s rest period between each sprint and the best of them were used to evaluate.

Statistical Analysis

Means and standard deviations were calculated for each variable. Differences between teams were analyzed using ANOVA and significance was set at $p<0.05$.

Results

The results of age, body height and mass showed that there is homogeneity between groups (Table 1).

Table 1: Demographic Characteristics of Players

	Handball (n=12)	Basketball (n=11)	Volleyball n=11)	F	Significant
Age (year)	13.08±0.7	12.9±0.9	13±0.8	.124	.884
Body Height (cm)	155.5±11	157.3±10	157±10	.091	.913
Body Mass (kg)	46.4±5	45.3±4	48.09±9	.501	.611

There were no statistical differences between the team athletes' age, body height and mass.

Power agility and sprint scores of athletes were depicted in Table 2.

Table 2: Power, Agility and Sprint Mean Values of Players

Variable	Handball (n=12) mean±SD	Basketball (n=11) mean±SD	Volleyball (n=11) mean±SD	F	Significant
Explosive Power (W)	913.7±227	853.3±183	1280.4±311	9,780	0.001
Sprint (s)	3.92±0.2	4.34±0.2	4.11±0.3	6,135	0.006
Agility (s)	7.59±0.4	7.69±0.5	7.46±0.4	634	0.537

ANOVA indicated that there were significantly difference between the teams for explosive power and sprint values ($p<0.05$), but it was not agility. Post Hoc comparison showed that having determined which test scores were responsive for difference (Table 3).

Table 3: Mean Differences between Values of Players

	Mean Difference			Significant		
Variable	H-B	H-V	B-V	H-B	H-V	B-V
Explosive Power (W)	-60.36	-366.6	-427	.828	.003	.001
Sprint (s)	-0.41	-0.19	0.22	.004	.173	.253
Agility (s)	-0.09	0.13	0.22	.884	.782	.509

H=Handball, B=Basketball, V=Volleyball

The volleyball players' power value was higher than the basketball and handball ($p<0.05$), but there was no difference statistically between the basketball and handball.

However, difference between the basketball and handball players' sprint scores was important that the handball player had the best score.

Discussion

In volleyball, handball and basketball athletes perform intermittent exercise that aerobic metabolism contributes to sport games during both exercise and recovery phases, whereas anaerobic metabolism provides energy during the exercise bout (J. Bangsbo, 2000).

Power, agility and speed actions are named as anaerobic activities.

Hence these actions are considered to be an important part of performance in the indoor team sports for success (N. BenAbdelkerim, 2007, T.J. Gabbett, 2008, M.B. Wallace and M. Cardinale, 1997).

Power, agility and speed values may differ between the teams according to training intensity, selection criteria, especially sport specific characteristics.

Present study indicated that there were significantly differences between the teams' explosive power and sprint values.

Especially, the volleyball players' explosive power values were significantly higher than the basketball and handball players.

It is possible to explain that lower limb activities (jumping) required explosive power may covers to a large part of the game during a volleyball match compared with basketball and handball.

Whereas recent researches provided evidence that average number of jumps per player was 45 for volleyball (M.D. Tillman, 2004) and 44 for basketball. (N. Ben Abdelkerim, 2007).

Although no was information on number of jumping activities during handball games, E.M. Gorositaga et al. (2005) reported that handball players' muscle power output of the lower extremities at all loads examined remained unaltered during the whole season.

Y. Nakamura at al. (1986) and J.Z. Popadic Gacesa et al. (2009) reported that anaerobic powers of male volleyball players were higher than basketball and handball. In contrast, M. Kalinski et al (2002) reported that national basketball players attained the largest absolute power values when compared national volleyball players.

This situation may be explained the training or match intensity may vary between team sports.

In addition, the discrepancy with making comparisons of explosive power data from various studies may be related to the methods of testing employed and different testing protocols.

Sprint activities are frequently performed by players during fast break and change of direction speed actions in both basketball and handball matches (N. Ben Abdelkerim, 2007, D. Ohnjec, 2003). This movement requires short-term sprint activities. We hypothesized that the basketball and handball players' sprint and agility abilities might improve during season and might better than the volleyball players.

Present study showed that the handball players' sprint ability was better than the basketball, but there was no statistical difference between the handball and volleyball.

In addition, it was no statistical differences observed between the team sports on the agility performance.

Sprint ability and agility are more based on genetic factors, although there is always a training potential to be considered (E.Van Praagh, 2002).

It was possible that differences of sprint values related to the players' genetic characteristics. In a previous study was reported that there was significant correlation between sprint speed and agility, and sprint speed could transferred to change of direction speed (K. Pauole et al, 2000).

It could be explained that although there was difference between the basketball and handball for sprint values, the basketball players had a limited capacity to transfer from their sprint speed to agility.

Conclusion

The results of this research suggest that each sport is characterized by athletes with particular physical and bio-motor attributes favoring performance in their given sport. Compared with adult athletes, who have already reached a high standard of performance, adolescents involved in many sports are still in the developmental phase.

Because of the relative young age of the athletes in this study, their profiles couldn't exactly reflect to characteristics of their particular sport.

Also, selection criteria and intensive training effects might have been responsible for most of the differences among sports.

The coaches consider it is generally necessary to determine power, agility and sprint speed profiles of athletes for the sake of selection of athletes for a particular sport or discipline and evaluation of training process.

These results may be useful information which contributes to selection criteria of indoor team sports coaches, although there is need to further study in this area.

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