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The Effect of Dominant Leg on Change of Direction Performance in Young Female Football Players

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Abstract

Over the last two decades, women's soccer has become increasingly established and recognised. The demands of women's soccer have increased significantly, with a significant development in terms of quantity, including improved fitness performances and a greater number of matches and players throughout the season. Movements in women's soccer consist of a large number of directional changes. In this study, the effect of dominant leg on Change of Direction (COD) performance in young female soccer players was investigated.Twenty (mean±SD age17.1±1.56 years, body weight:55.7±4.94kg, height:1.61±0.05 meter) young female soccer players participated in the study. The players performed change of direction tests at different angles (45°-90°-135°-180°) on a 10-meter track, knee flexion (KFRS) and extension isometric strength tests (KERS), and asymmetric depth jump tests (ADJ). Athletes performed all tests with both the dominant leg (DL) and non-dominant leg (NDL). In the analysis of the data, Parametric Dependent Samples T-test statistical analysis was used to determine the differences between DL and NDL performances, and correlation analysis was performed to examine the relationships between the tests.It was observed that COD performance of female soccer players with DL (5-10m P=0.000-0.009, t=2.924-4.802, ES:0.44-0.59 and, 0-10m P=0.000-0.030 t=2.351-6.757, ES:0.33-0.59) were better than the NDL. DL's KERS (Extension= 6.4%kg, t=4.947) and KFRS (Flexion=12.7% kg, t=4.406 ES:0.77-0.82), ADJ contact time (CT) (CT=-16.4% (ms), t=-22.601) and flight time (FT) (FT= %17,6 (ms), t=22.931 ES:0.64-0.75) tests showed better performance than NDL's. Significant relationship was found between DL KFRS and DL's 45 degrees (5-10m r=,715**, 0-10mr =,520* P<0.05), 135 degrees (5-10m r=,562**, 0-10m r=,533*, P<0.05), and 180 degrees (5-10 m r=,687**, 0-10m r =,622 ** P<0.05) COD values. Significant relationship was found between DL KERS and DL's 45 degrees (5-10m r=,566**; 0-10m r=,502* P <0.05) and 180 degrees (5-10m r=,495*, P<0.05) COD values.When the findings were examined, it was determined that change of direction performance with dominant leg was better than with non-dominant leg in female soccer players. This is thought to be due to the DL's ability to generate more isometric strength during COD.

Keywords: Change of direction, dominant leg, women's soccer, performance, strength asymmetry.

Genç Kadin Futbol Oyuncularinda Baskin Bacağin Yön Değiştirme Performansina Etkisi

Özet

Son yirmi yılda, kadın futbolu, giderek kendine daha fazla yer bulmakta ve tanınmaktadır. Gelişmiş kondisyon performansları ile sezon boyunca daha fazla sayıda maç ve oyuncuyu içeren nicelik açısından önemli bir gelişme gösteren kadın futbolunun talepleri önemli ölçüde artmıştır. Kadın futbolunda hareketler çok sayıda yön değiştirmeden oluşmaktadır. Bu çalışmada, genç kadın futbolcularda baskın bacağın yön değiştirme (COD) performansına etkisi incelenmektir.Çalışmaya 20 (mean ± SD age 17.1 ± 1.56 years, body weight: 55.7 ± 4.94 kg, height: 1.61 ± 0.05 m) genç kadın futbolcu katılmıştır. Oyuncular 10 metrelik parkurda ve farklı açılarda (45° -90° -135° ve 180°) yön değiştirme testi, diz fleksiyon ve ekstansiyon izometrik kuvvet testi ve asimetrik derinlik sıçraması testi gerçekleştirmişlerdir. Sporcular hem baskın bacak (DL) hem de baskın olmayan bacak (NDL) ile tüm testleri uygulamıştır. Verilerin analizinde baskın bacak ve baskın olmayan bacak performansları arasındaki farkları belirlemek amacıyla Parametrik Bağımlı Örnekler T-testi istatistiksel analizi ve testler arasındaki ilişkileri incelemek için de korelasyon analizi yapılmıştır.Kadın futbolcuların baskın bacaklarının (5-10m P=0.000-0.009, t=2.924-4.802, ES:0.44-0.59 and, 0-10m P=0.000-0.030 t=2.351-6.757, ES:0.33-0.59) COD performansının baskın olmayan bacaklarına göre daha iyi olduğu gözlendi. DL'nin diz ekstansiyon bağıl gücü (KERS) ve diz fleksiyon bağıl gücü (KFRS) (P=0.00 Ekstansiyon=6.4 %kg, t=4.947 and Fleksiyon=12.7% kg, t=4.406 ES:0.77-0.82)., asimetrik sıçrama temas süresi (CT) (CT = -16.4% (ms), t=-22.601) ve havada kalma süresi (FT) (FT=%17,6 (ms), t=22.931 ES:0.64-0.75) testleri NDL'lerden daha iyi performans gösterdi. DL KFRS ile DL'nin 45 derece (5-10m r =,715**, 0-10m r=,520*, P<0.05), 135 derece (5-10m r=,562**, 0-10m r=,533*, P<0.05) ve 180 (5-10m r=,687**, 0-10m r =,622** P<0.05) derece yön değiştirme performansları arasında anlamlı ilişki bulunmuştur. DL KERS ile DL'nin 45 derece (5-10m r=,566**, 0-10m r=,502* P<0.05) ve 180 derece (5-10m r=,495*, P<0.05) COD performansları arasında anlamlı ilişki bulunmuştur.Bulgular incelendiğinde kadın futbolcularda baskın bacak ile yön değiştirme performansının baskın olmayan bacağa göre daha iyi olduğu belirlendi. Bunun, baskın bacağın yön değiştirme sırasında daha fazla izometrik güç üretme yeteneğinden kaynaklandığı düşünülmektedir.

Anahtar Kelimeler: Yön değiştirme, baskın bacak, kadın futbolu, performans, kuvvet asimetrisi.

INTRODUCTION

Interest in soccer has increased in recent years and has become one of the most popular sport in the world played in different age groups at all levels (4, 14, 24). Women's soccer has more than 26 million players worldwide (14). Considering these numbers, it is seen that women's soccer is developing and requires further research.

Soccer is a multi-task sport and it involves different abilities such as sprints, jumps and shootings, dual tackles, and change of direction (COD) movements (9). Elite-level female soccer players may cover 335 m distance with a maximum speed in a single bout and cover 1.53-1,68 km distances with high speeds during a ~ 10 km match (7). They perform the numbers of 1,300 speed and direction changes within this distance, and the COD includes a majority of the activities (5) . On the other hand, young female soccer players perform 28% less high-speed running and 24% shorter distance sprinting than elite female soccer players (18). These movements mostly consist of short high-speed runs, jumps, dual tackle and COD (19). Some physical abilities such as strength, power, speed, and agility gain importance as a requirement of women's soccer, which are high-skill requering activities (10). Especially, the asymmetric strength difference between leg muscle strength is an important factor affecting COD performance (15, 23). In some studies, it has been found that the possibility of injury to the non-dominant leg during unilateral dynamic movements in female soccer players is higher than that of the dominant leg (11, 12, 21, 22). The decrease in the ratio of asymmetry between legs may improve the COD performance while reducing the risk of injury (1, 2).

Considering the studies examining the effect of leg muscle strength on COD performance, Thomas et al. (25) found a low correlation value between isometric mid-thigh pull strength and COD performance. A recent study also showed the same result, De Marco et al. (8) found no significant correlation between IMTPr performance and COD deficit. Additionally, Young et al. (28) found a low correlation value between isometric leg strength and reactive power output during drop jump and COD performance in different directions. Rouissi et al. (23) observed better COD performance and maximal isometric voluntary contraction of the knee extensors/flexors with the dominant leg. Although we can see in the literature that a high relationship between dominant leg and the COD performance, in almost all studies, there were either no significant correlation values between leg strength and COD performances, or values that could not be considered significant were found (16, 23).

The fact that there are few studies on agility, dominant leg strength and asymmetry for young female soccer players and the current studies do not give clear information indicate the deficiency in this area. This deficiency seems worth examining, considering the small differences in achieving success today and how big the factors affecting performance are. Therefore, this study was conducted to examine the effects of young female soccer players' dominant legs on COD performance. And we hypothesize that the COD performance of young female soccer players with their dominant legs will be better.

METHOD

Experimental Approach to the Problem

In this study, which was carried out to examine the effects of young female soccer players on their COD performance with their dominant legs, the direction change test in different angles (45 °, 90 °, 135 °, 180 °), isometric strength test (knee extension and flexion) was used for determining leg relative strength, and asymmetric depth jump test was used to determine the asymmetry between the legs, and the measurements were respectively evaluated.

Subjects

The research group of this study consisted of 20 (mean ± SD age 17.1 ± 1.56 years, body weight: 55.7 ± 4.94 kg, height: 1.61 ± 0.05 m) young women player who play in women soccer team from Turkish 3rd Women's League. The sample size was determined using the proportionate sample size calculation. This formula indicated that 16 players would be sufficient to complete the study with a 95% confidence interval (5% margin of error) (29). The criterion of the particapation to the study was to have at least 3 years of experience and competing actively in last 12 months. Athletes with any injury or recent injury were excluded from the study. Before the study, the participants were informed about the tests. A signed voluntary consent form was obtained from all participants. The study approved by the Sakarya University of Applied Sciences ethics committee. In every phase of the study, the Helsinki declaration was followed.

Procedures

The tests of the study COD, vertical jump and isometric force tests were conducted in 3 non-consecutive sessions with 48 hours intervals. Change of direction tests were carried out in the first practice session, isometric force tests in the second practice session, and jump tests in the third practice session. All measurements of the athletes were taken between 15:00 and 17:00 in the afternoon. The athletes were familiar with the tests due to the nature of soccer and their training and isometric strength training. Nevertheless, a familiarization session was held one week before the tests. All test measurements were carried out during the break period of the Women's 3rd League.

Change of direction tests

To determine the COD performances of female soccer players , the method reported by Rouissi et al. (23) was used (Figure 1). A general warm-up including 5 minutes of running and 10 minutes of dynamic stretching was performed before the female soccer players COD tests, and warm-up was performed on both the dominant leg and the non-dominant leg directions at all angles (23). The subject's dominant leg was determined based on Waterloo Footedness Questionnaire-Revised (WFQ-R) (13).

The COD performance started with the athlete standing 0,5 meter behind the first photocell door and waiting for staggered stance and starting as soon as she felt ready. During the 10-meter running performance, the direction was changed by using the thrust of the dominant or non-dominant leg at the angles determined (45o - 90o - 135o - 180o) at the 5th meter and the last 5 meters were performed with a straight run at maximum performance.

Each angles of the test, 2 trials were performed, 2 minutes rest was given between trials and the best trial was used for analysis. Strong verbal support was given to the participants throughout the trials to ensure maximum effort.

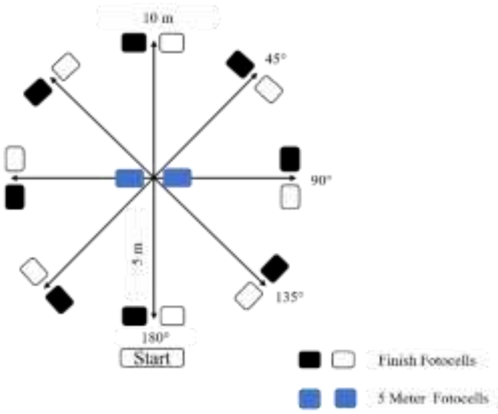

Figure 1. Different Angles of Change of Direction Test Track (Rouıssı et al., 2016)

Maximal knee isometric voluntary contraction tests

Before the knee isometric voluntary contraction test, after 10 minutes of running on the treadmill in the fitness center at 6 km/h, players warmed up with 30% of 1RM of their leg extension and seated leg curl (Diesel Fitness, USA) for 10 repetitions, 2 sets and after one-minute rest, they performed 40% of 1RM for 8 repetitions 2 sets. Knee voluntary isometric contractions of the players were measured by connecting the dynamometer to the leg extension and seated leg curl machines (Diesel Fitness, USA). A modified leg dynamometer (Takei Scientific Instruments Co., Japan) was used for this measurement (Figure 2). The isometric strength value was obtained with the power produced by connecting the gauge part of the dynamometer to the belt of the weight part of the machine. Dominant and non-dominant knee extension was measured first, and then dominant and non-dominant knee flexion was measured. All measurements were taken at a 90-degree knee angle. The athletes were asked to perform the test without lifting their bodies in the air while sitting and with the hands firmly on the handles next to the seat. Each test was done 2 times and the best performance was used for analysis.

Figure 2. Modified Leg Isometric Force Test Setup

Asymmetric Depth Jump Test

For the warm-up before asymmetric depth jump test, 5 minutes of jogging and 10 minutes of dynamic stretching exercises were followed by asymmetric depth jump (rigth-left single leg) trials and warm-up was done. After warm-up, the asymmetric depth jump test was performed first with the dominant leg and then with the non-dominant leg.

The players were standing on a 30 cm high box. The players then jumped unilaterally from the box to the ground and jumped vertically as high as possible immediately after contacted with the ground and landed on the ground with the foot on which she jumped and returned to the ground (28). The hands were fixed on the hips throughout the test. The players repeated this test 2 times and rested for 2 minutes between repetitions. The best value was used for analysis.

To record the jump, a smartphone camera used which placed on tripod facing the participant (in the frontal plane) at ~1.5 m from the box, and zooming in on the feet of the participant. The videos were then analyzed with the application named "Myjump 2" in the Appstore to determine the contact and flight time for each leg during the jump of the players. The validity and reliability study of the “Myjump 2” application was previously carried out by Bishop et. all., (3).

Statistical analyses

Descriptive statistics of all data are presented as mean ± SD. Shapiro-Wilk test used to determine the normality distrubution of data. For the reliability controls of the data, intraclass correlation coefficient (ICC), coefficient of variation (CV), standard error of measurement (SEM) were performed. Parametric Dependent Samples T-test statistical analyzes were performed to determine the difference between dominant leg and non-dominant leg performances, since the data showed normal distribution. The effect sizes (ES) of the data were calculated using Cohen's d (6). Cohen's d accepted d = <0.2 a 'small' effect size, from 0.2 to 0.8 a 'moderate' effect size and> 0.8 a 'large' effect size (25). Relationships between variables were evaluated using Pearson's correlation test. Statistical significance was set at P<0.05. All data were analyzed using SPSS 22.0 (SPSS Inc., Chicago, IL, version. 22.0).

FINDINGS

The analysis results of the data collected from the subjects are given below. ICC, SEM and CV values for all measurements showed moderate reliability: (ICC range: 0.50-0.99; SEM range: 0.00–9.05 and CV% range: 1.15–1.38). The effect sizes were observed to be moderate (ES: 0.6-0.82).

When DL and NDL COD performances were compared for 0-5 meters at all angles (45° -90° -135° -180°), it was observed that there was no statistically significant difference (P = 0.364-0.898 t=-.930-0.921 ES: -0.14-0.14), and when compared at 5-10 and 0-10 meters, a statistically significant difference was observed in favor of DL (5-10 P= 0.000-0.009, t=2.924-4.802, ES: 0.44-0.59 and, 0-10 P = 0.000-0.030 t= 2.351-6.757,ES: 0.33-0.59, respectively) (Table 1).

Comparing DL and NDL's relative isometric strength of knee flexion and extension, a significant difference was found in favor of DL in both flexion and extension (P = 0.00 Extension = 6.4% kg, t=4.947 and Flexion = 12.7% kg, t=4.406 ES: 0.77-0.82, respectively).

When DL and NDL's contact times (CT) and flight times (FT) were compared, a significant difference was found in favor of DL in both CT and FT (P = 0.00 Contact Time = -16.4% (ms), t=-22.601, Flight Time =%17,6 (ms), t=22.931 ES: 0.64-0.75, respectively) (Table 1).

When the relationship analysis between different tests was examined, a significant relationship was found between DL KFRS and DL's 45 degrees COD values (5-10 meters r =, 715 **; 0-10 meters r =, 520 * P <0.05). A significant relationship was found between DL KFRS and DL's 135 degrees COD values (5-10 meters r =, 562 **; 0-10 meters r =, 533 * P <0.05). A significant relationship was found between DL KFRS and DL's 180 degrees COD values (5-10 meters r =, 687 ** 0-10 meters r =, 622 ** P <0.05). A significant relationship was found between DL KERS and DL's 45 degrees COD values (5-10 meters r =, 566 **; 0-10 meters r =, 502 * P <0.05). A significant relationship was found between DL KERS and DL's 180 degrees COD values (5-10 meters r =, 495 *, P <0.05) (Table 2).

Comparing DL and NDL's all angles’ COD performances and CT and FT of asymmetric jump, significant relationships were found between DL FT vs. DL's 45 degrees (5-10 meters r = -, 555 *), 90 degrees (0-10 meters r = -, 456 *), 180 degrees (5-10 meters r = -, 512 *, 0-10 meters r = -, 533 *) COD performances (P <0.05) (Table 2).

Table 1. Performance test results of all participants

	Distance (meter)	DL	NDL	Asymmetry %	ES	P
COD 45° (sec.)	0-5	1.25 ± 0.08	1.27 ± 0.06	1.6	0.14	0.509
	5-10	1.08 ± 0.12	1.19 ± 0.10	10.1	0.44	0.009
	10	2.37 ± 0.15	2.47 ± 0.13	7.3	0.33	0.027
COD 90° (sec.)	0-5	1.29 ± 0.29	1.35 ± 0.08	4.4	0.13	0.369
	5-10	1.41 ± 0.11	1.59 ± 0.16	12.7	0.54	0.001
	10	2.79 ± 0.12	2.97 ± 0.16	6.4	0.44	0.001
COD 135° (sec.)	0-5	1.46 ± 0.13	1.42 ± 0.14	2.7	0.14	0.364
	5-10	1.65 ± 0.15	1.91 ± 0.20	15.7	0.59	0.001
	10	3.16 ± 0.18	3.36 ± 0.16	6.3	0.50	0.001
COD 180° (sec.)	0-5	1.33 ± 0.10	1.33 ± 0.06	0	0.06	0.898
	5-10	2.10 ± 0.22	2.30 ± 0.16	9.5	0.46	0.007
	10	3.46 ± 0.27	3.65 ± 0.20	5.4	0.37	0.030
KFRS (Kg)		27.7 ± 2.3	23.3 ± 2.8	12.7	0.82	0.001
KERS (Kg)		48.5 ± 5.3	45.5 ± 5.7	6.4	0.77	0.001
JUMPCont (ms)		274.4 ± 25.6	319.5 ± 28.0	16.4	0.64	0.001
JUMPFligth (ms)		329.1 ± 24.0	271.1 ± 25.7	17.6	0.75	0.001

DL: dominant leg; NDL: non-dominant leg; COD: Change of Direction (45o - 90 o - 135 o - 180 o); KFRS: Knee Flexion Relative Strenght; KERS: Knee Extension Relative Strenght; JUMPCont: Asymmetric Depth Jump Contact Time; Jump Fligth: Asymmetric Depth Jump Fligth Time; ES:Effect Size; (Sec.): Second; (ms): Milisecond

Table 2. Relationship values between change of direction tests at all angles and isometric strength and asymmetric depth jump performance

	Distance	KERS (Kg)		KFRS (Kg)		JUMPCont (ms)		JUMPFligth (ms)	
	(meter)	DL	NDL	DL	NDL	DL	NDL	DL	NDL
DL 45°	0-5	-.300	-.164	-.016	.126	.220	.276	-.046	-.256
COD	5-10	-.566**	-.121	-.715**	-.047	.079	-.036	-.555*	-.537*
(Sec)	10	-.502*	-.121	-.520*	.033	.166	.156	-.317	-.460*
DL 90°	0-5	-.044	.051	-.035	.274	-.057	-.147	-.247	-.369
COD	5-10	-.122	-.044	-.120	-.217	-.033	-.191	-.358	-.473*
(Sec)	10	-.008	-.160	-.026	.157	-.140	-.219	-.456*	-.532*
DL 135°	0-5	-.130	-.366	-.209	-.105	.059	-.028	-.183	-.256
COD	5-10	-.368	.058	-.562**	-.036	-.021	-.024	-.286	.147
(Sec)	10	-.434	-.301	-.533*	-.046	-.153	-.156	-.358	.103
DL 180°	0-5	-.146	-.099	-.374	.203	-.107	-.236	-.281	-.368
COD	5-10	-.495*	-.346	-.687**	.000	-.023	-.195	-.512*	-.608**
(Sec)	10	-.288	-.296	-.622**	.184	-.104	-.307	-.533*	-.548*
NDL 45°	0-5	-.198	-.443	-.202	-.087	-.342	-.459*	-.420	-.190
COD	5-10	-.229	-.257	-.117	-.276	.043	-.100	-.263	-.399
(Sec)	10	-.326	-.348	-.200	-.300	-.092	-.214	-.394	-.389
NDL 90°	0-5	-.243	.109	-.152	-.150	.124	0.57	-.460*	-.428
COD	5-10	-.056	-.537*	-.151	.046	-.394	-.461*	.206	.134
(Sec)	10	-.439	-.524*	-.446*	-.170	-.174	-.302	-.287	-.379
NDL 135°	0-5	-.108	-.113	-.165	-.099	-.002	-.111	-.512	-.281
COD	5-10	-.134	-.515*	-.388	.210	-.314	-.481*	.066	.032
(Sec)	10	-.280	-.498*	-.476*	.011	-.256	-.511*	-.226	-.186
NDL 180°	0-5	-.255	-.359	-.524*	-.395	.182	-.014	-.650**	-.232
COD	5-10	.057	-.457*	-.197	.052	-.421	-.436	.113	.154
(Sec)	10	-.095	-.509*	-.450*	-.294	-.109	-.257	-.330	-.136

DL: Dominant Leg; NDL: Non-Dominant Leg; COD: Change of Direction (45o - 90 o - 135 o - 180 o); KFRS: Knee Flexion Relative Strenght; KERS: Knee Extension Relative Strenght; JUMPCont: Asymmetric Depth Jump Contact Time; Jump Fligth: Asymmetric Depth Jump Fligth Time; Sec.: Second; ms: Milisecond

DISCUSSION AND CONCLUSION

The aim of this study was to examine the effect of dominant leg on COD performance at certain angles (45°-90°-135°-180°) in young female soccer players. The general results of the study conducted for this purpose showed that the COD performances performed with the dominant leg were better at 5-10 meters and 0-10 meters compared to the non-dominant legs. In Knee Extension Relative Strength and Knee Flexion Relative Strength, Asymmetric Depth Jump Tests Contact Time and Flight Time the dominant leg values performed better than the non-dominant leg. There was no overall significant relationship between COD performances and Knee Extension Relative Strength and Knee Flexion Relative Strength, Asymmetric Depth Jump Tests Contact Time, and Flight Time.

The study conducted by Rouissi et al. (23) tested the 45°-90°-135°-180° COD performance of the dominant and non-dominant leg using two different maneuvers in elite young soccer players found that the dominant leg performance was better. As a result of the study, it was predicted that the stronger leg would exhibit a better COD performance. The current study showed similar results. It was found that dominant leg performance was better in all directions and again, DL Knee Extension Relative Strength and Knee Flexion Relative Strength values were better than NDL. Similarly, Lehance et. al., (15) reported that DL is stronger than NDL in young elite soccer players . Based on these results, it can be said that the COD performance of the leg with a greater isometric strength will be better. It is thought that the reason for the high isometric force generation of DL is that the ground reaction force and propulsion. DL has more thrust than NDL, and this can be shown as one of the important factors affecting strength generation. Indeed, in Wong et al. (27)'s study, the difference between the preferred leg in some soccer-related movements and the non-preferred leg was examined and it was observed that the pressure of the preferred leg was more than the non-preferred leg in 115 of the 120 data. Specifically, higher ground reaction force was found in the preferred leg during the propulsion phase in each of the four movements, while higher pressure was found in the non-preferred leg during the landing phase. They attributed this to the preferred leg being stronger. This suggests that the preferred leg plays a role for higher strength of motion (27).

Since leg muscle quality is an important determinant in COD performance (4), the relationship between leg strength and COD performance was investigated in this study. For this purpose, when comparing the Knee Extension Relative Strength and Knee Flexion Relative Strength values with the COD performance, a statistically significant (r = -0.495 * - 0.715 **) relationship values were found between the DL Knee Extension Relative Strength and Knee Flexion Relative Strength values in some aspects. However, we cannot get a clear result with these values, both because there is no difference in all directions and because there are not very high correlation values. Young et al. (28), in their study to examine the relationship between muscle strength and COD performance, they compared their 8-meter straight sprint and their performance in different directions with the reactive muscle strength of a single leg depth jump. They concluded that the relationship between leg reactive muscle strength and speed performance during COD was moderate. They assumed that this might be because the movements were performed similarly. Considering the results obtained in this study, we can say that COD performed with the stronger leg will show better results, since the performances of COD with the dominant leg knee extension relative strength and knee flexion relative strength are better than the non-dominant leg.

The speed of COD is important in a variety of sports, but little is known about how muscle stiffness and asymmetries affect COD. Maloney et al. (17) used muscle stiffness and asymmetry to understand the determinants of COD performance. Eighteen men performed depth jump, right and left direction change with one leg. They found that faster athletes exhibited greater muscle stiffness and less asymmetry during depth jump. This result showed that muscle stiffness and depth jump height asymmetry are strong determinants of COD (17). On the other hand, in this study, a relationship was observed between the flight time asymmetry of the dominant leg and their DL COD performances (Table 2.). The main reason for this is that the dominant leg values show better results for both parameters when looking at contact time and flight time in jump performance (Table 1). In the literature, Nariman et al. (20) conducted a study to examine the different power outputs between dominant and non-dominant legs, and as a result found that the contact time and flight time of the dominant leg were better than the time of the non-dominant leg. In another study, Webb and Lander (26) obtained a low (r = -0.19) relationship value between the two in their study, where they compared the L direction change test and the vertical jump test. Based on the results, we can interpret that the better contact time and flight time the better the COD performance with the leg. However, this difference between the legs may increase the risk of injury or cause worse performance with the weak leg. These results show that the difference between legs should be reduced not only to improve performance but also to minimize the risk of injury.

In this research, when looking at knee extension relative strength and knee flexion relative strength, we can see that DL values produce higher isometric strength than NDL values (Table 1.). When looking at the relationship between leg isometric strength values and COD performances, significant relationships are seen (Table 2). Thomas et al. (25) examined the relationship between the one leg isometric mid-thigh pull test and COD performance and found a nonsignificant relationship (r = -0.01-0.03; p> 0.05) between the two. Considering the difference of the tests performed, it may be an idea for future studies to make a research on which test will be more appropriate with a COD. There is no limitation in this study.

Conclusion

In previous studies to examine the relationship between isometric leg strength and COD performance, isometric leg strength was evaluated and compared bilaterally rather than unilaterally (DL). In this study, they were evaluated unilaterally, and young female soccer players performed better with their dominant legs after changing direction during COD. The relationships between DJ performance and COD were examined, but there was no study examining the relationship between unilateral (DL) DJ and COD (DL). As with the DJ, the contact time increases during a sudden maneuver during COD. In the asymmetric depth jump test conducted in the study, the flight times and the contact times also showed a better result in dominant leg performances. It is an important detail that each of the tests is measured and analyzed unilaterally (DL), as in current study, to examine whether there is a relationship between these two. In addition, the possible increase in leg relative strength will positively affect COD performance. In current study, if it is taken into account that the dominant leg produces a greater isometric force in the relative strength test, the stronger the dominant leg explains the asymmetric difference in both the COD test and the jump test. Decreasing the difference between legs will give better results in COD performances with both legs. Since a relatively poor performance of the non-dominant leg will also create a negative consequence for possible necessary situations, it would be good to reduce the difference between the legs to the lowest possible level. The first aim of the trainers and conditioners in this regard should be to make practices and trainings that will close this difference.

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