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Talent Identification Indicators in Sepaktakraw Male Elite Players on the Bases of Some Biomechanical Parameters

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Abstract: Talent identification indicators on the bases of some biomechanical parameters in sepaktakraw male elite players were identified in this study. Thirty Iranian male elite sepaktakraw players were divided into three game position categories of server, feeder and spiker, with mean age (21.43±3.8), height (179.13 cm ±5.34) and weight (68.48 kg ±6.38). To determine Talent identification indicators, the biomechanical parameters were measured. An ANOVA was used to compare differences between three playing positions: feeder, server and spiker. A Tukey post-hoc test was used to locate difference. Level of significant was $P < 0.05$ for all analyses. The results showed significant differences in the hip range of motion in 3 directions include flexion, abduction and adduction between the servers with the others (spikers and feeders) and also the spikers with the feeders. No significant differences were found among all groups in the hip extension. Result of the study showed the significant differences in vertical jump of spikers with the others but no significant differences were found in the vertical jump of feeders with servers. No significant differences were found in the reaction time, speed and acceleration time of subjects. The results of this study showed that the differences between the participants may cause by the different roles and duties while playing and different training methods which specified for each position.

Key words: Sepaktakraw · Biomechanical parameters · Feeder · Server · Spiker

INTRODUCTION

Talent identification (TI) is a complex task. Now a day, researchers of many countries are trying to discover the most effective and most efficient TI method. Many East European countries between the 1960s and 1970s started to improve their traditional TI programs and attempted to develop methods of talent identification which supported by scientific theory and evidence. [1] Sepaktakraw had been included in the Asian Games since 1990 in Beijing, [2] and recently developed among the world like middle-east, Europe and America. Sepaktakraw is a complex net-barrier sport that players are allowed to use all part of their body except hands or arms to kick the ball. In sepaktakraw a team consists of three players with a different role: feeder, server and spiker. As in sport such as volleyball, badminton, squash and tennis, the intensity of the game is intermittent, depending on the length of the rallies following a serve. [3] Despite extensive research on talent identification in other sports, there is inadequate research about talent identification in sepaktakraw. With considering the importance of talent identification and its benefits, the purpose of this study was determining talent identification index in sepaktakraw on the bases of biomechanical parameters between sepaktakraw male elite players in three different positions of the game.

MATERIALS AND METHODS

Subjects: Thirty male, sepaktakraw players from the Iranian national team, were divided into three game positions categories of server, feeder and spiker, with at least 5 years of international competition playing experience and mean age (21.43±3.8), height (179.13 cm ±5.34) and weight (68.48 kg ±6.38) participated in this study. The research protocol was approved by the Research and Talent identification committee of Iran

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sepaktakraw association and informed consent were obtained from all subjects.

Biomechanical Parameters Measurements: Biomechanical parameters studied in this research, include: reaction time, hip range of motion, lower extremity power, agility, acceleration and speed. Questionnaires were used to collect general information from participants. Before each test, subjects were given prior familiarization with the test procedures and 5 minutes warm-up. The following biomechanical parameters and instruments were used in this study:

Speed and Acceleration: 10 and 40 meters running test were used to measure acceleration and sprint of subjects, respectively. They were asked to stand in their position behind the start line and start to run at a maximum speed with command 'GO'. 10 and 40 meters test performed one time with 1 minute rest between each test, respectively. The reliability of the 10 meter and 40 meter tests have been reported (r = 0.86) and (r = 0.98) by Baker *et al.* [4] for the 10-m and 40-m sprints, respectively). The times of the subjects were recorded by the stopwatch (JOEREX ST4610-2) and the score of speed and acceleration were calculated by the following formulas:

(Acceleration (A) = 2x (distance) / t ^ 2 (time)
speed (v) = x (distance) / t (time)

Where "x" is distance that participants must run and "t" is the total running time.

Reaction Time: Reaction times of subjects were evaluated by reaction time ruler test. The subjects were tested on stand position and the assessor holds the ruler vertically in the air between the subject's thumb and index finger avoiding touching the ruler. When the subject declared his readiness, ruler was released without assessor warning then the subject must catch it immediately as ruler start to fall. An average of 10 attempts was recorded in meters the distance the ruler fell. Reaction time was calculated by the following formula:

Reaction time (t) = √ (2d (average of ruler moving out of 10 attempts) / g(gravity)

Where "d" is distance that participants can catch and "g" is the earth gravity (9.8 $^{m.s^{-2}}$)

Range of Motion: Lafayette Goniometer (made in USA, with a sensitivity of 1 degree), were used to measure the hip range of motion in 4 directions including: hip flexion, hip extension, hip abduction and hip adduction. Subjects were asked to lie in supine position with hips and knees in neutral rotation. Reliability of the "Lafayette Goniometer" was reported r=0.952 by ockendon *et al.* [5]. In order to avoid any mistake by the assessor, femoral greater Trochanter of subjects were marked and their trunks were stabilized by body position.

Lower Extremity Power (Vertical Jump): Sargent vertical jump test were used to measure the lower extremity power. Reliability of the Sargent vertical jump test was reported by philips. [6] Subject were asked to stand next to the marked wall rises his near hand to the wall in upward direction in order to record the standing reach height without heels off or jumps. The subject then stands away from the wall and jumps vertically as high as he can. The difference in distance between the standing reach height and the jump height is the score. The best of three attempts is recorded.

Statistical Analysis: An ANOVA was used to compare differences between three playing positions: feeder, server and spiker. A Tukey post-hoc test was used to locate difference. Level of significant was $P < 0.05$ for all analyses. The statistical package for social science (SPSS 14) was used for all statistical analysis.

RESULTS

Descriptive statistics and result of ANOVA and Tukey post-hoc test of biomechanical parameters in three sepaktakraw playing position between Iranian elite male players are shown in table 1, 2, 3, 4 and 5. According to table 1 significant differences in the hip range of motion in 3 directions include flexion, abduction and adduction between the servers with the others (spikers and feeders) and the spikers with the feeders. There were shown no significant differences among all groups in the hip extension. Table 2 shows no significant differences in the speed and the acceleration of the participants. Table 3 shows significant differences in vertical jump of spikers with the others. There were shown no significant differences in the vertical jump of feeders with servers. Table 4 shows no significant differences in the reaction time of subjects.

Table 1: Descriptive statistics and result of ANOVA and Tukey post-hoc test for range of motion in three sepaktakraw playing position between Iranian elite male players

Range of motion	Playing position	N	Mean	St.d	P	Differences between three groups*.**	Result
Abduction ofhip joint	Spiker	10	100	12.06	-	spiker (0.02) with the feeder*	significant difference
	Server	10	107	4.22	-	server (0.05) with the spiker*	significant difference
	Feeder	10	90	6.67	-	feeder (0.00) with the server*	significant difference
	Total	30	99	11.82	0.0	between groups**	significant difference
Adduction ofhip joint	Spiker	10	53.4	4.86	-	spiker (0.03) with the feeder*	significant difference
	Server	10	50	4.71	-	server (0.04) with the spiker*	significant difference
	Feeder	10	48.4	5.4	-	feeder (0.05) with the server*	significant difference
	Total	30	50.60	4.94	0.05	between groups**	significant difference
flexion ofhip joint	Spiker	10	145.5	4.97	-	spiker (0.03) with the feeder*	significant difference
	Server	10	153	4.22	-	server (0.03) with the spiker*	significant difference
	Feeder	10	137	5.37	-	feeder (0.02) with the server *	significant difference
	Total	30	143.5	8.42	0.03	between groups**	significant difference
extension ofhip joint	Spiker	10	44.5	7.55	-	spiker (0.9) with the feeder	No significant difference
	Server	10	47.5	5.89	-	server (0.2) with the spiker	No significant difference
	Feeder	10	42.5	6.26	-	feeder (0.3) with the server	No significant difference
	Total	30	44.8	6.74	0.2	between groups	No significant difference

Significant level at p = 0/05.*significant differences obtained by Tukey post-hoc. ** significant differences obtained by ANOVA

Table 2: Descriptive statistics and result of ANOVA and Tukey post-hoc test for speed and acceleration in three sepaktakraw playing position between Iranian elite male players

Speed and acceleration	Playing position	N	Mean	St.d	P	Differences between three groups*.**	Result
10 meteracceleration	Spiker	10	1.58	0.65	-	spiker (0.1) with the feeder	No significant difference
	Server	10	2.07	0.74	-	server (0.9) with the spiker	No significant difference
	Feeder	10	1.95	0.32	-	feeder (0.3) with the server	No significant difference
	Total	30	1.86	0.61	0.1	between groups	No significant difference
40 meter(speed)	Spiker	10	6.53	0.26	-	spiker (0.6) with the feeder	No significant difference
	Server	10	6.72	0.25	-	server (0.2) with the spiker	No significant difference
	Feeder	10	6.62	0.25	-	feeder (0.7) with the server	No significant difference
	Total	30	6.62	0.26	0.2	between groups	No significant difference

Significant level at p = 0/05.*significant differences obtained by Tukey post-hoc. ** significant differences obtained by ANOVA

Table 3: Descriptive statistics and result of ANOVA and Tukey post-hoc test vertical jump in three sepaktakraw playing position between Iranian elite male players

vertical jump	Playing position	N	Mean	St.d	P	Differences between three groups*.**	Result
Sargent vertical jump test(cm)	Spiker	10	63.90	9.60	-	spiker (0.02) with the feeder*	significant difference
	Server	10	54.10	3.98	-	server (0.04) with the spiker*	significant difference
	Feeder	10	55.40	7.14	-	feeder (0.9) with the server	No significant difference
	Total	30	57.80	8.30	0.01	between groups**	No significant difference

Significant level at p = 0/05.*significant differences obtained by Tukey post-hoc. ** significant differences obtained by ANOVA

Table 4: Descriptive statistics and result of ANOVA and Tukey post-hoc test for reaction time in three sepaktakraw playing position between Iranian elite male players

Reaction time	Playing position	N	Mean	St.d	P	Differences between three groups*.**	Result
Reaction time ruler test	Spiker	10	1.83	0.06	-	spiker (1) with the feeder	significant difference
	Server	10	1.84	0.08	-	server (0.9) with the spiker	significant difference
	Feeder	10	1.83	0.06	-	feeder (0.8) with the server	No significant difference
	Total	30	1.83	0.06	0.8	between groups	No significant difference

Significant level at p = 0/05.*significant differences obtained by Tukey post-hoc. ** significant differences obtained by ANOVA

DISCUSSION

In sports like badminton, the physical requirement demand efficiency in number of fitness component. In order to play professionally against opponent and finally to be able to win the match, an athlete needs to improve his/her level of basic physical qualities, such as strength, power, muscular endurance, flexibility and agility. [7] To be able to achieve reasonable success in competition, improvement in physical fitness must be emphasized in addition to skill training. [8] According to Chin *et al.* [8] several factors contribute to the success in the sport such as badminton, including technique and tactics, psychological preparation and game strategy. In other sports like volleyball players require well-developed muscular strength, power and endurance, speed, agility and flexibility and have a high level of jumping ability, fast reaction time and swift movements. [9] Considerable demand is also placed on the neuromuscular system during sprints, jumps (blocking and spiking) and high-intensity court movements that occur repeatedly during competition. [10] Because of inadequate and unavailable information about sepaktakraw players of the other countries and also different nature of the game, data comparison is difficult. Due to the players' role, there are feeding, serving, spiking and blocking. Thus, the players need to immense agility, precision, leg strength, timing and skill. [11]. Following biomechanical parameters that were studied in this research can be considered as important factors for excellence in sepaktakraw.

Biomechanical Parameters

Hip Range of Motion: Hip range of motion and flexibility of the lower limbs may be an important attribute for excellence in sepaktakraw. [3] According to [11] kicking the ball at the higher point in sepaktakraw is very important. So players with sufficient range of motion especially in hip joint are able to serve or spike the ball with sharper angle and also block the opponent's spiker. Although there are no data correlating ROM with performance in other sports for comparison with sepaktakraw but presumably, hip range of motion can be considered as a fundamental parameter for servers to perform their service and also spiker in order to execute spike and/or block skillfully and efficiently. Information of table 1, shows the important data about the differences among the groups that enable players to play in different game position with different duties.

Speed and Acceleration: according to Omosegaard, [12] lieshout, [7] Speed is needed in badminton for moving to and from the shuttle and the ability to cover short distance quickly would be a great advantage for the badminton player. This may be true for sepaktakraw with considering the same size of court and height of the net. However, speed and acceleration can considered as a necessary component for sepaktakraw players. Due to the nature of the game it is important for the sepaktakraw players to reach their maximum speed as fast as possible. With considering the speed of the ball during the game, the ability of covering the court in short time is vital as well as in net-barrier sport like badminton, [7,12]. According to data of table 2, no significant differences were found among all participants but it seems due to the players' requirement to move rapidly in different directions through the court in order to reach the ball, sufficient speed and acceleration can give many advantages to the sepaktakraw players.

Lower Extremity Power (Vertical Jump): Vertical jump is an important fundamental ability for sepaktakraw players especially for the spikers. [11] In other net-barrier and rally sport such volleyball and badminton, lower extremity power is necessary to succeed. Leg power is an important component in badminton, that result in the player being able to move quickly and explosively to the shuttle in various directions and to jump high to play overhead strokes. [7] Among all the physical performance indicators, speed and power in jumping and spiking are of the most important ones. Particularly, jumping height is decisive for the execution of techniques and tactics. [13] The research by Japan Volleyball Association demonstrated the significant correlation between the vertical jumping index and the competitive ability of the volleyball players. It was found that the jumping ability had a positive correlation with the number of spiking and the total success rates of spiking, blocking and serving in a game. [14] In sepaktakraw, players need to jump high as much as they can to spike or block. Both Spike and Block are very important techniques in sepaktakraw game and constitute most of the total movements and reflexes in the game. Furthermore, a lot of points are gained through these techniques. Better performance of spike and Block as well as jumping is dependent to the amount of height which players can reach. Thus, Sepaktakraw demand high number of jumps for players to perform the technique, so the ability of jumping is an important factor for sepaktakraw players. Review of table 3 shows the spikers

had better lower extremity power than the feeders and servers. The feeders also had better vertical jump score than the servers but the difference is not significant. Due to specific roles that spikers must do while they are playing such as spiking and blocking, it seems they need high level of lower extremity explosive power that can help them to jump higher and spike the ball from higher point and sharp angle or block the opponent's spike. Totally, sepaktakraw players apart from which position they playing, lower extremity explosive power is necessary for all of them to succeed beside other necessary components of the game such as fitness characteristics and playing skills.

Reaction Time: According to table 4, no significant differences were found among all groups in reaction time of the participants but due to the high speed of displacement in sepaktakraw, it is understood that reaction time must be considered as a crucial parameters for the players. During the game, sometimes the speed of the ball reaches 75.6 kilometers per hour after sepaktakraw service as Juliana *et al.* [15] reported, by considering this there is no available information about the speed of the ball after a powerful spike. Thus, the players must respond as quickly as possible to the opponent's strikes.

Totally, it is understood from the result of this study, the differences between the participants may caused by different roles and duties while they are playing and different training methods which specified for each position. Servers usually stand in the circle at the backline of the court in order to serve the ball to the opponent side, spikers play in front of the net to spike or block and feeders usually participate as playmaker to receive or set the proper ball to the spikers. Despite of the differences, the study showed no significant differences in some biomechanical parameters like speed, acceleration and reaction time that likely is the result of similar task they have. Some similar duties can be rapid movement, receiving and digging the coming ball from the other side. Apart from task differences or similarity, optimal level of biomechanical parameters can give advantages to the players to accomplish their same or different duties efficiently. The benefit of the range of motion for the players (especially servers and spikers) is kicking the ball from higher point and sharper angle that can make the ball controlling very difficult for the opponent. Spikers with high level of lower extremity power are able to jump frequently in order to either spike or /and block. Due to quick displacement of the ball and rapid movement of the players consequently, ideal level of some parameters such as reaction time, speed and acceleration give extra benefit to the players. The parameters were measured in this study ??can be specified as an effective parameters for talent identification in Sepaktakraw. In addition according to the result of the current study, talent identification process must accomplish on the bases of the game position. So with considering differences or similarity of the players' task, the priorities of talent identification indicators according to the game position in order of importance are as follows:

Servers: due to servers' specific roles like performing consequent service, rapid movement through the court to receiving, digging and setting the ball, the biomechanical parameters such as hip range of motion, lower extremity power, reaction time, speed and acceleration should be considered as the main parameters through talent identification process.

Spikers: due to spikers' duties like rapid movement through the court to perform consequent spike or block, receiving and digging, the biomechanical parameters such as lower extremity power, hip range of motion, reaction time, speed and acceleration should be considered as the main parameters through talent identification process.

Feeders: with considering the feeders' task during the game like setting the ball, rapid movement in order to receiving or digging the ball, the biomechanical parameters such as reaction time, speed, acceleration, lower extremity power and hip range of motion should be considered as the main parameters through talent identification process.

CONCLUSION

The data presented in this study carry considerable practical applications. Biomechanical parameters that were identified in the current study can be used as the predictor of performance in sepaktakraw and provide a useful information for talent detection, talent identification in the field of sepaktakraw and training program development.

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