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The Examination of the Relationship between Sprint and Vertical Jump in Soccer Players

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Abstract

This study aims to analyze the relationship between sprint and vertical jump among soccer players. Sprint and vertical jump tests were performed by 25 soccer players who play in Regional Amateur League (n=25; age 27.04±3.16 year; body height 177±6.41 cm; body weight 70.10 ± 5.97 kg). Ten-meter sprint test (10mST) and 30 meter sprint test (30mST) were applied to determine the sprint performance, counter movement jump (CMJ) test and squat jump (SJ) test were applied to determine the vertical jump of the soccer players. Normal distribution assessment of the data was carried by Shapiro-Wilk. All parametric data were evaluated by Pearson correlation test. All the statistical evaluation was carried out using SPSS 21 package program. There is a statistically positive relationship between 10m sprint–30m sprint and between CMJ–SJ ($p<0.001$). Sprint and jumping are of the key determinants of performance. The present study shows that 10m sprint has an effect on 30m sprint and CMJ has an effect on SJ. Consequently, this study suggests that both sprint and jumping should be of prime importance in trainings.

Key Words: 10 m Sprint, 30 m Sprint, Counter Movement Jump, Squat Jump

Futbolcularda Sürat ve Dikey Sıçrama Arasındaki İlişkinin İncelenmesi

Öz

Bu çalışmanın amacı futbolcularda sürat ve dikey sıçrama arasındaki ilişkiyi incelemektir. Bölgesel Amatör Ligde oynayan 25 sporcuya (n=25; yaş 27.04±3.16 yıl; boy uzunluğu 177±6.41 cm; vücut ağırlıkları 70.10 ± 5.97 kg) sürat ve dikey sıçrama testleri uygulanmıştır. Futbolcuların sürat performanslarını belirlemek için 10 metre sürat testi (10mST) ve 30 metre sürat testi (30mST), dikey sıçramalarını belirlemek için ise aktif sıçrama (AS) testi ve skuat sıçrama (SS) testi uygulanmıştır. Yapılan analizlerde verilerin normal dağılım değerlendirmeleri Shapiro-Wilk testi ile yapılmıştır. Parametrik nitelik taşıyan tüm veriler Pearson Korelasyon Testi ile değerlendirilmiştir. Tüm istatistiksel değerlendirmeler SPSS 21 paket programı yardımıyla yapılmıştır. Yapılan incelemede 10m sürat-30m sürat ile AS-SS değerleri arasında istatistiksel olarak pozitif yönde ilişki ($p<0.001$) tespit edilmiştir. Sonuç olarak, performansın en temel belirleyicilerinden olan sürat ile sıçrama özelliklerinin Bölgesel Amatör Lig futbolcularında 10m süratin 30m sürat ve AS'nin de SS üzerine etkili olduğu ve antrenman içeriklerinde hem sürat hem de sıçrama çalışmalarına gereken önemin verilmesi gerektiği düşünülmektedir.

Anahtar Kelimeler: 10 m Sürat, 30 m Sürat, Aktif Sıçrama, Skuat Sıçrama

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Introduction

Football is one of the most popular sport branches both in Turkey and the world. The key to the success in football is finding primarily the players who are suitable for the game and then increasing their performances (Günay, & Yüce, 2008, p. 221). As well as being predominantly aerobic, football is a sport consisting of intermittent, high intensity exercises which require a number of sprints and jumps in various periods of time. Therefore, lower extremity strength and sprint parameters are important performance components for a football player (Hazır et al., 2010, p. 146-153). For the success in football, the athlete's being faster than the rivals with or without a ball, jumping higher to control the balls in the air, staying muscularly stronger to tackle his opponent will always keep him one step ahead of his opponents. Therefore, superior physical and motor performance as well as skills and abilities are very important for forward-looking success expectations in footballers (Taşkın et al., 2015, p. 101-107).

Sprint is described in the literature with various definitions, and it is defined as the ability of man to move himself from one place to another at the highest speed, to make the particular movements as fast as possible and to move the body or a part of it quickly. Sprint is an innate trait and can be improved through proper training (Eniseler, 2010, p. 242-250). Achieving success in sports like football depends on the sprint of an athlete as well (Günay, & Yüce, 2008, p. 221). It is stated that football players sprint about 60 times for the distances between 5-40 m. during a match (Ziyagil, & İmamoğlu, 2000, p. 3-10). A football match analysis shows that sprints at short distances are run generally 17-81 times per game and represent 8-12% of the distance covered by the players (İmamoğlu et al., 2018, p. 913-918).

Jumping has an important role during defense and offense in football game and it is used a lot. On the other hand, while Squat jump (SJ) evaluates the transfer of maximal force (the highest force exhibited in one repetition), Active jump (AJ) gives information about the elastic and explosive force (a factor affecting accelerating performance) features of the muscle (Aşçı, 2009, p. 27-28).

Sprint and vertical jump height in football are considered a good indicator of anaerobic performance (Eniseler, 1995). Jumps, which are the indicators of anaerobic power, are one of the important factors affecting the performance of athletes in offense and defense. There is a strong relationship between the vertical jump and the competition performance (Karadenizli, 2016, p. 27-42). Both force and the sprint characteristics associated with force are critical factors affecting performance in football (Akyüz, 2017, p. 1256-1262). In order to evaluate lower extremity strength, active jump and squat jump tests are frequently preferred field tests (Cardinale et al., 2011, p. 259-277). Relationships among motor features have always attracted the researchers' attention. Therefore, studies aiming to improve the physical characteristics of football players are conducted and the performances of the players are investigated with the tests (Taşkın et al., 2015, p. 101-107).There exist many studies in the literature investigating the relationship between force and sprint performance in football. In some of these studies a relationship between sprint and force parameters was reported (McBridege et al., 2009, p. 1633-1636; Wisloff et al. 2004, p. 285-288) while no relationship was identified in others (Seyhan, 2019, p. 19-27; Özdemir, 2013, p. 43). It seems that there are contradictory findings on this subject and more studies are needed. Based on the information above, this study was conducted to determine the relationship between speed and vertical jump parameters in amateur football players.

Method

Sample

This research was carried out with a football team in Ankara Regional Amateur League and tested 25 football players in total whose mean age is 27.04±3.16 years, body height is 177±6.41 cm, body weight is 70.10±5.97 kg and body mass index is 22.12±1.56 kg/m². Ethics committee report was received from Bilecik Şeyh Edebali University Ethics Committee before the study started (2018/43). After all the volunteers were verbally informed prior to the study, their written informed consents were taken.

Measurements

Body Height Measurement. Body height of the players was measured using a stadiometer (Holtain, UK). The measurements were taken while the person's body weight was evenly distributed on both legs, with the head in the "Frankfort Horizontal Plan" position, with the arms on the side of the body, with the palms facing the legs and in bare feet (Akın et al., 2004, p. 161-167).

Body Weight Measurement. Body weight was measured by Tanita MC780 (Japan) brand body fat analyzer. Measurements were taken before breakfast, without any nutrients. Measurements were made while participants were wearing shorts and T-shirts. The metal parts of the platform that touch the hands and feet are wiped with a damp cloth after each player leaves the platform (Işın, & Melekoğlu, 2019, p. 80-86).

"Squat and active jump" test protocols have been applied in order to determine the jumping skills of the volunteers. Squat jump was performed by using two feet together while the hands are on hips. The test started with the command given to the athlete when he was in an upright position on the contact mat and switched to the half squat (90^0 knee joint angle) position. After the athlete waited in this position for at least 3 seconds, he performed the maximal vertical jump. The measurement method used for the active jump is the same as the one used in the squat jump. Nevertheless, in the active jump, the athlete performed the maximal vertical jump without waiting in the half squat position. During the performance of both jumps, the position of the hands on the hip was maintained and in this position the jump was made on both legs to the highest possible point. Volunteers made 3 trials in both jumps and the highest of these measurements was taken (Köklü et al., 2009, p. 61-68). Active jump and squat jump parameters were measured with the Fusion Sports Smart Jump Professional Performance, Chicago/USA device.

Sprint Tests. Transition times of 10m and 30m were measured with a stopwatch system with a precision of ±0.0l by using the photocell 'Fusion Sports Smart Speed Professional Performance, Chicago/USA' (Köklü et al., 2009, p. 61-68).

Statistical Analysis

After the descriptive statistics of the volunteers were calculated, performance values of athletes was evaluated by Shapiro-wilk test in order to check whether the data showed a normal distribution and variance homogeneities were evaluated by Levene test. All the parametric data were evaluated by Pearson Correlation Test. Statistical data were calculated with the help of SPSS 21 Package program. Significance value was taken as $p < 0.05$.

Findings

Table 1. *Physical Properties of Football Players*

Variables	$\bar{x}\pm sd$
Age (year)	27.04±3.16
Body Height (cm)	177±6.41
Body Weight (kg)	70.10±5.97
Body mass index (kg/m²)	22.12±1.56

When Table 1 is examined, the average age, body height, body weight and body mass index of football players (n: 25) are respectively 27.04±3.16 years; 177±6.41 cm; 70.10±5.97 kg; 22.12±1.56 kg/m².

Table 2. *Physiological Values of Football Players Participating in the Research*

Variables	*n*	$\bar{x}\pm ss$
Active Jump (cm)	25	39.30±4.53
Squat Jump (cm)	25	36.84±4.81
10m Speed (sec)	25	1.61±0.11
30m Speed (sec)	25	4.08±0.18

$\bar{x}$: mean value, sd: standard deviation

When Table 2 is analyzed, it is determined that the average of the active jump values of the football players participating in the research is 39.30±4.53 cm, the average of squat jump values is 36.84±4.81 cm, the average of 10m speed values is 1.61±0.11 sec. and the average of 30m speed values is 4.08±0.18 cm.

Table 3. *The Relationship Between Speed and Vertical Jumping Values of Football Players Participating in the Research*

Variables		*Active Jump (cm)*	*Squat Jump (cm)*	*10m Sprint (sec)*	*30m Sprint (sec)*
Active Jump (cm)	**r**	1	0.820	-0.125	-0.325
	p		0.000*	0.553	0.112
Squat Jump (cm)	**r**	0.820	1	-0.067	-0.303
	p	0.000*		0.749	0.141
10m Sprint (sec)	**r**	-0.125	-0.067	1	0.614
	p	0.553	0.749		0.001*
30m Sprint (sec)	**r**	-0.325	-0.303	0.614	1
	p	0.112	0.141	0.001*	

* p<0,05

Table 3 demonstrates a strong positive correlation between active jump and squat jump values [r (25) = 0.820; p <0.000]; and a moderate positive correlation between 10m sprint and 30m sprint values [r (25) = 0.614; p <0.001].

Discussion

The aim of this study was to examine the relationship between speed and vertical jump in football players. The active jump average of the players is 39.30±4.53 (cm), the average of squat jump is 36.84±4.81 (cm), the average sprint of 10m is 1.61±0.11 (sec), and the average sprint of 30m is 4.08±0.18 (sec) (Table 2). A strong positive correlation was determined between active jump and squat jump values of football players participating in the current research (p <0.05), and a moderate positive correlation was obtained between 10m sprint and 30m sprint values, (p <0.05). No correlation was attained between sprint and jump parameters (Table 3).

According to the findings in the literature, the level of relationship between power and sprint performance is influenced by the type of experimental groups, the sprint distance, and the type of movement being considered. Results of the previous studies investigating the relationship between speed skill and jumping skill (vertical) differ from one another (Çolak et al., 2017, p. 1-12).

In their work with footballers, both Seiler et al. (1990, p. 9-15) and Brechue et al. (2010, p. 1169-1178) found a weak correlation between vertical jump and sprint parameters. Yitik (2018, p. 50-54) discovered in his study that there was a significant weak-moderate negative correlation between active jump and squat jump and 10 m acceleration and 30 m maximal sprint values. In another study, Los Arcos et al. (2017, p. 22-29) examined the jumping, acceleration and direction change motor abilities of 42 male footballers playing in the 2nd and 3rd leagues. They found a moderate correlation between squat jump and 5m, 10m and 15m acceleration tests, and a medium-strong correlation between 5m, 10m and 15m acceleration tests and active jump.

Cerrah et al. (2011, p. 1-6), in their study of amateur footballers, determined that 10m and 30m sprint values did not differ between positions in leg strength and vertical jump characteristics. On the other hand, Chelly et al. (2010, p. 266-271) could not find a significant relationship between the regional youth football team vertical jump performance and 5m and 10m speed runs. Göral (2014) also found the relationship between two variables not significant in his study on sprint speed and vertical jump in footballers.

However, Wisloff et al. (2004, p. 285-288) found a significant relationship between the Norwegian national football team's vertical jump and 10m to 30m sprint skills. Yelken et al. (2018, p. 85-90) stated that while there is no relationship between active and passive jump and 5m sprint and 10m sprint in football players who play in the 2nd League, there exists a relationship in the case of 30m sprint.

Football is an aerobic-based anaerobic sport that includes jumps, head shots, turns, runs with direction changes, runs and sprints at different tempo, walks, tackles, ball control against defensive pressure, sliding tackles and ball movements. The fact that there are so many and a complex movement in it, performance in football is affected by many factors (Aslan, & Ersöz, 2012, p. 89-96).

Undoubtedly, vertical jumping ability in football is one of the most important basic features of it. This feature provides great advantage in offensive or defensive head shots. Additionally, it is necessary for the coach to determine that there is a certain limit for the player to increase the unit strength and where the limit is.

Sprint and jumping are of the key determinants of performance. The present study indicates that in the Regional Amateur League players, 10m sprint has an influence on 30m sprint and AJ has an effect on SJ. Consequently, it is concluded that the necessary emphasis should be placed on both speed and jumping in the training contents.

Ethical Declaration

In the writing process of the study titled *"The Examination of the Relationship between Sprint and Vertical Jump in Soccer Players"*, there were followed the scientific, ethical and the citation rules; was not made any falsification on the collected data and this study was not sent to any other academic media for evaluation. Ethics committee report was received from Bilecik Şeyh Edebali University Ethics Committee before the study started (2018/43).

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TÜRKÇE GENİŞ ÖZET

Dünyada ve Türkiye'de futbol, en sevilen popüler spor dallarından birisidir. Futbolda başarıya giden yolun anahtarı öncelikle futbol için uygun olan oyuncuların bulunması ve bu oyuncuların performansının artırılmasına bağlıdır (Günay ve Yüce, 2008). Futbol, büyük bölümü aerobik olmakla beraber, değişik sürelerde çok sayıda sprint ve sıçrama gerektiren hareketler içeren yüksek şiddette, kesintili egzersizlerden oluşan bir spordur. Bu nedenle alt ekstremite kuvveti ve sürat parametreleri futbol oyuncusu için önemli performans bileşenleridir (Hazır vd., 2010). Futbolda başarı için sporcunun, toplu ya da topsuz rakiplerinden daha süratli olması, yüksekten gelen toplarda daha yükseğe sıçraması, ikili mücadelelerde kassal olarak daha güçlü kalması, onu her zaman rakiplerinden bir adım önde tutacaktır. Bu yüzden futbolcularda ileriye dönük başarı için, beceri ve yeteneğin yanında üstün fiziksel ve motorsal performans çok önemli bir yere sahiptir (Taşkın vd., 2015). Sıçrama futbol oyununda savunma ve hücum esnasında önemli yer tutmaktadır ve çok fazla kullanılmaktadır. Diğer yandan futbolcuların Skuat sıçrama (SS) maksimal kuvvetin (bir tekrarda ortaya konulan en yüksek kuvvet) patlayıcı kuvvete aktarımını değerlendirirken, aktif sıçrama (AS) kasın elastik ve patlayıcı kuvvet (hızlanma performansını etkileyen bir faktör) özellikleri hakkında bilgi vermektedir (Aşçı, 2009, s. 27-28). Futbolda sürat ve dikey sıçrama yüksekliği, anaerobik performansın iyi bir göstergesi olarak kabul edilmektedir (Eniseler, 1995, s. 3-5). Alt ekstremite gücünü değerlendirebilmek için aktif sıçrama ile skuat sıçrama testleri sıklıkla tercih edilen saha testlerindendir (Cardinale vd., 2011, s. 259-277). Motorsal özellikler arasındaki ilişkiler her zaman araştırmacıların ilgisini çekmiştir. Bu yüzden futbolcuların fiziksel özelliklerini geliştirmeyi hedefleyen çalışmalar yapılmaktadır ve yapılan testlerle oyuncuların performansları araştırılmaktadır (Taşkın vd., 2015, s. 101-107). Bu çalışmanın amacı, futbolcularda sürat ve dikey sıçrama arasındaki ilişkiyi incelemektir. Bölgesel Amatör Ligde oynayan 25 sporcuya (n=25; yaş 27.04±3.16 yıl; boy uzunluğu 177±6.41 cm; vücut ağırlıkları 70.10 ± 5.97 kg) sürat ve dikey sıçrama testleri uygulanmıştır. Çalışma başlamadan önce Bilecik Şeyh Edebali Üniversitesi Etik Kurulu'ndan etik kurul raporu alınmıştır (2018/43). Tüm gönüllüler çalışmaya alınmadan önce sözel olarak bilgilendirildikten sonra, yazılı olarak aydınlatılmış onamları alınmıştır. Futbolcuların sürat performanslarını belirlemek için 10 metre sürat testi (10mST), ve 30 metre sürat testi (30mST), dikey sıçramalarını belirlemek için ise aktif sıçrama (AS) testi ve skuat sıçrama (SS) testi uygulanmıştır. Yapılan analizlerde verilerin normal dağılım değerlendirmeleri Shapiro-Wilk testi ile yapılmıştır. Parametrik nitelik taşıyan tüm veriler Pearson Korelasyon Testi ile değerlendirilmiştir. Tüm istatistiksel değerlendirmeler SPSS 21 paket programı yardımıyla yapılmıştır. Futbol oyuncularının (n:25) yaş, boy uzunluğu, vücut ağırlığı ve vücut kitle indeksi ortalamalarının sırasıyla 27.04±3.16 yıl; 177±6.41 cm; 70.10±5.97 kg; 22.12±1.56 kg/m² olduğu görülmektedir (Tablo 1). Futbolcuların aktif sıçrama ortalaması 39.30±4.53 (cm), skuat sıçrama ortalaması 36.84±4.81 (cm), 10m sürat ortalaması 1.61±0.11 (sn), 30m sürat ortalaması 4.08±0.18 (sn) olarak tespit edilmiştir (Tablo 2). Araştırmamıza katılan futbolcuların aktif sıçrama ile skuat sıçrama değerleri arasında pozitif yönde yüksek düzeyde ilişki $p<0.05$; 10m sürat ile 30m sürat değerleri arasında ise pozitif yönde orta düzeyde ilişki $p<0.05$ tespit edilmiştir. Sürat ve sıçrama parametreleri arasında ise ilişki bulunamamıştır (Tablo 3). Literatürdeki bulgulara göre güç ve sprint performansı arasında ilişki düzeyi, deney gruplarının türü, sprint mesafesi ve ele alınan hareket türünden etkilenmektedir. Sürat becerisi ile sıçrama (dikey) becerisi arasındaki ilişkiyi inceleyen araştırma sonuçları birbirleri ile farklılıklar göstermektedir (Çolak vd., 2017). Literatürdeki bulgulara göre güç ve sprint performansı arasında ilişki düzeyi, deney gruplarının türü, sprint mesafesi ve ele alınan hareket türünden etkilenmektedir. Sürat becerisi ile sıçrama (dikey) becerisi arasındaki ilişkiyi inceleyen araştırma sonuçları birbirleri ile farklılıklar göstermektedir (Çolak vd., 2017, s. 1-12). Hem Seiler vd. (1990), hem de Brechue vd. (2010) futbolcularla yaptıkları çalışmalarında dikey sıçrama ile sürat parametreleri arasında

zayıf ilişki bulmuşlardır. Yitik (2018) yaptığı çalışmada, aktif sıçrama ve skuat sıçrama ile 10 m ivmelenme ve 30 m maksimal hız değerleri arasında negatif yönde anlamlı zayıf-orta bir ilişki olduğunu tespit etmiştir. Los Arcos vd. (2017) 2. ve 3. Ligde oynayan 42 erkek futbolcuda sıçrama, ivmelenme ve yön değişim motor yeteneklerini inceledikleri çalışmada, skuat sıçrama ile 5m, 10m ve 15m ivmelenme testleri arasında orta korelasyon tespit ederken, aktif sıçrama ile 5m, 10m ve 15m ivmelenme testlerinde yine orta-güçlü korelasyon tespit etmişlerdir. Diğer taraftan Chelly vd. (2010) bölgesel genç futbol takımı dikey sıçrama performansı ve 5m ve 10m sürat koşuları arasında anlamlı bir ilişki bulamamışlardır. Göral (2014) da futbolcularda sprint sürati ve dikey sıçramayı değerlendirmeye yönelik yaptığı çalışmada, iki değişken arasındaki ilişkiyi anlamsız bulmuştur. Futbolda şüphesiz ki, dikey sıçrama yeteneği, en önemli temel özelliklerden birisidir. Bu özellik, hücumda veya defansta kafa vuruşlarında büyük avantaj sağlamaktadır. Futbolcunun, birim kuvvetini arttırmasında belirli bir sınır olduğunu ve sınırın neresi olduğunun da antrenör tarafından tayin edilmesi gerekmektedir. Sonuç olarak, performansın en temel belirleyicilerinden olan sürat ile sıçrama özelliklerinin Bölgesel Amatör Lig futbolcularında 10m süratin 30m sürat ve AS'nin de SS üzerine etkili olduğu ve antrenman içeriklerinde hem sürat hem de sıçrama çalışmalarına gereken önemin verilmesi gerektiği düşünülmektedir.