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*THE EXAMINATON OF RELATIONSHIPS AMONG STATIC AND DYNAMIC BALANCE, SPEED AND AGILITY IN FEMALE FOOTBALL PLAYERS

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Abstract

The aim of this study was öto examine relationship among stability, speed and agility at female soccer players. The twenty-threee female soccer players participated in this study voluntarily (n=23, age=15.69±1.39 years, height=161.33±5.48 cm, weight=55.04±8.44 kg). The stability parameters of female soccer players were measured as static stability at opened and closed eyes positions and dynamic stability by stability measurement device. The 10, 30 and 40 meters sprint tests ans Illinois agility test were performed on synthetic turf soccer pitch by electronic photocell system. The 10, 30 and 40 meters sprint and Illinois agility test durations were determined. All tests were performed on different days and at the same time of day. The relationship stability, speed and agility parameters was determined by Pearson and Spearman correlation coefficients. According to analyze results, there was no significant correlation among stability, speed and agility parameters except for the correlation between the 30 meters sprint values and ATE (average track error) values from stability parameters. Consequently, it might be said that there was no significant relationship among stability, speed and agility parameters of female soccer players and stability ability at female soccer players could not be affected by speed and agility abilities.

Keywords: Soccer, static stability, dynamic stability, speed, agility.

INTRODUCTION

Speed is intensely performing motor activities of human within the shortest time (Hahn, 1982). Speed is ability of performing movements within the shortest time as far as possible in consequence of coordination neural and muscle systems (Taşkıran, 2007). The agility is the main determinant of change direction at high speed and tempo and sudden stop abilities of a soccer player. Generally, the criterions as strength power and flexibility are more distinguishing features determining athlete performance than other field tests (Reilly et al., 2000).

The agility is a control and coordination ability providing balance of body and posture in the desired position in space during quick and sudden direction changes following a series of movements (Sheppard and Young, 2006). The stability has an important place in sports activities. It is an important determinative in physical activities, as game, sport, dance and gymnastics. The stability may be defined as ability to remain stationary of body or ability to make stable movements performing resistance to gravity (Kirchner, 2001). The stability measurements is divided to two as static and dynamic stability (Era et al., 1996). The static stability is ability to maintain body stability at a certain point (Hazar and Taşmektepligil, 2008). The dynamic stability is a stability ability while moving (Muratlı, 2003).

*This study was reproduced from master thesis named **'The Examinaton of Relationships Among Static and Dynamic Balance, Speed and Agility in Female Football Players'** prepared by Ercan ÇAKMAK.

Although the soccer is a sport branch using aerobic energy system highly, it includes discontinuous activities requiring sprint, acceleration, leap and agility ability and performed with high tempo at different times during game (Shephard, 1999). The aim of this study was to examine relationships among static and dynamic stability, speed and agility parameters of female soccer players.

METHODS

Research Group

The twenty-three female soccer players playing in Turkey third football league from Ordu province participated in this study. The descriptive statistics of research group were presented in Table 1. All female soccer players were informed about study. This study was approved by Ordu University Clinical Researches Ethics Committee.

Table 1. The Descriptive Statistics of Female Soccer Players

	N	x̄	SS	Min.	Max.
Age (year)	23	15.69	1.39	13.00	17.00
Height (cm)		161.33	5.48	153.00	173.70
Weight (kg)		55.04	8.44	42.90	82.00

Data Collection

Body Weight Measurement

The body weight values of female soccer players were measured with 0.1 kg accuracy with sport clothes as barefoot in anatomical posture position.

Body Height Measurement

The body height values of female soccer players were measured by height gauge with 0.1 cm accuracy as barefoot, heels adjacent, breathless, head straight with eyes facing in anatomical posture position.

Static Stability Test

The static stability measurement procedure was explained to players. All players tried test before measurement. The stability measurements were performed as opened eyes and closed eyes. The stability measurement device (Pro-kin, Technobody PK-252, Dalmine, Italy) was used for stability measurements. The athletes tried to see to fixed point in device monitor in the opened and closed eyes positions during 30 seconds test duration. The athletes tried to maintain their positions during opened and closed eyes stability measurement tests. The stability datas were automatically recorded by stability device. The forward-backward standard deviation (F-BSD), medium-lateral standard deviation (M-LSD), perimeter (PM), ellips area (EA), trunk total standard deviation (TTSD), trunk backward-forward standard deviation (TB-FSD), trunk medium-lateral standard deviation (TM-LSD) parameters were measured as static stability parameters. The static stability values of athletes were determined by sum of F-BSD and M-LSD parameters. It was assumed that higher stability standard deviation values indicated lower static stability ability (Güngör, 2010).

Dynamic Stability Test

The dynamic stability measurement was performed by stability measurement device (Pro-kin, Technobody PK-252, Dalmine, Italy). The athletes performed stability measurement procedure before test. The test was performed with bipedal measurement design in fifth difficulty degree during 60 seconds. There was a red target circle in device monitor. The athletes stepped to device platform with two feet and tried to move the device indicator to center of the red target circle. After the indicator of the device is set to the red target circle, athletes tried to turn indicator of the device clockwise five times without going out of the red target circle during 60 seconds test duration. The test results were automatically recorded by device. The average track error (ATE), average force variance (AFV), stability index (SI), trunk total standard deviation (TTSD), trunk backward-forward standard deviation (TB-FSD), trunk medium-lateral standard deviation (TM-LSD), parameters were determined as dynamic stability parameters. The ATE parameter indicated amount of overflow beyond the borders of the red target circle. It was accepted that higher ATE values indicated better dynamic stability ability (Güngör, 2010).

Sprint Tests

The sprint ability of athletes was measured by 10, 30 and 40 meters sprint tests. The sprint tests were performed on synthetic turf soccer pitch by four gate photocell system (Witty, Microgate, Balzano, Italy). The athletes performed five minutes warming-up exercises before sprint tests. The gates of photocell system were placed at 10, 30 and 40 meters on synthetic turf soccer pitch. After warming-up exercises, the athletes performed stretching exercises.

Then athletes performed sprint tests three times with three minutes rest intervals. The best sprint duration was recorded as test value with an accuracy of 0.01 seconds.

Illinois Agility Test

The agility ability of athletes was measured by Illinois agility test. The Illinois agility test tarack was showed in Figure 1. The athletes performed five minutes warming-up exercises before test. After stretching exercises, athletes performed Illinois agility test. The two gates of photocell system were placed at start and end points of the test track. All athletes performed test one time to become familiar with the test before measurement.

The starting photocell began test duration when athlete passed starting point of the test. All athletes tried to complete test track as soon as possible. Test duration was automatically recorded with an accuracy of 0.01 seconds by photocell system (Witty, Microgate, Balzano, Italy) when athlete passed end point of the test. The Illinois test was performed two times with three minutes rest intervals and the test duration was evaluated as test duration.

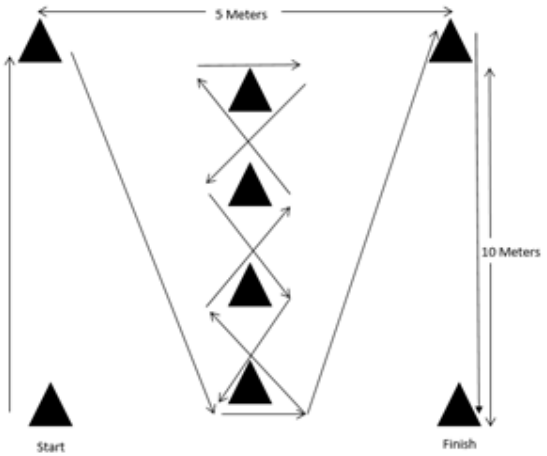

Figure 1. Illinois Agility Test Track

Data Analyze

The descriptive statistics of datas were presented as mean and standard deviation ($\bar{x}\pm Sd$). The normality of datas was tested by Shapiro-Wilk test. The relationship among speed, agility, static and dynamic stability parameters of athletes were determined by correlation analyze. The relationships among parameters were evaluated by Pearson and Spearman correlation coefficients according to normality of datas. The significance level of statistical analyzes was accepted as $p < 0.05$.

RESULTS

Table 2. The Descriptive Statistics of Test Parameters of Female Soccer Players

Measurements	Parameters	N	X̄	SS	Min.	Max.
Opened Eyes Static Stability	F-BSD	23	2.78	1.08	1.00	5.00
	M-LSD		2.21	0.79	1.00	5.00
	EA (mm2)		115.08	58.72	32.00	285.00
	PM (mm)		288.60	75.11	183.00	530.00
	TTSD		3.46	2.77	0.46	9.12
	TB-FSD		1.06	0.94	0.12	4.41
	TM-LSD		3.19	2.8	0.28	9.01
Closed Eyes Static Stability	F-BSD	23	4.86	2.13	2.00	10.00
	M-LSD		4.39	2.31	3.00	14.00
	EA (mm2)		395.86	277.91	95.00	1272.0
	PM (mm)		494.86	160.17	314.00	934.00
	TTSD		3.43	2.86	0.84	9.91
	TB-FSD		1.52	1.52	0.18	6.75
	TM-LSD		3.01	2.82	0.37	9.52
Dynamic Stability	ATE (%)	23	30.91	7.61	20.00	52.00
	AFV		0.52	0.23	0.20	1.20
	TTSD		4.22	1.76	1.79	8.87
	TB-FSD		2.38	1.53	0.93	7.11
	TM-LSD		3.35	1.34	0.69	5.86
	SI		1.19	0.82	0.09	4.36
10m Sprint (sn)		23	2.06	0.13	1.83	2.39
30m Sprint (sn)		23	5.28	0.34	4.66	6.03
40m Sprint (sn)		23	6.59	1.51	0.00	7.86
Illinois Agility Test (sn)		23	18.73	1.11	17.29	21.27

F-BSD: Forward Backward Standard Deviation, M-LSD: Medium- Lateral Standard Deviation, PM: Perimeter, EA: Ellips Area, TTSD: Trunk Total Standard Deviation, TB-FSD: Trunk Backward-Forward Standard Deviation, TM-LSD: Trunk Medium-Lateral Standard Deviation, ATE: Average Track Error, AFV: Average Force Variance, SI: Stability Index, TTSD: Trunk Total Standard Deviation, TB-FSD: Trunk Backward-Forward Standard Deviation, TM-LSD: Trunk Medium-Lateral Standard Deviation.

Table 3. Pearson and Spearman Correlation Coefficients Among Test Paremeters of Female Soccer Players

Measurement	Parameters	10m. Sprint	30m. Sprint	40m. Sprint	Illinois Aglity
Opened Eyes Static Stability	F-BSD	0.305	0.266	0.001	0.281
	M-LSD	0.117	0.190	0.164	0.165
	EA (mm2)	0.318	0.381	0.189	0.301
	PM (mm)	-0.015	-0.164	0.128	0.409
	TTSD	0.166	0.281	0.274	0.128
	TB-FSD	0.144	0.117	0.130	-0.122
	TM-LSD	0.161	0.282	0.298	0.165
Closed Eyes Static Stability	F-BSD	-0.207	-0.131	-0.186	0.162
	M-LSD	-0.268	-0.197	-0.210	-0.003
	EA (mm2)	-0.279	-0.190	-0.206	0.126
	PM (mm)	-0.372	-0.358	-0.099	0.324
	TTSD	0.049	0.130	0.105	0.006
	TB-FSD	0.017	0.114	0.126	-0.319
	TM-LSD	0.061	0.155	0.187	0.063
Dynamic Stability	ATE (%)	0.336	**0.474***	0.258	0.191
	AFV	- 0.056	0.038	0.088	0.012
	TTSD	-0.035	0.025	0.151	0.110
	TB-FSD	-0.008	0.027	0.006	0.048
	TM-LSD	-0.028	0.018	0.080	0.170
	Stab. İndx.	0.115	0.115	0.334	0.198
10m. Sprint					0.410
30m. Sprint					**0.416***
40m. Sprint					0.185

*p<0.05, F-BSD: Forward Backward Standard Deviation, M-LSD: Medium- Lateral Standard Deviation, PM: Perimeter, EA: Ellips Area, TTSD: Trunk Total Standard Deviation, TB-FSD: Trunk Backward-Forward Standard Deviation, TM-LSD: Trunk Medium-Lateral Standard Deviation, ATE: Average Track Error, AFV: Average Force Variance, SI: Stability Index, TTSD: Trunk Total Standard Deviation, TB-FSD: Trunk Backward-Forward Standard Deviation, TM-LSD: Trunk Medium-Lateral Standard Deviation.

According to correlation coefficients in Table 3, there was a significant correlation between ATE (average track error) from dynamic stability parameters and 30 m. sprint values (p<0.05). There was no significant correlation between other stability parameters and speed, agility test values (p>0.05).

DISCUSSION AND CONCLUSION

Although three were a lot of studies about soccer, few studies about static, dynamic stability, speed and and agility parameters of female soccer players were seen in literature. Gökmen (2013) measured F-BSD and M-LSD values of eleven years old male athletes during opened eyes static and dynamic stability tests (7.96±3.93, 4.72±5.00, respectively). The values of this study were higher than values of our study and this finding might arise from age difference of research groups.

The closed eyes static stability values of female soccer players in our study were measured and F-BSD and M-LSD values were found as 4.86±2.13 and 4.39±2.31 respectively (Table 2). Kırdiş (2010) determined pre-test F-BSD and M-LSD values during closed eyes static stability test (F-BSD: 4.0±1.35 and M-LSD: 2.93±1.28).

The F-BSD values resembled among two studies differed. There was no significant relationship between 10 meters sprint and Illinois agility test values of female soccer players in this study (p>0.05).

Similarly, there was no significant relationship between 10 meters sprint values and opened, closed eyes stability parameters of female soccer players ($p>0.05$). On the other hand, there was a low and negative relationship between 10 meters sprint values and bipedal dynamic stability parameters of female soccer players but it was found that this relationship was statistically non-significant ($p<0.05$).

It was determined that there was a significant relationship between 30 meters sprint and Illinois agility test values of female soccer players ($p<0.05$). Arabacı et al. (2010) determined a medium and significant relationship between 30 meters sprint and agility test values of taekwondo athletes. The findings getting in Arabacı et al. (2010) was similar to our study findings. Also, it was determined significant relationship among one repetition maximal strength during half squat exercise, 10, 30 meters sprint, 10 meters shuttle run and vertical jump test values of male soccer players in study of Wisløff et al. (2004). These findings revealed that increase in leg strength might positively affect sprint and vertical jump abilities of players. In our study, Illinois agility test values correlated with 30 meters sprint values and this finding indicated relationship between strength and agility parameters when the results of this study were evaluated in terms of strength parameter.

Vescovi and Meguigan (2008) researched on 15-20 aged female soccer players educating in college and high school and it was determined a significant relationship among agility (Pro-agility and Illinois tests) and different sprint tests (9.1, 18.3, 27.4 and 36.6 meters sprint tests). The findings of this study showed to findings of our study. Taşmektepligil (2016) found significant relationship between dynamic and static parameters and some isokinetic strength parameters at different angles of dominant and non-dominant legs in male soccer players. In our study, it was found that ATE parameter of female soccer players positively correlated with 30 meters sprint values. It might be said that the relationship between ATE parameters ans 30 meters sprint values might be linked to isokinetic strength values of players when it was considered that isokinetic strength values might have an effect on speed values.

Consequently, it was not found significant correlation among stability, speed and agility of female soccer players except for the correlation between the 30 meters sprint values and ATE parameter. It might be said that speed and agility parameters were not related to stability parameters at female soccer players. The similar studies may be performed on athletes at different branches and levels to determine the relationship between stability, agility and speed parameters accurately.

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