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Evaluation of fms, dynamic balance and jump performance in faculty of sports sciences students

Gamze ERİKOĞLU ÖRER[1], Seyfullah ÇELİK[1], Burak Alperen ÜNSAL[3], Büşra YILMAZ[1], İpek AKINCI[2], Salih ÇABUK[2]

[1]Ankara Yıldırım Beyazıt University, Faculty of Sports Sciences, Ankara, Turkiye
[2]Ankara Yıldırım Beyazıt University, Institute of Health Sciences, Ankara, Turkiye
[3]Ege University, Faculty of Sports Sciences, İzmir, Turkiye

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Abstract

The aim of this study was to investigate whether there is a difference between the Functional Movement Screening (FMS), dynamic balance and drop jump values of male and female athletes and non-athletes. 41 athletes (23 male and 18 female) and 27 non-athletes (14 male and 13 female) participated in this study. FMS, Y balance, 40 and 50 cm drop jump tests values of participants were collected, respectively. Data were analyzed by using SPSS 22.0 statistical program. Two Independent Samples t-test was used to analyze the differences between groups. Comparisons of athlete male-female groups demonstrated significant differences in terms of FMS, 40-50 cm height, flight times, power, Reactive Strenght Index (RSI) and 50 cm ground contact times, that of non-athlete male-female indicated significant differences in regard to right leg Y Balance Test Composite Scores, 40-50 cm jumping height, flight times, power and RSI values. Moreover, there are significant differences in terms of FMS scores in athlete-nonathlete female groups ($p<0.05$). Regardless of sportiveness, significant differences were found in 40-50 cm jumping height, flight times, power, RSI, contact times between genders. FMS scores can serve as a guide for long-term athlete development and injury prevention programs.

Keywords: Dynamic balance, functional motion analysis, jump performance.

Spor bilimleri fakültesi öğrencilerinin fms, dinamik denge ve sıçrama performanslarının değerlendirilmesi

Öz

Bu çalışmanın amacı, erkek ve kadın sporcular ile spor yapmayan bireyler arasında Fonksiyonel Hareket Analizi (FMS), dinamik denge ve derinlik sıçrama değerleri arasında bir fark olup olmadığını incelemektir. Çalışmaya, sırasıyla; toplam 41 sporcu (23 erkek ve 18 kadın) ve spor yapmayan 27 birey (14 erkek ve 13 kadın) katıldı. Katılımcıların FMS, Y denge, 40 ve 50 cm derinlik sıçrama testi verileri toplandı. Veriler SPSS 22.0 istatistik programı kullanılarak analiz edildi. Gruplar arasındaki farkları analiz etmek için İki Bağımsız Örneklem t-testi kullanıldı. Bulgular incelendiğinde; spor yapan erkek-kadın gruplarda FMS ve 40-50 cm sıçrama yüksekliği, havada kalış süresi, güç, Reaktif Kuvvet İndeksi (RSI), 50 cm temas süresi değerlerinin; erkek-kadın spor yapmayan gruplarda sağ bacak Y denge testi kompozit skor, 40-50 cm sıçrama yüksekliği, havada kalış süresi, güç, RSI, temas süresi değerlerinin; kadın spor yapan-yapmayan gruplarda ise FMS değerlerinin istatistiksel olarak anlamlı farklılıklar gösterdiği tespit edilmiştir ($p<0,05$). Spor yapma durumundan bağımsız olarak cinsiyetler arasında 40-50 cm sıçrama yüksekliği, havada kalış, güç, RSI ve temas süreleri açısından önemli farklılıkların olduğu tespit edilmiştir ($p<0,05$). FMS skorları, uzun vadeli sporcu gelişimi ve sakatlık önleme programları için bir rehber niteliği taşıyabilir.

Anahtar Kelimeler: *Dinamik denge, fonksiyonel hareket analizi, sıçrama performansı.*

Sorumlu Yazar/ Corresponded Author: Gamze ERİKOĞLU ÖRER, **E-posta/ e-mail:** basketball.08@hotmail.com
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INTRODUCTION

Balance, which forms the foundation of nearly all human movements, enables a person to maintain the desired position against gravity and interact with their surroundings (Acar & Genç, 2019; Garcia et al., 2021). Through the ability to maintain balance, humans can devise solutions to disturbances arising from changes in the center of gravity within the body (Atar et al., 2015). In sports activities, proper balance is important to avoid injuries. It is also important to have a good control of balance in order for the athlete to demonstrate superior sporting abilities in training and competitions (Sucan et al., 2005; Atar et al., 2015; Atalay Güzel et al., 2022). If a healthy athlete is identified as having poor balance in advance, various preventive measures can be taken to prevent various injuries. Evaluating balance in athletes can be beneficial, as poor balance can have negative effects on some sports skills (Panjan & Sarabon, 2010). Poor balance is considered an indicator of neuromuscular control deficiency and movement quality inadequacies in physical activity and sports (Kramer et al., 2019). Balance is highly important for most activities, ranging from sports-related activities to daily routines (Harshbarger et al., 2018). Low dynamic balance is associated with a high risk of injury (Butler et al., 2013; Teyhen et al., 2014; Engquist et al., 2015). Authors such as Hewet et al. (2006), Kiesel et al. (2007) and Mc Guine et al. (2000) have defined balance as a controllable risk factor. Furthermore, dynamic balance is also linked to performance. To assess balance disorders that can affect performance, both in team and individual sports, as well as disorders stemming from past injuries and injury risks, numerous balance tests have been developed (Lockie et al., 2015; Fusco et al., 2020). However, these devices are often expensive, time consuming and inaccessible. The Y dynamic balance test is an inexpensive, easily portable and simple test battery that can be applied by a variety of health professionals to evaluate movement patterns, asymmetry, coordination, neuromuscular control, strength and to identify individuals at risk of injury, in addition to measuring athletes' performance (Olmsted et al., 2002; Plisky et al., 2006; Hale et al., 2007; Sipe et al., 2019). The implementation of the Y-balance test protocol takes only about 5 minutes after adequate warm-up and preparation. This makes the test easily applicable in large groups (Butler et al., 2013; Engquist., 2015; Smith et al., 2015). Numerous studies have applied the Y-balance test to a wide range of populations, including team athletes, individual athletes, and non-athletic individual (Plisky et al., 2006; Butler et al., 2013; Engquist et al., 2015; Lockie et al., 2015; Smith et al., 2015; Chimera et al., 2015; Kelleher et al., 2017; Sipe et al., 2019; Misegades et al., 2020). Functional Movement Screen (FMS) is a test battery designed to determine potential injury risks and assess movement asymmetry and quality (Davis et al., 2020). FMS includes lower-extremity-focused tests such as the deep squat, hurdle step, active leg raise, and in-line lunge, which help identify movement disorders that affect versatile movements like sprinting and jumping, crucial for team sports (Lockie et al., 2015). Additionally, it incorporates movements related to balance-dependent motor skills, such as trunk stability push-ups, shoulder mobility, and rotation stability (Silva et al., 2019). When examining FMS total scores, several studies have indicated that athletes with a total score ≤14 are at a higher risk of injury (Beardsley & Contreras, 2014; Mokha et al., 2016; Del Vecchio et al., 2016; Bonazza et al., 2017; Smith et al., 2017; Scudamore et al., 2020). The FMS test battery has been used across a diverse range of populations, including rugby players, American football players, golfers, firefighters, soccer players, basketball players, MMA fighters, cricket players, surfers, wushu athletes, Jiu-Jitsu practitioners, hockey players, as well as university and high school student (Minick et al., 2010; Parchmann & McBride, 2011; Frost et al., 2012; Parenteau et al., 2014; Bodden et al., 2015; Mokha et al., 2016; Gnacinski et al., 2016; Del Vecchio et al., 2016; Bonazza et al., 2017; Smith et al., 2017; Martin et al., 2017; Silva et al., 2017; Marques et al., 2017; Armstrong & Greig, 2018; Lisman et al., 2018; Attwood et al., 2019; Lee et al., 2019; Medeiros et al., 2019; Bond et al., 2019; Shimoura et al., 2019; Kramer et al., 2019; Jones et al., 2020; Wang et al., 2021; Lisman et al., 2021). The FMS serves various purposes, including assessing individuals physical performance, identifying movement disorders, predicting injury risks in different body regions, detecting asymmetry and imbalance and evaluating agility and flexibility (Minick et al., 2010; Parchmann & McBride, 2011; Frost et al., 2012; Gribble et al., 2013; Bodden et al., 2015; Mokha et al., 2016; Del Vecchio et al., 2016; Gnacinski et al., 2016; Smith et al., 2017; Marques et al., 2017; Martin et al., 2017; Silva et al., 2017; Armstrong & Greig, 2018; Lisman et al., 2018; Lee et al., 2019; Medeiros et al., 2019; Bond et al., 2019; Shimoura et al., 2019; Attwood et al., 2019; Scudamore et al., 2020; Jones et al., 2020; Wang et al., 2021; Lisman et al., 2021). In a study 2010 on 40 university-level female and male athletes, it was mentioned that FMS can be easily applied to trained individuals. Furthermore, they discussed the possibility of implementing exercise intervention programs for areas with identified functional movement impairments to prevent injuries in those specific regions (Peng et al., 2017). In a study 2019 on 56 high school female and male athletes, it was suggested that the application of a multi-area test like FMS could serve as the initial step in injury prevention strategies and long-term athlete development programs (Kramer et al., 2019). In a study 2017 on 150 American football players, including middle school, high school, and university students, they emphasized the importance of establishing normative values for FMS tests based on the level of play in American football (Lisman et al., 2018). They also mentioned that FMS scores could serve as a guide for both performance enhancement and injury prevention programs. FMS expert Cook Gray, in a book he authored in 2004, stated, The inability of an individual to perform any movement correctly on the test can provide us with key information about reducing the risk of chronic injuries, enhancing overall sports performance, and designing appropriate training and rehabilitation programs (Gray, 2004). Although they are more intense, plyometric exercises lead to less fatigue. Compared to traditional exercises, they also result in greater strength gains at the end of training sessions (Bridgeman et al., 2017). Depth jumps, which involve controlled descent from a high platform followed by an immediate maximal effort jump upon landing, are considered one of the most popular plyometric exercises (Peng et al., 2017). The use of depth jump training in a workout regimen leads to improvements in sprint performance, jump performance, strength, and agility. Therefore, depth jump training sessions are considered a valuable option for strength and conditioning coaches (Bridgeman et al., 2017). When reviewing the literature, it has been observed that many studies are conducted on athlete populations, and there is a lack of literature regarding comparisons between individuals who engage in sports and those who do not. Furthermore, in the literature, there is limited research on the combined use of depth jump, dynamic balance performance, and the FMS test battery, and the existing studies have been conducted on athlete populations and utilized different test batteries. With this study, the aim is to conduct analyses of functional movement, dynamic balance, and vertical jump performance. The obtained values will be compared not only between groups of individuals who do and do not engage in sports but also between male and female groups, contributing to the literature (Kramer et al., 2019).

METHOD

Research group (population-sample)

A total of 23 active male athletes in various sports disciplines (age=21.39±2.44; height=179.87±7.41; body weight=73.69±10.30) formed the male group actively engaged in sports. Additionally, there were 18 female participants (age=20.56±1.75; height=164.17±6.37; body weight=58.71±9.80) who did not engage in sports, constituting the female group not involved in sports. Furthermore, 14 males (age=21.79±1.18; height=179.00±5.24; body weight=71.30±10.69) ve who did not actively participate in any sports and 13 females (age=20.69±1.49; height=163.23±6.76; body weight=60.33±9.35) who were similarly not involved in sports constituted the male and female groups not engaged in sports, respectively (Table 1).

Data collection tools

Participants were verbally informed about the research. Informed Consent Forms, containing information about the purpose and methods of the study, were signed by the participating students. To determine whether participants had any known musculoskeletal injuries and to ensure their voluntary participation in the research, a "Participant Information and Measurement Form" was used. Measurement of Height, Body Weight, Body Mass Index (BMI), and Body Fat Percentage: The participants' heights were measured with ±1mm precision using a Holtain brand stadiometer from the UK. A Tanita brand body composition analyzer was used to measure body weight, Body Mass Index (BMI), and body fat percentage with an accuracy of 100 grams. Measurements were taken with participants barefoot and wearing sports attire in an anatomical position. Prior to the tests, a warm-up program consisting of jogging and dynamic stretching was implemented (Atan, 2019; Çelik & Örer, 2023)

Y Dynamic Balance Lower Extremity Application Protocol: In the implementation of the Y dynamic balance test for the lower extremities, application protocols used in previous research studies in the literature were taken into consideration. Access was provided for both the right and left lower extremities separately for the Y dynamic balance test. Sportswear was used to ensure that movements could be performed comfortably without any constraints. Before the test, all procedures were explained to the participants. Furthermore, for better understanding, the procedures were demonstrated by the researcher. Participants practiced reaching with one foot on both the right and left sides once. At the beginning of the test, one of the participant's feet was positioned at the center point with hands on the hips to maintain balance in a stable manner. The foot on which the test was applied was positioned anteriorly on a block. Participants were instructed to maintain a stable posture and avoid any swaying. Subsequently, they were asked to drag the blocks in each reaching direction to the farthest distance possible. After completing three reaches in each direction, they returned to the starting point and position for new reaches. A total of three reaches were performed in each reaching direction. The average of the reaches was recorded in centimeters for evaluation. The following formula was used for data normalization and determining composite scores (Türkeri et al., 2020; Ödemiş & Çelik, 2021).

$$\text{Score}= \frac{\text{Anterior} + \text{Posteromedial} + \text{Posterolateral}}{3 \times \text{Leg Length}} \times 100$$

Figure 1. Lower extremity dynamic balance composite score formula

The 40-50 cm vertical jump tests were conducted using the Microgate-Optojump measurement device, which has been validated and shown positive results in terms of validity and reliability. Prior to both tests, participants were verbally and visually briefed. Participants first climbed onto a 40 cm box and, when they felt ready, they placed their hands on their hips and dropped to the ground, immediately performing a vertical jump as high as possible upon landing. Following this jump, participants were given a 10-minute rest period, after which the same procedures were repeated using 50 cm boxes. Any deviation of the hands from the hips, opening or pulling of the knees or feet upwards or sideways was considered an error, and the test was repeated. Measurements were taken twice with a 3-minute interval, and the highest jump height was recorded. The measurements were performed on a hard surface, with participants wearing soft sports shoes. The values obtained from these tests are presented in Table 5 and Table 6 (Glatthorn et al., 2011).

Functional Movement Analysis (FMS): In functional movement analyses, the Functional Movement Test Battery developed by Gray Cook was used (Cook et al., 2014). The Functional Movement Test Battery consists of 7 movement tests and 3 control tests. The movement tests are as follows: Deep Squat, Hurdle Step, Inline Lunge, Shoulder Mobility, Active Straight-Leg Raise, Trunk Stability Push-Up, and Rotary Stability. The evaluation of the FMS test was based on the scores participants obtained from these 7 movements. Test scores were assessed on a scale of 0-3, where 0 points were given when pain was felt during the movement, 1 point when the movement could not be completed, 2 points when the movement was completed with deficiencies, and 3 points when the movement was completed in full. Participants were given three attempts to complete the movement as effectively as possible (Dorrel et al., 2015).

Data collection/processing method

Ethical approval for the study was obtained by applying to the Ankara Yıldırım Beyazıt University Health Sciences Ethics Committee, and approval was granted under reference number 2022-782 on March 25, 2022.

Data analysis

The SPSS 22 software package was used for statistical procedures. The normality of the data was examined using skewness and kurtosis coefficients, and it was determined that the skewness and kurtosis values for each variable were between -3 and +3. This indicates that the data were normally distributed, allowing for the application of parametric tests (Jondeau, 2003; Kalaycı, 2010). After confirming that the data were normally distributed, Independent Samples t-tests were conducted to determine whether there was a significant difference between the groups. Cases where the p-value was less than 0,05 were considered statistically significant.

FINDINGS

Descriptive statistical findings of the participants consisting of arithmetic mean, standard deviation, minimum and maximum values are presented in Table 1.

Table 1. Descriptive statistics of participants

Parameter	Group	N	Min.	Max.	Mean ± SD
Age	Male Sports	23	19	31	21.39 ± 2.44
	Male Non-Sports	14	20	24	21.79 ± 1.18
	Female Sports	18	19	26	20.56 ± 1.75
	Female Non-Sports	13	19	24	20.69 ± 1.49
Height	Male Sports	23	166	200	179.87 ± 7.41
	Male Non-Sports	14	169	187	179.00 ± 5.24
	Female Sports	18	150	180	164.17 ± 6.37
	Female Non-Sports	13	153	175	163.23 ± 6.76
Weight	Male Sports	23	55.9	92.9	73.69 ± 10.30
	Male Non-Sports	14	49.2	84.3	71.30 ± 10.69
	Female Sports	18	42.3	78.4	58.71 ± 9.80
	Female Non-Sports	13	45.7	80.0	60.33 ± 9.35
BMI	Male Sports	23	16.9	25.9	22.48 ± 2.39
	Male Non-Sports	14	17.2	24.6	21.67 ± 2.32
	Female Sports	18	15.7	26.3	21.39 ± 2.71
	Female Non-Sports	13	18.8	26.1	22.53 ± 2.56
Body Fat (%)	Male Sports	23	3.0	29.1	11.55 ± 6.69
	Male Non-Sports	14	3.0	21.8	10.72 ± 5.13
	Female Sports	18	18.0	33.0	22.03 ± 5.58
	Female Non-Sports	13	12.5	30.4	22.96 ± 6.12

BMI = Body Mass Index, SD = Standard Deviation

The analyses related to whether there is a difference between groups were given in Table 2, Table 3, Table 4, Table 5 and Table 6.

Table 2. Comparison of FMS total scores by gender and sports status

Variable	Group	N	Mean ± SD	t	p
FMS Total Score	Male Sports	23	11.91 ± 2.72	0.338	0.73
	Male Non-Sports	14	11.64 ± 1.55		
	Female Sports	18	13.61 ± 2.20	2.69	0.01*
	Female Non-Sports	13	11.54 ± 1.98		
	Male Sports	23	11.91 ± 2.73	-2.14	0.03*
	Female Sports	18	13.61 ± 2.20		
	Male Non-Sports	14	11.64 ± 1.55	0.15	0.88
	Female Non-Sports	13	11.54 ± 1.98		

*=p<0.05 FMS = Functional Movement Screen, SD = Standard Deviation

FMS total score means were significantly higher in the female sports group compared to the female non-sports group (Table 2) (13.61±2.20-11.54±1.98; p=0.01). In addition, FMS total score value means were significantly higher in the female sports group compared to male sports group (Table 2) (13.61±2.20-11.91±2.73; p=0.03). There were no significant differences in other comparisons that related to FMS total scores (p>0.05).

Table 3. Comparison The comparisons of the y balance test values between individuals of the same gender

Variable	Group	N	Mean ± SD	t	p
Right Leg YBTA	Male Sports	13	72.85 ± 8.50	-0.260	0.797
	Male Non-Sports	8	73.88 ± 9.26		
Right Leg YBTPM	Male Sports	13	99.85 ± 12.81	0.284	0.779
	Male Non-Sports	8	98.00 ± 16.91		
Right Leg YBTPL	Male Sports	13	89.38 ± 14.25	-0.749	0.463
	Male Non-Sports	8	93.75 ± 10.41		
Right Leg YBTC	Male Sports	13	154.77 ± 11.81	-1.397	0.179
	Male Non-Sports	8	163.88 ± 18.21		
Left Leg YBTA	Male Sports	13	75.54 ± 8.60	0.347	0.732
	Male Non-Sports	8	74.13 ± 9.7		
Left Leg YBTPM	Male Sports	13	97.08 ± 13.40	-0.258	0.799
	Male Non-Sports	8	98.75 ± 16.00		
Left Leg YBTPL	Male Sports	13	88.00 ± 10.80	0.099	0.922
	Male Non-Sports	8	87.50 ± 12.01		
Left Leg YBTC	Male Sports	13	159.62 ± 18.94	-0.483	0.635
	Male Non-Sports	8	164.00 ± 22.23		
Right Leg YBTA	Female Sports	16	76.88 ± 5.58	0.678	0.504
	Female Non-Sports	10	75.20 ± 6.94		
Right Leg YBTPM	Female Sports	16	98.00 ± 10.29	0.814	0.423
	Female Non-Sports	10	94.40 ± 12.00		
Right Leg YBTPL	Female Sports	16	88.50 ± 12.53	0.441	0.663
	Female Non-Sports	10	86.50 ± 8.67		
Right Leg YBTC	Female Sports	16	155.38 ± 17.45	1.507	0.145
	Female Non-Sports	10	145.30 ± 15.01		
Left Leg YBTA	Female Sports	16	77.63 ± 11.14	0.332	0.742
	Female Non-Sports	10	76.30 ± 7.33		
Right Leg YBTPM	Female Sports	16	98.63 ± 11.09	0.836	0.411
	Female Non-Sports	10	94.60 ± 13.27		
Right Leg YBTPL	Female Sports	16	94.19 ± 16.46	-0.167	0.869
	Female Non-Sports	10	95.30 ± 16.58		
Left Leg YBTC	Female Sports	16	158.94 ± 10.96	0.558	0.582
	Female Non-Sports	10	156.30 ± 10.91		

*=$p<0.05$ YBTA = Y Balance Test Anterior, YBTPM = Y Balance Test Posteromedial, YBTPL = Y Balance Test Posterolateral, YBTC = Y Balance Test Composite, SD = Standard Deviation

There were no significant differences between the mean values of Right and Left Leg YBTA, YBTPM, YBTPL and YBTC among individuals of the same gender ($p>0.05$). The reason that why no difference was found may be that all participants were students of the Faculty of Sport Sciences and that the participants in all groups developed similar dynamic balance abilities due to the exercise lessons.

Table 4. Comparisons of Y Balance Test values between ındividuals of different gender

Variable	Group	N	Mean ± SD	t	p
Right Leg YBTA	Male Sports	13	72.85 ± 8.50	-1.534	0.137
	Female Sports	16	76.88 ± 5.58		
Right Leg YBTPM	Male Sports	13	99.85 ± 12.81	0.430	0.670
	Female Sports	16	98.00 ± 10.29		
Right Leg YBTPL	Male Sports	13	89.38 ± 14.25	0.178	0.860
	Female Sports	16	88.50 ± 12.53		
Right Leg YBTC	Male Sports	13	154.77 ± 11.81	-0.107	0.916
	Female Sports	16	155.38 ± 17.45		
Left Leg YBTA	Male Sports	13	75.54 ± 8.60	-0.554	0.584
	Female Sports	16	77.63 ± 11.14		
Left Leg YBTPM	Male Sports	13	97.08 ± 13.40	-0.341	0.736
	Female Sports	16	98.63 ± 11.09		
Left Leg YBTPL	Male Sports	13	88.00 ± 10.80	-1.216	0.235
	Female Sports	16	94.19 ± 16.46		
Left Leg YBTC	Male Sports	13	160.38 ± 18.13	0.253	0.803
	Female Sports	16	158.94 ± 10.96		
Right Leg YBTA	Male Non-Sports	8	73.88 ± 9.26	-0.347	0.733
	Female Non-Sports	10	75.20 ± 6.94		
Right Leg YBTPM	Male Non-Sports	8	98.00 ± 16.91	0.529	0.604
	Female Non-Sports	10	94.40 ± 12.00		
Right Leg YBTPL	Male Non-Sports	8	93.75 ± 10.41	1.613	0.126
	Female Non-Sports	10	86.50 ± 8.67		
Right Leg YBTC	Male Non-Sports	8	163.88 ± 18.21	2.374	0.030*
	Female Non-Sports	10	145.30 ± 15.01		
Left Leg YBTA	Male Non-Sports	8	74.13 ± 9.77	-0.540	0.597
	Female Non-Sports	10	76.30 ± 7.33		
Left Leg YBTPM	Male Non-Sports	8	98.75 ± 16.00	0.603	0.555
	Female Non-Sports	10	94.50 ± 13.22		
Left Leg YBTPL	Male Non-Sports	8	87.50 ± 12.01	-1.114	0.282
	Female Non-Sports	10	95.30 ± 16.58		
Left Leg YBTC	Male Non-Sports	8	164.00 ± 22.23	0.869	0.404
	Female Non-Sports	10	156.30 ± 12.91		

*=p<0.05 YBTA = Y Balance Test Anterior, YBTPM = Y Balance Test Posteromedial, YBTPL = Y Balance Test Posterolateral, YBTC = Y Balance Test Composite, SD = Standard Deviation

Right Leg YBTC value means were significantly higher in the male sports group than the female sports group (Table 4) (163.88±18.21-145.30±15.01; p=0.30). Right-left leg YBTA, YBTPM, YBTPL, YBTC values were not significantly different between male and female sports groups. Additionaly, right-left leg YBTA, YBTPM, YBTPL values were not significantly different between male sports and female non-sports groups (p>0.05).

Table 5. Comparisons of 40 cm jump heights

Variable	Group	N	Mean ± SD	t	p
Jump Height (cm)	Male Sports	23	29.63 ± 5.82	-0.353	0.726
	Male Non-Sports	14	30.27 ± 4.19		
	Female Sports	18	21.20 ± 3.21	0.867	0.393
	Female Non-Sports	13	19.85 ± 5.41		
	Male Sports	23	29.63 ± 5.82	5.518	0.001*
	Female Sports	18	21.20 ± 3.21		
	Male Non-Sports	14	30.27 ± 4.19	5.610	0.001*
	Female Non-Sports	13	19.85 ± 5.41		
Contact Time (sn)	Male Sports	23	0.23 ±0.04	1.880	0.068
	Male Non-Sports	14	0.21 ±0.02		
	Female Sports	18	0.26 ±0.07	0.177	0.861
	Female Non-Sports	13	0.26 ±0.04		
	Male Sports	23	0.23 ±0.04	-1.727	0.096
	Female Sports	18	0.26 ±0.07		
	Male Non-Sports	14	0.21 ±0.02	-3.264	0.005*
	Female Non-Sports	13	0.26 ±0.04		
Flight Time (sn)	Male Sports	23	0.48 ±0.04	-0.426	0.673
	Male Non-Sports	14	0.49 ±0.03		
	Female Sports	18	0.41 ±0.03	0.998	0.327
	Female Non-Sports	13	0.39 ±0.05		
	Male Sports	23	0.48 ±0.04	5.526	0.001*
	Female Sports	18	0.41 ±0.03		
	Male Non-Sports	14	0.49 ±0.03	5.433	0.001*
	Female Non-Sports	13	0.39 ±0.05		
Power (W)	Male Sports	23	37.19 ± 6.71	-1.280	0.209
	Male Non-Sports	14	40.11 ± 6.74		
	Female Sports	18	26.71 ± 6.28	0.707	0.485
	Female Non-Sports	13	25.04 ± 6.71		
	Male Sports	23	37.19 ± 6.71	5.098	0.001*
	Female Sports	18	26.71 ± 6.28		
	Male Non-Sports	14	40.11 ± 6.74	5.813	0.001*
	Female Non-Sports	13	25.04 ± 6.71		
RSI (m/s)	Male Sports	23	1.29 ±0.30	-1.373	0.178
	Male Non-Sports	14	1.43 ±0.30		
	Female Sports	18	0.85 ±0.29	0.630	0.534
	Female Non-Sports	13	0.78 ±0.28		
	Male Sports	23	1.29 ±0.30	4.695	0.001*
	Female Sports	18	0.85 ±0.29		
	Male Non-Sports	14	1.43 ±0.30	5.699	0.001*
	Female Non-Sports	13	0.78 ± 0.28		

*=p<0.05 RSI = Reactive Strenght Index, SS = Standard Deviation

According to Table 5 containing 40 cm jump values; jump height (29.63±5.82-21.20±3.21; p<0.01), flight time (0.48±0.04-0.41±0.03; p<0.01), power (37.19±6.71-26.71±6.28; p<0.01), RSI (1.29±0.30-26.71±6.28; p<0.01) means of the male sports group were significantly higher than the female sports group, and jump height (30.27±4.19-19.85±5.41; p<0.01), contact time (0.21±0.02-0.26±0.04; p=0.05), flight time (49±0.03-0.39±0.05; p<0.01), power (40.11±6.74-25.04±6.71; p<0,01), RSI (1.43±0.30-0.78±0.28;

p<0.01) means of the male non-sports group were significantly different from the female non-sports group. However, no significant difference was found in other comparisons (p>0.05).

Table 6. Comparison of 50 cm jump values within group and between groups

Variable	Group	N	Mean ± *SD*	t	p
Jump Height (cm)	Male Sports	23	31.32 ± 5.67	-0.011	0.991
	Male Non-Sports	14	31.30 ± 3.95		
	Female Sports	18	21.96 ± 4.41	0.953	0.348
	Female Non-Sports	13	20.16 ± 6.14		
	Male Sports	23	31.32 ± 5.67	5.759	0.001*
	Female Sports	18	21.96 ± 4.41		
	Male Non-Sports	14	31.30 ± 3.95	5.647	0.001*
	Female Non-Sports	13	20.16 ± 6.14		
Contact Time (sn)	Male Sports	23	0.22 ± 0.04	1.031	0.310
	Male Non-Sports	14	0.21 ± 0.02		
	Female Sports	18	0.26 ± 0.07	0.222	0.826
	Female Non-Sports	13	0.26 ± 0.03		
	Male Sports	23	0.22 ± 0.04	-2.098	0.046*
	Female Sports	18	0.26 ± 0.07		
	Male Non-Sports	14	0.21 ± 0.02	-3.517	0.002*
	Female Non-Sports	13	0.26 ± 0.03		
Flight Time (sn)	Male Sports	23	0.50 ± 0.04	-0.065	0.949
	Male Non-Sports	14	0.50 ± 0.03		
	Female Sports	18	0.42 ± 0.04	1.071	0.293
	Female Non-Sports	13	0.40 ± 0.06		
	Male Sports	23	0.50 ± 0.04	5.835	0.001*
	Female Sports	18	0.42 ± 0.04		
	Male Non-Sports	14	0.50 ± 0.03	5.396	0.001*
	Female Non-Sports	13	0.40 ± 0.06		
Power (W)	Male Sports	23	39.42 ± 6.99	-0.851	0.400
	Male Non-Sports	14	41.53 ± 6.86		
	Female Sports	18	26.86 ± 5.73	0.698	0.497
	Female Non-Sports	13	25.23 ± 7.43		
	Male Sports	23	39.42 ± 6.99	6.163	0.001*
	Female Sports	18	26.86 ± 5.73		
	Male Non-Sports	14	41.53 ± 6.86	5.523	0.001*
	Female Non-Sports	13	25.23 ± 7.43		
RSI (m/s)	Male Sports	23	1.39 ± 0.31	-0.944	0.352
	Male Non-Sports	14	1.50 ± 0.36		
	Female Sports	18	0.87 ± 0.31	0.691	0.495
	Female Non-Sports	13	0.79 ± 0.30		
	Male Sports	23	1.39 ± 0.31	5.203	0.001*
	Female Sports	18	0.87 ± 0.31		
	Male Non-Sports	14	1.50 ± 0.36	5.373	.001*
	Female Non-Sports	13	0.79 ± 0.30		

*=p<0.05 RSI = Reactive Strength Index, SD = Standard Deviation

When Table 6 containing 50 cm jump values was examined; it was seen that the Jump Height (31.32±5.67-21.96±4.41; p<0.01), Contact Time (0.22±0.04-0.26±0.07; p=0.46), Flight Time (0.50±0.04-0.42±0.04; p<0.01), Power (39.42±6.99-26.86±5.73; p<0.01), RSI (1.39±0.31-0.87±0.31; p<0.01) means of the Male Sports group were significantly different from the Female Sports group, and Jump Height (31.30±3.95-20.16±6.14; p<0.01), Contact

Time (0.21±0.02-0.26±0.03; p=0.02), Flight Time (0.50±0.03-0.40±0.06; p<0.01), Power (41.53±6.86-25.23±7.43; p<0.01), RSI (1.50±0.36-0.79±0.30; p<0.01) means of the Male Non-Sports group were significantly different from the Female Non-Sports group. However, no significant difference was found in other comparisons (p>0.05).

DISCUSSION AND CONCLUSION

The aim of this study was to compare the Functional Movement Analysis, Y balance and jump performances of male and female students of the Faculty of Sport Sciences who do or do not sports. Functional movements reflect the interaction between motor control, flexibility, balance, muscle strength and are pivotal to sports-related skills. Functional movement defects that caused by various balance disorders, muscle weakness or neuromuscular control deficiencies can adversely affect health and sports performance (Mens et al., 1999; Kraemer et al., 2004). In this context, one of the main goals of conditioning coaches and physiotherapists is to create movement profiles of individuals in order to reveal functional movement disorders (Kraus et al., 2014). It comes to making an assessment, high reliability of a method or measuring device is a necessary prerequisite. Reaching the reliable results and eliminating ambiguities in the evaluation process is an issue that needs to be emphasized for coaches and researchers (Smith et al., 2013). The FMS test battery, which was developed by Gray Cook, for the purpose of performing functional movement analyses was used for functional movement analyses in the study (Gray, 2004; Smith et al., 2013). In this study, It was determined that FMS total score means were significantly higher in the female sports group compared to male sports group. (13.61±2.20-11.91±2.73; p=0.03) (Table 2). In the studies compared young male and female athletes, reported that the FMS total score means of female were higher than that of men (Taylor et al., 2019; García-Luna et al., 2020; Hamil et al., 2021). Thus, obtained similar results with our study. In another study, found that men have lower FMS total score means than female (13.57±2.59,-16.00±1.79 respectively), Based on these results, they stated that men may have worse motor competence, coordination and balance. In addition, they may be more prone to injuries during physical activity (Taylor et al., 2019). In the study, as a result of the FMS total score comparisons of the sports and non-sports groups, a significant difference was found in favor of the sports group. (13.61±2.20-11.54±1.98 respectively; p=0.01) (Table 2). Similarly, found out that FMS total score values of the female athlete group were significantly higher than the non-athlete female group. Mekic et al. stated that regular exercise positively affects functional mobility and according to them, regular exercise caused the difference between female athletes and non-athletes in their study (Mekic et al., 2020). Engquist et al. compared college students who participate in sport activities (age = 20.3±1.5) and who do not participate in (age=20.3±1.5). They found a significant difference in favor of the female sports group in FMS total scores, similar to our findings (14.3±0.3-13.9±0.3; p=0.34) (Enquist et al., 2015). In this study, It has been stated that the general activity level, rather than the trainings specific to a particular sport branch, may have an effect on the FMS total scores. Our findings also showed that the FMS total score values of all groups that included in our study were lower than 14 points, which is considered the threshold value for disability risk in many studies (Table 2) (Beardsley & Contreras, 2014; Mokha et al., 2016; Del Vecchio et al., 2016; Bonazza et al., 2017; Smith et al., 2017; Scudamore et al., 2020). This suggests that all subjects in this study may need to do appropriate exercises in order to reduce the risk of injury. Poor balance is a serious risk factor that increases the likelihood of lower extremity injury (Plisky et al., 2006; Schnurrer-Luke Vrbanić et al., 2007). In this respect, the evaluation of balance can be very useful in predicting and preventing lower extremity musculoskeletal injuries (Schnurrer-Luke Vrbanić et al., 2007). Table 3, comparing the Y Balance Test performances of individuals of the same sex and Table 4, comparing the Y Balance Test performances of individuals of different genders reveals that; right leg YBTC value means were significantly higher in favor of the male non-sports group. (163.88±18.21-145.30±15.01; p=0.30), However, there was no significant difference in other comparisons. Alnahdi et al., compared female (age=20.61±1.1) and male (age=21.40±1.4) college students in terms of sY balance test scores. They found that the male YDTC score means were significantly higher by approximately 9 points compared to females (94.7±7.0-85.4±5.8) (Alnahdi et al., 2015). Engquist et al. (2015), found that the YBTC score mean of the male non-sports group is approximately 4 points higher than the female non-sports group. Nevertheless they did not put these results into statistical calculations. Lack of physical activity can weaken muscle strength, impairing postural control ability, lead to coordination disorders and balance disorders (Kananda & Megawati, 2020). The fact that the sample group of our study consisted of the students of the Faculty of Sport Sciences and that they participated in many classes that included physical activity as per the curriculum, and therefore they had the chance to do physical activity, may explain the reason why there was no significant difference between individuals who do and do not sports in most of the Y Balance Test parameters. According to Table 5 which regarding the 40 cm depth jump values; The jump height of the male sports group compared to the female sports group (29.63±5.82-21.20±3.21; p<0.01), flight time (0.48±04-0.41±0.03; p<0.01), Power (3719±6.71-26.71±6.28; p<0,01), RSI (1.29±0.30-26.71±6.28; p<0.01) the jump height of the male non-sports group compared to the female non-sports group (30.27±4.19-19.85±5.41; p<0.01), contact time (0.21±0.02-0.26±04; p=0.05), flight time (49±0.03-0.39±0.05; p<0.01), power (40.11±6.74-25.04±6.71; p<0.01) RCI (1.43±0.30-0.78±0.28; p<0.01) were found to be significantly different, but no significant difference was found in other comparisons. According to Table 6, which includes 50 cm jump values, jump height (31.32±5.67-21.96±4.41; p<0.01), contact time (0.22±0.04-0.26±07; p=0.46), flight time (0.50±0.04-0.42±04; p<0.01), power (39.42±6.99-26.86±5.73; p<0.01), RSI (1.39±0.31-0.87±0.31; p<0.01) means of the male sports group were significantly different compared to the female sports group. Additionaly, jump height (31.30±3.95-20.16±6.14; p<0.01), contact time (0.21±0.02-0.26±0.03; p=0.02) flight time (0.50±0.03-0.40±0.06; p<0.01), power (41.53±6.86-25.23±7.43; p<0,01), RSI (1.39±0.31-0.87±0.31; p<0.01) means of the male non-sports group were significantly different compared to the female non-sports group. However, there were no significant differences in other comparisons. Walsh et al. (2004) stated that the jump technique was more effective on the parameters related to the depth jump than the depth jump starting height (Walsh et al., 2004). Bobbert et al. (1987) used 20, 40, 60 cm jump heights in their study and did not find any difference in terms of performance. For these reasons, it was not necessary to include a height other than 40 and 50 cm jump heights in the study. Better elastic energy can be stored when ground contact times are short (Ito et al., 1987). Considering that this elastic energy may also have positive effects on power and therefore on contact times, it can be thought that this elastic energy was effective in obtaining better jump heights, higher power and RSI values of participants with short contact times in our study. According to the results; female sports group had better FMS total scores than female non-sports group. In addition, male sports group had better FMS total score, 40 – 50 cm depth jump height, flight time, power, RSI and 50 cm ground contact time values than female sports group. Moreover, male sports group have higher right leg YBTC, better 40-50 cm depth jump height, flight time, ground contact time, strength, RSI and 50 cm ground contact time values compared to the non-sports female group. FMS, 40-50 cm jump, staying power, RSI and contact time values were different between genders in all groups. Furthermore, it was determined that the FMS total score means of all groups participating in the study were lower than the 14 point value, which is considered the threshold value for injury risk. Considering that functional movement disorders may adversely affect health and sports performance, training programs can be designed with the help of the information obtained from the research findings to increase the FMS scores of sports science faculty students of both genders who do or do not sports. Functional movement trainings can also provide some benefits in terms of long-term athlete development. In order to achieve more comprehensive results according to sports status and gender; Studies could be conducted to examine the relationships between dynamic balance, FMS and jump performances.

Recommendations

Functional movement disorders can negatively impact health and sports performance. Therefore, the research findings suggest designing training programs to improve FMS scores for all sports science students, regardless of their participation in sports. Functional movement trainings can also provide some benefits in terms of long-term athlete development. In order to achieve more comprehensive results according to sports status and gender; Studies could be conducted to examine the relationships between dynamic balance, FMS and jump performances.

GENİŞLETİLMİŞ ÖZET

GİRİŞ

Antrenman programında derin atlama eğitiminin kullanımı, sprint performansında, sıçrama performansında, kuvvette ve çeviklikte iyileşmelere yol açar. Bu nedenle, derin atlama eğitim seansları, kuvvet ve kondisyon koçları için değerli bir seçenek olarak kabul edilir (Bridgeman ve ark., 2017). Literatürü gözden geçirirken, birçok çalışmanın genellikle spor yapan bireyler üzerinde yapıldığı ve spor yapanlarla yapmayanlar arasındaki karşılaştırmalara dair sınırlı bilgi olduğu gözlemlenmiştir. Ayrıca, literatürde derin atlama, dinamik denge performansı ve FMS test bataryasının bir arada kullanımı üzerine sınırlı araştırma bulunmaktadır ve mevcut çalışmalar genellikle sporcular üzerinde yapılmış ve farklı test bataryalarını kullanmıştır. Bu çalışma ile fonksiyonel hareket, dinamik denge ve dikey sıçrama performansının analizleri yapılacaktır. Elde edilen değerler, sadece spor yapanlar ve yapmayanlar arasında değil, aynı zamanda erkek ve kadın grupları arasında da karşılaştırılacak ve literatüre katkı sağlanacaktır (Kramer ve ark., 2019).

YÖNTEM

Katılımcılara araştırma ile ilgili bilgilendirmeler sözlü olarak yapılmıştır. Çalışmaya katılan öğrencilere, çalışmanın amaç ve yöntemleri konusunda bilgilendirmeler içeren "Bilgilendirilmiş Onam Formu" imzalatılmıştır. Katılımcıların araştırmaya gönüllü olarak katılabilmeleri için bilinen bir kas-iskelet yaralanması olup olmadığı "Katılımcı Bilgi ve Ölçüm Formu" ile sorulmuştur.

Boy Uzunluğu, Vücut Ağırlığı, Beden Kitle İndeksi ve Vücut Yağ Yüzdesi Ölçümleri: Holtain, UK marka stadiometre kullanılarak katılımcıların boy uzunlukları ±1mm hassasiyetle ölçülmüştür. Tanita marka (BC, 418 Tanita, Japan) vücut kompozisyon analizörü ise vücut ağırlığı, beden kitle indeksi (BKİ) ve vücut yağ yüzdesini 100 gram hassasiyetle ölçmek için kullanılmıştır. Ölçümler, katılımcılar çıplak ayak ve spor kıyafeti ile anatomik duruşta yapılmıştır. Testler yapılmadan önce jogging ve dinamik germelerden oluşan ısınma programı uygulanmıştır (Atan, 2019; Çelik & Örer, 2023).

Y Dinamik Denge Alt Ekstremiteye Yönelik Test Uygulama Protokolü: Y dinamik denge testinin alt ekstremiteye yönelik uygulanmasında, literatürdeki araştırmalarda kullanılmış uygulama protokolleri dikkate alınmıştır. Sağ ve sol bacak olarak alt ekstremite uzuvlarının her ikisi ile ayrı ayrı alt ekstremite y dinamik denge testi için erişim sağlanmıştır.

Katılımcılara sabit duruşu korumaları ve herhangi bir salınım yapmamaları gerektiği söylenmiştir. Ardından her uzanma yönü için blokları en uzak mesafeye kadar sürüklemeleri istenmiştir. Her uzanma yönünde 3 erişim tamamlandığında yeni erişimler için başlangıç noktasına ve pozisyonuna geri dönülmüştür. Uzanma yönlerine toplamda 3 erişim gerçekleştirilmiştir. Yapılan erişimlerin ortalaması alınarak değerlendirmek üzere cm cinsinden kayıt altına alınmıştır. Aşağıdaki formül, verilerin normalleştirilmesi ve kompozit skorların tespit edilmesi için kullanılmıştır (Türkeri ve ark., 2020; Ödemiş & Çelik, 2021).

$$\text{Skor}= \frac{\text{Anterior} + \text{Posteromedial} + \text{Posterolateral}}{3 \times \text{Bacak Uzunluğu}} \times 100$$

Şekil 1. Alt ekstremite dinamik denge kompozit skor formülü

40 – 50 cm sıçrama testleri: Dikey sıçrama testleri geçerlik – güvenirlik anlamında olumlu sonuçlar alınan Microgate – Optojump ölçüm cihazıyla yapılmıştır. Her iki test öncesi katılımcılar sözlü ve görsel olarak bilgilendirilmiştir. Katılımcılar önce 40 cm'lik kutuya çıkıp kendilerini hazır hissettiklerinde eller belde vaziyette yere kendilerini bırakıp, yere ayak basar basmaz mümkün olan en yükseğe dikey sıçrama gerçekleştirmişlerdir. Bu sıçrayıştan sonra katılımcılara 10 dakika dinlenme süresi verilip 50 cm'lik kutulardan aynı işlemler tekrarlanmıştır. Ellerin belden ayrılması, dizini ya da ayaklarını yukarıya, yana doğru açması veya çekmesi hata kabul edilerek testin tekrarlanması istenmiştir. Ölçümler 3'er dakika arayla 2'şer kez tekrarlanmış, en yüksek sıçrama yüksekliği değerlendirmeye alınmıştır. Ölçümler sert zeminde, katılımcı yumuşak spor ayakkabı ile olacak şekilde yaptırılmıştır. Bu testlerden ölçülen değerlere Tablo 5 ve Tablo 6'da yer verilmiştir (Glatthorn ve ark., 2011).

Fonksiyonel Hareket Analizi (FMS): Fonksiyonel hareket analizlerinde, Gray Cook tarafından geliştirilen Fonksiyonel Hareket Test Bataryası kullanılmıştır (Cook ve ark., 2014). Fonksiyonel Hareket Test Bataryası; 7 hareket testi ve 3 kontrol testinden oluşmaktadır. Hareket Testleri şunlardır; Deep Squat (Derin Çömelme), Hurdle Step (Yüksek Adımlama), Inline Lunge (Tek Çizgi Üzerinde Hamle), Shoulder Mobility (Omuz Mobilitesi), Active Straight-Leg Raise (Aktif Düz Bacak Kaldırma), Trunk Stability Push-Up (Gövde Stabilitesi Şınavı), Rotary Stability (Rotasyon Stabilitesi). FMS testinin değerlendirilmesi katılımcılara yaptırılan 7 hareket üzerinden aldıkları puana göre yapılmıştır.

Test puanları 0-3 arasında değerlendirilmiş, hareket esnasında ağrı hissedildiğinde 0 puan, hareket tamamlanamadığında 1 puan, hareket eksik şekilde tamamlandığında 2 puan ve hareket tam anlamıyla gerçekleştiğinde 3 puan verilmiştir. Katılımcılara hareketi mümkün olan en iyi şekilde tamamlamaları için üç deneme hakkı verilmiştir (Dorrel ve ark., 2015).

İstatiksel işlemler için SPSS 22 programı kullanılmıştır. Verilerin normalliği çarpıklık – basıklık katsayıları ile incelenmiş, her bir değişkene ait çarpıklık ve basıklık değerlerinin -3 , +3 arasında olduğu belirlenmiştir. Bu durum, verilerin normal dağıldığını ve parametrik testlerin uygulanabileceğini göstermektedir (Jondeau, 2003; Kalaycı, 2006). Verilerin normal dağıldığı sonucuna varıldıktan sonra gruplar arasında anlamlı bir fark olup olmadığının belirlenmesi için Bağımsız Örneklem T testi uygulanmıştır. p değerinin 0,05'in altında olduğu durumların istatistiksel olarak anlamlı olduğu kabul edilmiştir.

BULGULAR

Çalışmada, kadın spor yapan grubun, erkek spor yapan gruba göre FMS toplam skor ortalamalarının anlamlı düzeyde yüksek olduğu ve kadın spor yapan-yapmayan grupların FMS toplam skor karşılaştırmaları sonucunda ise kadın spor yapan grup lehine anlamlı düzeyde bir farklılık tespit edilmiştir. Bulgularımız ayrıca, çalışmamızda yer verilen tüm grupların FMS toplam skor değerlerinin, sakatlık riski için eşik değer kabul edilen 14 puandan düşük olduğunu göstermiştir. Bu durum, çalışmada yer verilen hem sporcu hem de sporcu olmayan bireylerin sakatlık riskini azaltmak için FMS skorlarını yükseltmeye yönelik egzersizler yapmaya ihtiyaçları olabileceğini düşündürmektedir. Aynı cinsiyetten bireylerin Y Denge Test performanslarını karşılaştıran Tablo 3, ve farklı cinsiyetten bireylerin Y Denge Test performanslarını karşılaştıran Tablo 4 incelendiğinde; erkek spor yapmayan-kadın spor yapmayan grup Sağ bacak YDT değer ortalamalarının erkek spor yapmayan grup lehine anlamlı derecede yüksek olduğu görülmüş, diğer karşılaştırmalarda ise anlamlı bir farklılığa rastlanmamıştır. 40 cm derinlik sıçrama değerlerine ilişkin Tablo 5 incelendiğinde; erkek spor yapan grubun, kadın spor yapan gruba nazaran sıçrama yüksekliği, havada kalış süresi, güç, RKİ ortalamalarının anlamlı derecede yüksek olduğu, yine erkek spor yapmayan grubun kadın spor yapmayan gruba nazaran sıçrama yüksekliği, temas süresi, havada kalış süresi, güç, RKİ ortalamalarının anlamlı derecede farklı olduğu tespit edilmiş, diğer karşılaştırmalarda anlamlı bir farka rastlanmamıştır. 50 cm sıçrama değerlerini içeren Tablo 6 incelendiğinde ise; erkek spor yapan grubun, kadın spor yapan gruba nazaran sıçrama yüksekliği, temas süresi, havada kalış süresi, güç, RKİ ortalamalarının anlamlı derecede farklı olduğu, yine erkek spor yapmayan grubun kadın spor yapmayan gruba nazaran sıçrama yüksekliği, temas süresi, havada kalış süresi, güç, RKİ ortalamalarının anlamlı derecede farklı olduğu tespit edilmiş, diğer karşılaştırmalarda anlamlı bir farka rastlanmamıştır.

TARTIŞMA VE SONUÇ

Elde edilen sonuçlara göre; spor yapan kadınların spor yapmayan kadınlara göre daha iyi FMS toplam skorlarına sahip oldukları, spor yapan erkeklerin ise spor yapan kadınlara göre daha iyi FMS toplam skor, 40-50 cm derinlik sıçrama yüksekliği, havada kalış süresi, güç, RKİ ve 50 cm yer temas süresi değerlerine sahip oldukları tespit edilmiştir. Spor yapmayan erkeklerin ise spor yapmayan kadın grubuna göre daha yüksek sağ bacak YDTK, daha iyi 40-50 cm derinlik sıçrama yüksekliği, havada kalış süresi, yer temas süresi güç, RKİ ve 50 cm yer temas süresi değerlerine sahip oldukları tespit edilmiştir. FMS, 40-50 cm sıçrama, havada kalış güç, RKİ ve temas süresi değerlerinin spor yapma durumundan bağımsız olarak cinsiyetler arası fark gösterdiği anlaşılmıştır. Ayrıca çalışmaya katılan tüm grupların FMS toplam skor ortalamalarının, sakatlık riski için eşik değer kabul edilen 14 puan değerinden daha düşük olduğu belirlenmiştir. Fonksiyonel hareket bozukluklarının sağlık ve spor performansını olumsuz yönde etkileyebileceği göz önünde bulundurulduğunda, araştırma bulgularından elde edilen bilgiler ile her iki cinsiyetten spor yapan-yapmayan spor bilimleri fakültesi öğrencilerinin FMS skorlarını yükseltmek üzerine antrenman programları tasarlanabilir. Fonksiyonel hareketlerin düzeltilmesine yönelik antrenmanlar; sakatlıktan korunmanın yanı sıra uzun vadeli sporcu gelişimi noktasında da birtakım faydalar sağlayabilir. Spor yapma durumları ve cinsiyetlere göre daha kapsamlı sonuçlara ulaşılabilmesi için; dinamik denge, FMS ve sıçrama performansları arasındaki ilişkileri inceleyen çalışmalar yapılabilir.

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KATKI ORANI *CONTRIBUTION RATE*	**AÇIKLAMA** *EXPLANATION*	**KATKIDA BULUNANLAR** *CONTRIBUTORS*
Fikir ve Kavramsal Örgü *Idea or Notion*	Araştırma hipotezini veya fikrini oluşturmak *Form the research hypothesis or idea*	Gamze ERİKOĞLU ÖRER Seyfullah ÇELİK
Tasarım *Design*	Yöntem ve araştırma desenini tasarlamak *To design the method and research design.*	Gamze ERİKOĞLU ÖRER
Literatür Tarama *Literature Review*	Çalışma için gerekli literatürü taramak *Review the literature required for the study*	Gamze ERİKOĞLU ÖRER Seyfullah ÇELİK Burak Alperen ÜNSAL Büşra YILMAZ
Veri Toplama ve İşleme *Data Collecting and Processing*	Verileri toplamak, düzenlemek ve raporlaştırmak *Collecting, organizing and reporting data*	Seyfullah ÇELİK Burak Alperen ÜNSAL Büşra YILMAZ İpek AKINCI Salih ÇABUK
Tartışma ve Yorum *Discussion and Commentary*	Elde edilen bulguların değerlendirilmesi *Evaluation of the obtained finding*	Gamze ERİKOĞLU ÖRER Seyfullah ÇELİK Burak Alperen ÜNSAL

Destek ve Teşekkür Beyanı

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This study was conducted with the decision of Ankara Yıldırım Beyazıt University Ethics Committee dated 25.03.2022 and numbered 2022-782.