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The Relationship Between Functional Movement Screening Scores and Injury History Of U20 Elite Male Soccer Players

U20 Elit Erkek Futbolcuların Fonksiyonel Hareket Taraması Skorları ile Yaralanma Geçmişi Arasındaki İlişki

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Abstract

Objective: To investigate the relationship between functional movement screening and injury history in elite academy players under the age of twenty.

Material-Method: U20 athletes who athletes of soccer academy that a soccer club which competing in Turkey Football Federation Super League were included the study. The injury history of the participants was questioned and recorded. Each participant was evaluated according to functional movement screening test protocol. Functional movement screen scores of athletes with injury in the history of injury and functional movement screen scores of athletes without injury in the history of injury were compared.

Results: The age, body weight and height of the participants who reported injury in the injury history were 17.46±0.52 years, 177.23±4.92 cm and 71.00±4.60 kg, respectively. The age, body weight and height of the participants who did not report any injury in the injury history were 17.29±0.49 years, 175.14±4.49 cm and 65.86±5.21 kg, respectively. The participants were divided into two groups according to their injury history. There was no statistically significant difference between the participants who reported injuries in their past and those who did not have injuries in the past (p>0.05).

Conclusions: The quality of movement of elite youth male soccer academy players under the age of 20 is low and the rate of asymmetrical movement patterns is high. Injury history of elite youth male soccer academy players under the age of twenty does not affect the composite FMS score, FMS subgroup scores, individual test score and distribution of asymmetric scores.

Keywords: Soccer, Injuries, Functional Movement Screen.

Özet

Amaç: Yirmi yaş altı elit akademi futbolcularında fonksiyonel hareket taraması ile yaralanma geçmişi arasındaki ilişkiyi incelemektir.

Materyal-Metot: Türkiye Futbol Federasyonu Süper Ligi'nde yarışan bir futbol kulübünün futbol akademisi U20 takımı sporcuları çalışmaya dahil edildi. Katılımcıların yaralanma geçmişi sorgulanıp kaydedildi. Her bir katılımcı fonksiyonel hareket taraması test protokolüne göre değerlendirildi. Yaralanma geçmişinde yaralanma bildiren sporcuların test sonuçları ile yaralanma geçmişinde yaralanma bildirmeyen sporcuların fonksiyonel hareket taraması skorları karşılaştırıldı.

Bulgular: Yaralanma geçmişinde yaralanma bildiren katılımcıların yaş, vücut ağırlığı ve boy uzunlukları sırasıyla 17,46±0,52 yıl, 177,23±4,92 cm ve 71,00±4,60 kg idi. Yaralanma geçmişinde herhangi bir yaralanma bildirmeyen katılımcıların yaş, vücut ağırlığı ve boy uzunlukları sırasıyla 17,29±0,49 yıl, 175,14±4,49 cm ve 65,86±5,21 kg idi. Katılımcılar yaralanma geçmişlerine göre iki gruba ayrıldı. Geçmişlerinde yaralanma bildiren katılımcılar ile geçmişlerinde yaralanma olmayan katılımcıların fonksiyonel hareket taraması skorları arasında istatistiksel olarak fark bulunmadı (p>0,05).

Sonuç: Yirmi yaş altı elit genç erkek futbol akademi sporcularının hareket kaliteleri düşük ve asimetrik hareket paternlerinin oranı yüksektir. Yirmi yaş altı elit genç erkek futbol akademi sporcularının yaralanma geçmişi her bir FHT testinden alınan skorları, toplam FHT skorunu, FHT subgrup skorlarını ve asimetrik skorların dağılımının etkilememektedir.

Anahtar kelimeler: Futbol, Yaralanmalar, Fonksiyonel Hareket Taraması.

Introduction

Musculoskeletal complaints caused by soccer during training or matches are called soccer injuries. High participation and high risk factors increase the frequency of soccer injuries (1). Soccer injuries are madeplayers incapable of participating in training and matches for a certain period of time. This period can extend from a few days to months or even years depending on the type and severity of the injury (2). In particular, injuries in youth athletes effect the future careers of the athletes and cause serious economic loss and psychological trauma. For this reason, researches on the diagnosis, treatment and precautions to be taken to prevent the occurrence of soccer injuries become important. Recently, a significant part of these studies focused on prevention strategies in soccer injuries (3).

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In order to develop strategies to prevent soccer injuries, it is necessary to reveal the causes of these injuries (4). Risk factors that cause soccer injuries can be classified as extrinsic and intrinsic risk factors. Causes such as ground, equipment, fair play rules, weather conditions are known as extrinsic risk factors and age, gender, previous injuries, muscle strength, normal joint motion, muscle strength imbalances, musculoskeletal system deformities, flexibility, and neuromuscular stability are known as intrinsic risk factors. Risk factors such as ground, muscle strength and flexibility are also known as changeable risk factors.In contrast, age and structural musculoskeletal system deformities are risk factors that cannot be changed. Prevention of soccer injuries is possible by scanning the risk factors and modifying them (5). Therefore, analysis and elimination of risk factors, especially intrinsic risk factors, form the basis of soccer injury strategies and programs.In recent years, researches for the development of screening methods that can be used to prevent sports injuries have increased. In addition, the effectiveness of exercise programs prepared according to the results of risk screening tools in preventing injuries is intensively investigated (4, 6). One of the analysis protocols emerging due to this effort is Functional Movement Screen (FMS) (7, 8).

FMS is a protocol based on the scoring of seven movement patterns that are the basis of human movement (7, 8). The reliability of the FMS among scoring of the trained testers is high (9, 10). The protocol can be used for all athletes' groups and healthy individuals, including children and the elderly (11, 12). Whether there is a relationship between injury history and FMS scores in athletes and how effective the protocol is in predicting possible injuries has been examined with previous studies (13-18).The composite score obtained from FMS provides useful information for predicting some injuries (15). However, the induvidual test score is more effective than the composite score in predicting injuries. In addition, the strength of the relationship between asymmetries and injuries is higher than the correlation between composite FMS score and injuries (16-18). However, prospective studies are needed to determine whether it is effective in predicting injuries specific to each sport.

In the light of the above information; the main purpose of this study is to investigate the relationship between FMS score and injury history in elite male soccer academy athletes aged between 18 and 20.

Material and Methods

Volunteer athletes, who U20 elite male soccer team of soccer academy of soccer club which competing in the Turkey Football Federation Super League were included in this study. The criteria for exclusion from the study are; any musculoskeletal injuries, high-intensity training within 24 hours, consuming alcohol within 48 hours, taking anti-inflammatory/muscle relaxant/pain medication within 48 hours, consuming a stimulant, such as caffeine within 12 hours before the test protocol. In addition, the information of soccer players who received 0 from any test due to pain was not used in the analysis of the data (19).

The age, height and body weight of the participants were recorded. Injury histories were questioned in a face-to-face interview with participants. In this context; it was noted that the injuries experienced by the participants and the type of injury and which anatomical region of injury (1).

The participants were evaluated with the FMS protocol after recording the information about their injury history. Participants were allowed to participate in the test protocol with appropriate clothing (shorts, t-shirts and rubber shoes). Participantswere evaluated by a certified FMS expert according to the FMS test protocol. The FMS test protocol was made using the official FMS kit. FMS expert explained each test and allowed the participants to do the tests 3 times. The best score of the participants from each test was noted as the test score. Composite FMS score, FMS subgroup score and each test score were recorded.

FMS is a musculoskeletal test protocol aimed to scoring functional movement patterns, mobility and stability. Evaluation of these three main parameters of musculoskeletal system gives information about the complex structure of motor control (20). The FMS test protocol consists of seven movement patterns. These seven movement patterns are observed and scored between 0 and 3. A score of 0 and 1 means that the test failed, while a score of 2 and 3 indicates that the test was successful.According to the general scoring criteria, tests are given “0” if the tests cannot be performed due to pain, “1” if it can not be performed in facilitated positions or even compensation, “2” if it can be done in facilitated positions or compensation, and “3” if it can be performed without compensation in the desired position (7, 8). The tests that make up the test battery; deep squad, hurdle step, inline lunge, shoulder mobility, activated straight leg raise, trunk stability push-up and rotatory stability. Hurdle step, inline lunge, shoulder mobility, activated straights leg rise, rotator stability tests are scored separately for the right and left sides.The lowest of these two scores is usedto calculate the composite score. A single score is given for deep squat and trunk stability push-up tests. The composite FMS score is obtained by summing the scores of the seven movement patterns. It is accepted that 14 is a threshold scores in individuals who do sports that require high physical exertion. Athletes with a 14 FMS composite score and below are more likely to experience musculoskeletal injuries than individuals with more scores (20-22). In addition, the sum of the deep squad, hurdle step and inline lunge scorescan be evaluated as motor control score, the sum of the shoulder mobility and active straight leg raise scorescan be evaluated as mobility score, the sum of the trunk stability push up and rotatory stability score can be evaluated as reflex correlation score. Scores of 6≥ for motor control, 4≥ for mobility and 4≥ for reflex chore stabilization are considered as threshold points. Thus, the screening protocol is examined and interpreted in three main headings (23, 24).

According to the decision numbered 2019/1924 of Necmettin Erbakan University Meram Faculty of Medicine's Ethics Committee for the Non-Medicinal Research Ethics Committee No. 90 dated 21.06.2019, the conduct of the research is

ethically appropriate. The research was carried out according to the Helsinki Declaration.

Statistical Analysis

The Statistical Package for Social Sciences (SPSS) version 21.0 (SPSS Inc., Chicago, IL, USA) was used for analysis. Mean and standard deviation were used in calculating the age, body weight, height, and FMS scores of the participants. Percentage distributions were used to identify injuries reported by participants and to calculate asymmetric tests. Mann-Witney U test was used to compare the age of the participants, and Student's t test was used to compare the height and weight of the participants. Mann-Whitney U test was used to compare the FMS scores of those with and without injuries in the reported injury history. Chi-square test was used to compare the asymmetric tets distribution of those with and without injuries in the reported injury history.

Results

With this study; relationship between injury history and FMS scores of elite male soccer academy athlete under 20 years of age was investigated. Twenty athletes, who provide the inclusion criteria, were included in the study. 4 athletes could not be included in the study due to exclusion criteria.

The age, body weight and height of the participants who reported injury in the injury history were 17.46±0.52 years, 177.23±4.92 cm and 71.00±4.60 kg, respectively. The age, body weight and height of the participants who did not report any injury in the injury history were 17.29±0.49 years, 175.14±4.49 cm and 65.86±5.21 kg, respectively. Participants who reported injury and those who did not report injury were statistically similar in age, height, and weight.

Adductor muscle strains (18.75%) and knee anterior cruciate ligament sprains (18.75%) were the most reported injuries among injuries reported by participants. These were followed by knee meniscus (12.5%) and ankle inversion sprain (12.5%) injuries. The distribution of injuries reported by participants in the past is detailed in Figure 1.

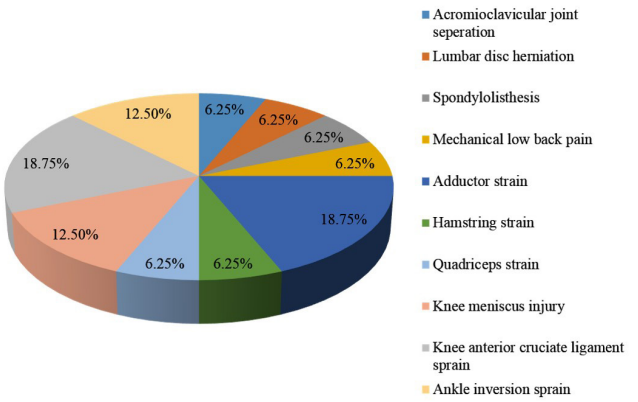

Figure 1. Injuries reported by participants in their injury history

The mean of the composite FMS scores of the participants was 11.00±1.55. The average scores of the FMS tests are shown in Table 1. When the participants were grouped as those with at least one injury and no injuries in the past, there was no statistically significant difference between the composite FMS values of both groups. In addition, there was no statistically significant difference between the motor control, mobility and reflex core scores of the participants who had no injury in the history of injury and those who had injury in the history of injury. Comparison of the FMS scores of those with and without injuries in the reported injury historyis given in Table 2.

Asymmetry was observed in at least one of the tests evaluating asymmetry in 70% of the participants. 30% of all participants received asymmetrical scores from rotatory stability, active straight leg raise and inline lunge tests. While the rate of those who received asymmetrical scores from the shoulder mobility test was 20%, the rate of participants who received asymmetric scores from the hurdle step test was 10%. While the test with the most asymmetric score in the participants with no injury in the history of injury was rotator stability

Table 1. FMS scores of the participants

	No injuries in the reported injury history (n=7) Mean±SD	No injuries in the reported injury history (n=13) Mean±SD	Total (n=20) Mean±SD
Deep squat	1.57±0.53	1.76±0.59	1.70±0.57
Hurdle step	1.57±0.53	1.61±0.50	1.60±0.50
İnline lunge	1.57±0.53	1.53±0.51	1.55±0.51
Functional motion score	4.71±1.38	4.92±1.25	4.85±1.26
Shoulder mobility	1.71±0.75	1.53±0.51	1.60±0.59
Active straight leg raise	1.42±0.53	1.69±0.48	1.60±0.50
Mobility score	3.14±0.89	3.23±0.72	3.20±0.76
Trunk stability pushup	1.85±0.37	1.76±0.43	1.80±0.41
Rotatory stability	1.14±0.37	1.15±0.37	1.15±0.36
Reflex core stability score	3.14±0.69	2.92±0.64	3.00±0.64
Composite score	10.85±1.86	11.07±1.44	11.00±1.55

n: The number of participants, SD: Standard deviation

Table 2. Comparison of FMS scores of those with and without injury in the reported injury history

	No injuries in the reported injury history (n=7) Median (min-max)	No injuries in the reported injury history (n=13) Median (min-max)	p
Deep squat	2.00 (1.00-2.00)	2.00 (1.00-3.00)	0.490
Hurdle step	2.00 (1.00-2.00)	2.00 (1.00-2.00)	0.852
İnline lunge	2.00 (1.00-2.00)	2.00 (1.00-2.00)	0.890
Functional motion score	5.00 (3.00-6.00)	5.00 (3.00-7.00)	0.774
Shoulder mobility	2.00 (1.00-3.00)	2.00 (1.00-2.00)	0.655
Active straight leg raise	1.00 (1.00-2.00)	2.00 (1.00-2.00)	0.263
Mobility score	3.00 (2.00-5.00)	3.00 (2.00-4.00)	0.569
Trunk stability pushup	2.00 (1.00-2.00)	2.00 (1.00-2.00)	0.648
Rotatory stability	1.00 (1.00-2.00)	1.00 (1.00-2.00)	0.949
Reflex core stability score	3.00 (2.00-4.00)	3.00 (2.00-4.00)	0,470
Composite score	10.00 (9.00-14.00)	11.00 (9.00-14.00)	0.624

n: The number of participants, Min: Minimum, Max: Maximum

Table 3. Comparison of asymmetric test distributions of those with and without injuries in the reported injury history

		No injuries in the reported injury history (n=7)		No injuries in the reported injury history (n=13)		p
	Injury	n	%	n	%	
Active straight leg raise	No	4	57.14	10	76.29	0.336
	Yes	3	42.86	3	23.08	
Shoulder mobility	No	6	85.71	10	76.92	0.561
	Yes	1	14.29	3	23.08	
Inline lunge	No	4	57.14	10	76.92	0.336
	Yes	3	42.86	3	23.08	
Rotatory stability	No	3	42.86	11	84.62	0.780
	Yes	4	57.14	2	15.38	
Hurdle step	No	7	100.00	11	84.62	0.411
	Yes	0	0.00	2	15.38	

n: The number of participants

(57.1%), the most asymmetry in the history with injuries was active straight leg raise (23.1%), shoulder mobility (23.1%) and inline lunge (23.1%) tests. The distribution of the tests in which the participants with asymmetrical scores and those with no injuries in the injury history were statistically similar. Comparison of asymmetric test distributions of those with injuries and no injuries in the reported injury history is given in Table 3.

Discussion

This study was planned to investigate the relationship between FMS scores and injury history in elite male soccerplayers under the age of 20. According to the findings, the history of injury in elite male soccerers under 20 does not affect the individual FMS test score, the composite FMS score, the FMS subgroup scores, and the distribution of the asymmetric scores.

In the literature, it is possible to reach studies on soccer injuries observed in youth elite male players. Muscle injuries are the most common injuries in youth elite male players (25). Ergünet al's studies, where they took the national team athletes as participants; reported that the most common injury among the muscle injuries was the adductor muscle strain (26). According to the results of our study, the adductor muscle strain is the most common injury reported in the history of injury, and the our results are consistent with the literature.Muscle injuries are common in youthsoccer players because the mechanical properties of the muscles are not developed as much as soccer requires in youth individuals (27). In contrast, participants reported a high rate of knee anterior cruciate ligament injury as well as muscle injuries. This rate is quite higher than the literature (28). Participants' reports of such anterior knee anterior cruciate ligament injury in their injury history can be explained by the inadequacy of practices to prevent anterior cruciate ligament injuries in our soccer academies.

There are some studies on FMS scores of youth male soccerers. Portas MD et al. reported the total FMS score of

male soccers under the age of 18 as 14.00 in their study, where they concluded that maturation affects the FMS scores (29). Vanessa Bernardes Marques et al. gave the average of the composite FMS score as 13.44 in elite youth male soccerers under 20 (19). In our study, FMS mean was 11.00±1.55. The results are below the values reported for the relevant group in the literature. The reason for this may be due to the implementation of different training or exercise programs individually or as a team. In addition, it is possible that the changes caused by genetic differences on motoric features have affected the results. Another result of Vanessa Bernardes Marques et al's work is that the patterns are asymmetrical in 65% of the participants (19). Similar asymmetry rates were found in our study. The fact that soccer contains asymmetric movement patterns intensively may increase the incidence of musculoskeletal system asymmetries.

The effectiveness in predicting sports injuries of the composite FMS score, FMS subgroup scores, and individual test score were investigated by research for different sports branches. However, a full consensus could not be reached with regard to whether or not predictions can be made with FMS scores. Warren M et al. reported that the composite FMS score, asymmetries and individual test score were weak in predicting noncontact and overuse injuries in the studies they received from participants from different sports branches (17). In contrast, Moore E et al. reported that composite FMS score and asymmetries provide useful information in predicting injuries, especially in adult athletes (30). Bardenett SM et al. reported that FMS scores are not affected by injuries in high school athletes. They concluded that FMS scores were not sufficient to predict injuries in high school athletes (31). Based on the relationship between injury history and FMS scores, Amir Letafatkar and colleagues reported that FMS tests provide positive information in predicting injuries (13). The results of this study show that the history of injury does not affect the composite FMS score, FMS subgroup scores, scores from each test, and asymmetry rates. Therefore, the results of this study suggest that the effectiveness of FMS in predicting injuries may be limited. However, evidences for individual test score and the role of asymmetries in predicting injuries suggest that more studies are required (32).

The low number of participants is the most important limitation of this study. The prospective studies with more participants should investigate the effectiveness of FMS in predicting injuries among elite youth male soccer academy athletes. Adequate information on the extent to which the ground and equipment are effective in the occurrence of reported injuries has not been obtained. Therefore, the inability to exclude their effect is another limitation of this study. It is another limitation that the deficiencies in the rehabilitation of the reported injuries are not known and the effect of this on the FMS results cannot be excluded. In addition, the lack of FMS reference values for elite youth male soccer academy athletes of different ages indicates that more research is needed on this subject.

Conclusion

This scope of work; muscle strains and anterior knee anterior cruciate sprain are the most reported injuries of elite youth male soccer academy athletes under the age of 20. The quality of movement of elite youth male soccer academy players under the age of 20 is low and the rate of asymmetrical movement patterns is high. Injury history of elite youth male soccer academy players under the age of twenty does not affect the composite FMS score, FMS subgroup scores, individual test score and distribution of asymmetric scores.

The results of this study were accepted at the 2nd International Congress on Sports, Anthropology, Nutrition, Anantomy and Radiology (SANAR2002) but it is not presented beause of the Congress postponed, normally would hold between 9 and 11 April 2020.

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