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Original investigation

Relationship Between Functional Movement Screen Scores and Musculoskeletal Injuries in Youth Male Soccer Players: One-year Retrospective Observation

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ABSTRACT

Objective: The aim of this study is to examine the success of functional movement screening (FMS) tests performed at the beginning of the season in youth male players for predicting musculoskeletal injuries (MSI) that occurred in the same season.

Methods: Fifty seven elite youth male soccer players were included in the study. Age, height and body weight of the participants were 15.95±2.44 years, 170.87±12.67 cm and 61.28±13.69 kg, respectively. Medical records of the participants for the 2016–2017 season were investigated retrospectively. FMS tests results conducted at the beginning of the season and MSIs encountered in the relevant season were recorded.

Results: Inline lunge, active straight leg raises, and composite FMS scores were statistically different (0.05>p) according to age groups. The composite FMS score increased with increasing age. The results revealed that no FMS test score can predict the rate of MSI that may occur during the season (p>0.05).

Conclusion: It has been observed that composite FMS score increases with age. It can be said that FMS test scores at the beginning of the season provides useful information in determining musculoskeletal system asymmetries and dysfunctions but it cannot be used to predict injuries that occur during the season in youth male soccer players. In addition, the study results indicated that the composite FMS score is not a factor that increases the time loss, but that asymmetries can be a factor that increases the time loss.

Keywords: football, sport injury, motor control, young.

INTRODUCTION

Soccer is the most popular team sport all over the world (1). A large number and variety of musculoskeletal injuries (MSI) are encountered in soccer due to high participation and the presence of many intrinsic and extrinsic risk factors (2). MSIs seen in soccer cause interruptions in the performance of the athlete and the team (3).

Especially MSIs that occur in youth male soccer players cause the technical, tactical, physical and mental developments of the athletes to be interrupted (4). For this reason, there is a need for MSI prevention programs that will predict MSIs in youth male soccer players, help identify risks and guide the management of existing risks (3).

Functional movement screening (FMS) is a clinical assessment tool created to predict MSI's in athletes (5). It was developed to determine decreased joint mobility, reduced core stabilization and muscle strength imbalances that can be observed during dynamic and functional movements and impair the quality of these movements (6, 7). The intra-rater test reliability of FMS is high (8, 9).

There are studies examining the composite FMS score and the success of each test for predicting MSI's in athletes (10–12). The composite FMS score in team sports has moderate evidence in predicting MSI (8). However, the interpretation of each test separately is more effective in predicting MSIs than the composite FMS score (11). In soccer, there is no clear opinion about the effectiveness of FMS in predicting MSIs (9, 13, 14). Some studies suggest that the FMS score provides useful information in predicting MSIs (9), while other studies report that FMS scores is not effective in predicting MSIs (13). However, FMS is the most commonly used scanning tool for predicting MSI's in soccer. More evidence is needed on the effectiveness of FMS in predicting

MSIs in different groups for soccer (13, 15). Therefore, it was hypothesized that FMS test scores alone would fail to predict MSIs in youth male soccer. In this context, the aim of the study was to examine the success of FMS tests performed at the beginning of the season in youth male soccer players to predicting MSI's that occurred in the same season.

METHODS

Participants

Fifty seven athletes from the male soccer academy teams U13, U16 and U19 of the Turkey Super League soccer team were included to study. The mean age, height and body weight of the participants were 15.95 ± 2.44 years, 170.87 ± 12.67 cm and 61.28 ± 13.69 kg, respectively. The medical records of these athletes made before the 2016–2017 season were reviewed retrospectively. FMS test scores conducted at the beginning of the season and MSI's encountered during the relevant season were recorded. Participants who performed the FMS test at the beginning of the season, have been evaluated by the same tester with the FMS test, have completed the FMS test battery, have not continued any preventive exercise program during the season, and have completed the entire soccer season at the soccer academy were included in the study. The study was carried out according to the Declaration of Helsinki and it was ethically compliant according to the decision numbered 2019/2021 of the Ethics Committee of Necmettin Erbakan University Meram Faculty of Medicine Drug and Non-Medical Device Research Ethics Committee dated 12.07.2019.

Musculoskeletal Injuries

MSI's caused by a single trauma were defined as traumatic MSI. MSIs with recurrent microtrauma without a specific major trauma were recorded as overuse MSI. The type of MSIs and which body part they affect were noted. MSIs that occur without any contact are defined as noncontact, while MSIs that occur with physical contact of a rival athlete or any object are defined as contact MSI. The severity of the MSIs was determined by taking into account the time the athlete could not participate in training and matches: mild (1–3 days), minor (4–7 days), medium (8–28 days) and major (>28) (16). After the athlete fully participates in training and matches after the treatment of any MSI, MSIs formed in the same body part and in the same tissue are called recurrent MSI. Compliant MSI's were recorded as recurrent MSI's (17). In addition, the time that participants could not participate in training and matches due to MSI was noted as time loss (16).

Functional Movement Screen

FMS consists of seven functional movement tests. These; deep squad, hurdle step, inline lunge, shoulder mobility, active straight leg raise, trunk stability push-up and rotatory stability (5). Each functional movement test is observed and scored between "0" and "3". A score of "0" is given if the test cannot be completed due to pain, "1" if the test cannot be completed even with compensation despite the absence of pain, "2" if the test can be completed with compensation, and "3" if the test can be achieved without compensation (6). Hurdle step, inline lunge, shoulder mobility, active straight leg raise, rotator stability tests are scored separately for the right and left sides. The low score is taken as a basis when determining the score of the tests that score separately for the right and left (5). The composite score is obtained by summing 7 test scores (7). The maximum score that can be obtained from seven tests is 21 (6–7). FMS test battery scores of the participants at the beginning of the season were recorded. The score of each test, the composite score, and asymmetrical movement patterns were recorded.

Statistical analysis

The data were analyzed by grouping the participants according to age, presence/absence of MSI and composite FMS score. Statistical calculations were made with SPSS 21.0 package program (Version: 21, IBM corporation, Armonk, NY). Mean and standard deviation were calculated for numerical data. Number and percentage distributions of nominal and ordinal data were found. A multifold chi square test was used to compare MSI features and asymmetric movement patterns of age groups. Kruskal Wallis test was used to compare time loss and FMS scores of age groups. Post hoc analysis was performed after the Kruskal Wallis test for variables with statistically significant difference. Mann-Whitney U test was used to compare the FMS scores of those with and without MSI during the season. Receiver-operator characteristic (ROC) analysis was performed to find the cut off score of the composite FMS score. Four-eyed chi-square test was used to compare the MSI rates and features of the groups formed according to the cut off score and asymmetric patterns. The comparison of times loss of the groups formed according to the cut off score was made with the Mann-Whitney U test. Logistic regression models were used to calculate the composite FMS score, asymmetry and age for predicting MSI's during the season.

RESULTS

Thirteen-year-old 19 participants; the average body weight was 45.17±7.20 kg and the average height was 157.95±9.85 cm. There were 20 participants aged 16. The average body weight of these participants was 68.17±7.88 kg and their average height was 176.88±8.18 cm. Eighteen participants aged nineteen; the average body weight was 70.50±7.45 kg and the average height was 178.83±6.69 cm.

Results related to musculoskeletal injuries

About half of the participants (47.37%) of the participants had experienced at least one MSI in the 2016–2017 season. The percent 59.2 of the total MSIs in the relevant season were realized during training. The most common MSI was the thigh (33.33%) and the most common MSI type was muscle strains (37.04%). More than half of the MSIs were moderate (51.85%). Contact MSIs (51.85%) were more than non-contact MSIs (48.15%). When participants were grouped by age, the incidence of MSI at the age of 13, 16 and 19 was 10.52%, 60.04% and 72.21%, respectively. The incidence of MSI increased statistically with age (0.05>p). However, MSI features did not change statistically with age (p>0.05). Distribution of musculoskeletal MSI features by age is given in Table 1.

The time that the participants who had MSI could not attend the training and matches due to MSI was 17.82±13.21 days. The time loss of the 13, 16 and 19 age groups was 1.104±3.414 days, 8.400±10.210 days, and 16.222±16.710 days, respectively. The time loss in the 13 age group was statistically less than in both the 16 and 19 age groups (0.01>p).

Results related to Functional Movement Screen

FMS test scores according to age groups are shown in Table 2. According to the FMS test battery results of the participants at the beginning of the 2016–2017 season; the composite FMS score average was 15.68±2.02. Inline lunge, active straight leg raises, and composite FMS scores were statistically different according to age groups (0.05>p). The composite FMS score and active straight leg raise test score of the 13-age group was statistically less than the composite FMS score and active straight leg raise test score of both 16 and 19 age groups (p<0.05). However, the inline line test score of the 19-age group was higher than the inline lunge test score of both the 13-age group and the 16-age group (0.05>p). In addition, as the age increased, composite FMS score increased.

Table 1. Musculoskeletal injury features of the participants by age

		T (n: 57)		U13 (n=19)		U16 (n=20)		U19 (n=18)		
		n[i]	%	n[i]	%	n[i]	%	n[i]	%	p[a]
Where injury has occured	Training	16	59.26	1	50.00	6	50.00	9	69.23	0.597
	Match	11	40.74	1	50.00	6	50.00	4	30.77	
Injury localization	Head	1	3.70	0	0	1	8.33	0	0	0.447
	Shoulder	1	3.70	0	0	0	0	1	7.69	
	Lumbar region	2	7.40	1	50.00	0	0	1	7.69	
	Groin	2	7.40	0	0	1	8.33	1	7.69	
	Thigh	9	33.33	1	50.00	4	33.33	4	30.77	
	Knee	3	11.11	0	0	3	25.00	0	0	
	Lower leg	3	11.11	0	0	2	16.67	1	7.69	
	Ankle	5	18.52	0	0	1	8.33	4	30.77	
	Foot	1	3.70	0	0	0	0	1	7.69	
Type of injury	Contusion	6	22.22	2	100.00	2	16.67	2	15.38	0.331
	Strain	10	37.04	0	0	5	41.67	5	38.46	
	Sprain	8	29.63	0	0	3	25.00	5	38.46	
	Fracture	2	7.40	0	0	1	8.33	1	7.69	
	Bursit, Tendinit	1	3.70	0	0	1	8.33	0	0	
Severity of injury	Minimum	0	0	0	0	0	0	0	0	0.424
	Mild	8	29.63	1	50.00	5	41.67	2	15.38	
	Moderate	14	51.85	1	50.00	6	50.00	7	53.85	
	Major	5	18.52	0	0	1	8.33	4	30.77	
Cause of injury	Travma	25	92.59	2	0	11	91.67	12	92.31	0.916
	Overuse	2	7.40	0	0	1	8.33	1	7.69	
Reccurent injury	Yes	2	7.40	0	0	1	8.33	1	7.69	0.916
	No	25	92.59	0	0	19	91.67	12	92.31	
Occurence	Non contact	13	48.15	0	0	5	41.67	8	61.54	0.224
	Contact	14	51.85	2	100.00	7	58.33	5	38.46	

[a]Multifold chi square test, **T:** total, n: number of participants, **n[i]:** number of musculoskeletal injuries.

Table 2. Functional movement screen scores of participants by age

	Total	13 years old	16 years old	19 years old	p[a]
	M ± SD	M ± SD	M ± SD	M ± SD	
Squat	1.77±0.54	1.58±0.61	1.85±0.49	1.89±0.47	0.058
Hurdle step	2.14±0.58	2.00±0.58	2.15±0.67	2.28±0.46	0.369
Inline Lunge	2.33±0.55	2.21±0.54	2.20±0.52	2.61±0.50	0.032*
Shoulder mobility	2.65±0.48	2.74±0.45	2.55±0.51	2.67±0.49	0.472
Active straight leg raise	2.14±0.69	1.63±0.68	2.40±0.50	2.39±0.61	0.001*
Trunk stability push up	2.53±0.54	2.42±0.61	2.70±0.47	2.44±0.51	0.209
Rotatory stability	2.09±0.34	1.95±0.23	2.10±0.31	2.22±0.43	0.051
Composite score	15.68±2.02	14.53±1.65	15.95±1.88	16.61±2.03	0.006*

[a]Kruskal-Wallis test, **M:** mean, **SD:** standard deviation, * p<0.05

Table 3. Asymmetric movement patterns of participants by age

		Total		13		16		19		p[a]
		n	%	n	%	n	%	n	%	
Hurdle step	Yes	13	22.81	6	31.58	3	15.00	4	22.22	0.466
	No	44	77.19	13	68.42	17	85.00	14	77.78	
Inline lunge	Yes	6	10.53	3	15.79	3	15.00	0	0	0.212
	No	51	89.47	16	84.21	17	85.00	18	100.00	
Shoulder mobility	Yes	16	28.07	5	26.32	6	30.00	5	27.78	0.967
	No	41	71.93	14	73.68	14	70	13	72.22	
Active straight leg raise	Yes	9	15.79	5	26.32	1	5.00	3	16.67	0.188
	No	48	84.21	14	73.68	19	95	15	83.33	
Rotatory stability	Yes	4	7.02	1	5.26	2	10.00	1	5.56	0.810
	No	53	92.98	18	94.74	18	90	17	94.44	
At least one asymmetric movement pattern	Yes	39	68.42	15	78.95	12	60.00	12	66.67	0.437
	No	18	31.58	4	21.05	8	40.00	6	33.33	

[a]Multifold chi square test; **n:** number of participants

The distribution of asymmetric movement patterns is detailed in Table 3. The percent 68.42 of the participants had at least one asymmetric movement pattern. The most asymmetry was seen in the shoulder mobility test (28.07%). The percent 78.95 of the 13-year-old participants, the percent 60.00 of the 16-year-old participants, and the percent 66.67 of the 19-year-old participants had at least one movement pattern asymmetrical. Hurdle step (31.58%) in 13-year-old participants, and shoulder mobility (30.00%, 27.78%) tests in participants aged 16 and 19 were the tests with the highest asymmetry percentage. The distribution of asymmetrical movement patterns was not statistically different between age groups (p>0.05).

Results related to regarding musculoskeletal injuries and Functional Movement Screen relationship

The composite FMS score, asymmetry, and age data for evaluation of the potential to predict MSI are shown in Table 4. It has been seen that no FMS test score can predict the MSI rate that may occur during the season (p>0.05). It was also found that FMS scores were insufficient to predict MSI properties (p>0.05). Table 5 shows the FMS test scores of participants with and without MSI at the beginning of the season. When the FMS test scores of those who did not experience MSI and those who experienced MSI in the 2016–2017 season were compared, it was found that the scores of active straight leg raise and rotatory stability tests were statistically different (p<0.05). The scores of active straight legs raise and rotatory stability tests were better in the MSI group than the non-MSI group. Other FMS scores of those with and without MSI were statistically similar (p>0.05). In addition, participants with MSI in the 2016–2017 season were also divided into two groups as those who did not have an asymmetrical movement pattern and had at least one asymmetric movement pattern according to the FMS tests performed at the beginning of the season. There was no statistically significant difference in the incidence and features of MSI in the participants with at least one asymmetric movement pattern and no asymmetric movement pattern (p>0.05). The distribution of participants with and without MSI according to the asymmetric movement patterns is shown in Figure 1. The time loss of the participants with at least one asymmetric pattern

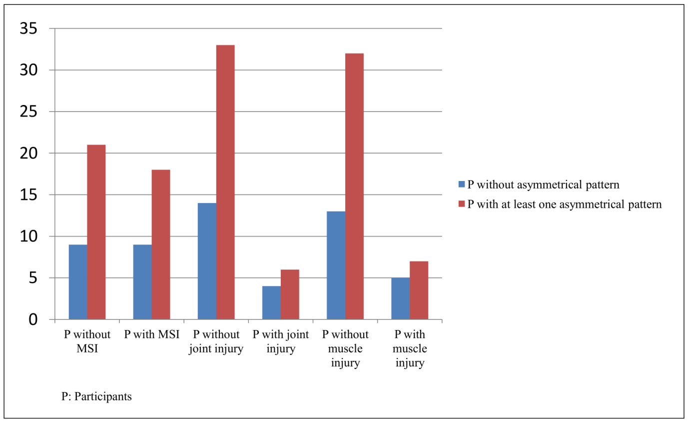

Figure 1. The MSI's of the participants who had at least one asymmetric movement pattern, and who had not any asymmetric movement patterns in the FMS test conducted at the beginning of the season.

Table 4. Assessment of the potential to predict musculoskeletal injuries of the functional movement screen composite score, asymmetry and age

		Odd ratio	95% CI	p[a]
Musculoskeletal injury	Composite FMS score	1.28	0.79–1.61	0.506
	Asymmetry	0.79	0.20–3.10	0.736
	Age	1.57	1.18–2.10	0.002*

[a]Logistic regression models, **FMS:** functional movement screen, *p<0.05

Table 5. The functional movement screen tests scores of participants with and without musculoskeletal injuries

	Participants without MSI	Participants with MSI	
	M ± SD	M ± SD	p[a]
Squat	1.70±0.53	1.85±0.53	0.163
Hurdle step	2.13±0.63	2.15±0.53	0.970
Inline Lunge	2.23±0.57	2.44±0.51	0.171
Shoulder mobility	2.67±0.48	2.63±0.49	0.772
Active straight leg raise	1.93±0.69	2.37±0.63	0.018*
Trunk stability push up	2.53±0.57	2.52±0.51	0.811
Rotatory stability	1.97±0.18	2.22±0.42	0.005*
Total score	15.17±1.97	16.26±1.95	0.060

[a]Mann-Whitney U test, **MSI:** musculoskeletal injury, **M:** mean, **SD:** standard deviation, *p<0.05

Table 6. Distribution of participants according to the functional movement screen composite cut off score

		FMS composite score 15≥		FMS composite score >15		p[a]
		n	%	n	%	
Musculoskeletal injury	No	17	65.38	13	41.94	0.066
	Yes	9	34.62	18	58.06	
Joint injury	No	22	84.62	25	80.65	0.486
	Yes	4	15.38	6	19.35	
Muscle injury	No	21	80.77	24	77.42	0.509
	Yes	5	19.23	7	22.58	

[a]Four-eyed chi-square test, **FMS:** functional movement screen, **n:** number of participants

was 8.846±14.082 days, while the time loss of the participants without asymmetric movement pattern was 7.556±9.376 days. The time loss differences of the groups were not statistically significant (p>0.05).

The distribution of participants with and without MSI according to the cut off score is shown in Table 6. As a result of the ROC analysis, the cut off score was found to be 15.50. Participants were divided into two groups as those who received a composite FMS score of 15≥from the FMS test battery made at the beginning of the season, and those who received a composite FMS score of >15, and MSI rates and features were examined. Although there was no statistically significant difference (p=0.066), it was observed that the MSI rate was higher in those with an FMS score below 15 (58.1%) than those with an FMS score above 15 (34.6%). In addition, when MSIs were considered as joint and muscle MSIs and examined, no significant statistical difference was found between the two groups (p>0.05). No statistically significant difference was found between the MSI features of the participants with a composite FMS score of 15≥at the beginning of the season and those with a FMS score of >15 at the beginning of the season (p>0.05). Participants with a composite FMS score of 15≥had a time loss of 5.235±14.498 days, while participants with a composite FMS score of >15 had a time loss of 9.800±11.809 days. The time loss differences of the groups were statistically significant (p>0.05).

DISCUSSION

The aim of present study was to investigate whether FMS test results performed at the beginning of the season on youth male soccer player can be used to predict MSIs in the same season. The study results were as follows; MSI rate in youth male soccer player is about 50%, MSI rate increases with age, MSI features are not affected by age, composite score of FMS tests performed at the beginning of the season is insufficient to predict MSIs and does not affect the MSI features.

In this study, the rate of MSI was found at 47.37%. Previous studies have reported that the MSI rate in youth male soccer players is between 9.50% and 48.70% (18, 19). The wide range of MSI ratios can be explained by the difference in the samples chosen. The present study results show that the rate of MSI increases with age, and this result is supported by the literature. Bastos et al. reported that the rate of MSI in youth male soccer players increases with age. Authors suggested that career concerns, increased training intensity and frequency may be the reason for this (20). According to this study results, age can be used to estimate MSI rates. There are results in the literature that support this finding. Le Gall et al. reported that youth soccer players were experienced more MSI exposure more than older soccer players (18). Deehan et al reported that the 16-year-old group experienced more frequent injuries in their study of soccer player between the ages of 9 and 18 as participants (16). These evidence suggests that age may be an injury estimator, at least for injury rate. Although evidence indicated that age is a predictor of MSI, more information is needed for understaning which type of MSI's age is effective to predict. According to the results of the present study, the ratio of training and match injuries was equal in 13 and 16 age group players, while the rate of training injuries was higher in the 19 age group. However, it is reported in the literature that training injuries are more common in younger age groups, and match injuries are more common in older age groups (21). The reason for the higher training injury rates of the older age groups in this study may be training mistakes. The fact that the match injury rate in the 13 and 16 age groups is equal to the training injury rate can be attributed to the match frequency.

According to the results of the study, non-contact, traumatic and moderate injuries were more common. In addition, the most common injury type was muscle strains and the body part where the injuries were most common was the thigh. The study results are similar to the literature in terms of MSI features. Most of the MSIs encountered in youth male athletes are traumatic and non-contact MSIs related to the thigh (21, 22). In addition, muscle strains are the most common MSI type (18, 23). The effect of the muscles of the thigh region in performing activities such as acceleration, deceleration, directing the ball and adjusting the speed of the ball may explain the high injury rates of these muscles (24). In addition, factors such as fatigue and strength imbalances may have contributed to this (22).

According to the results of this study, the average composite FMS score of youth male soccer players at the beginning of the season was 15.68±2.02. Newton F et. al, reported the composite FMS scores of male soccer academy athletes between 15.30 and 16.10 (13). Therefore, the results of this study were consistent with the values reported for soccer academy athletes. On the other hand, study results showed that the composite FMS score differs according to age groups and increased with age. Other studies on this subject have also reported that FMS scores are affected by maturation (25, 26). Physical development continues during adolescence and peaks between the ages of 18 and 25. The quality and quantity of physical performance also increase in parallel with this physical development. The reflection of this change on FMS test performance may explain the difference in FMS test scores between age groups (27).

The study results showed that the FMS tests performed at the beginning of the season were insufficient to predict the MSI's seen during the season. There is evidence in the literature supporting this. Newton et al. reported that the composite FMS score in male soccer academy athletes was not related to the MSI (13). Warren M et al. reported that athletes from different branches of sports informed that their composite FMS score, asymmetries, and scores from each test were insufficient for predicting noncontact and overuse MSI's (28). In contrast, Letafatkar A et al. reported that the composite FMS score is associated with MSI and can be used for risk screening (14). Recent evidence suggests that the composite FMS score is more effective for predicting MSI in senior athletes than in youth athletes (29). Physical development continues in youth athletes and there may be significant changes in this regard even in a few months period (27). Thus, the FMS tests' results conducted only at the beginning of the season may be insufficient to predict MSI. Also according to other research results; the relationship between MSI's, asymmetric movement patterns and individual test scores is stronger than the composite FMS score (30). However, these study results do not support this.

The time loss of the participants was 17.82±13.21 days. It can be said that these results are compatible with the literature. Price et al. reported that the time loss in English elite soccer players was 21.9 days per season, while Le Gall et al. reported that the time loss in the French elite youth player was 15 days per season (18, 31). The present study result showed that participants with a composite FMS score of 15≥had less time loss than participants with a composite FMS score of >15. There is no study in the literature examining the relationship between FMS scores and time loss in elite youth male soccer players. According to the results of the present study, it can be said that there is no relationship between composite FMS score and time loss. However, although it is not statistically significant, it can be claimed that the time loss of those with at least one asymmetric pattern is high, asymmetries determined by the FMS test battery increase the time loss. Although there is no study in the literature examining the effect of musculoskeletal system asymmetries determined by FMS on time loss, there are studies examining the relationship between musculoskeletal system asymmetries and MSI. It has been reported that musculoskeletal system asymmetries are a risk factor that causes time loss injuries (32). It is also reported that the asymmetries revealed by FMS test battery provide more useful information in predicting MSIs than the composite FMS score (30). Therefore, future studies may focus on investigating the asymmetries determined by FMS test battery and time loss due to specific MSIs.

The study has some limitations. Failure to eliminate other risk factors such as weather conditions and equipment that may be effective in the formation of MSIs may have weakened the ability of FMS scores to predict injuries. In addition, not knowing how many of these MSIs are caused by training mistakes may be another factor affecting the results. Studies that will investigate the effectiveness of FMS scores in predicting specific soccer MSI in the future will contribute to further clarification of this issue. In addition, studies that will show which FMS test is related to which MSI and the strength of this relationship will also make a significant contribution to the literature.

CONCLUSION

The MSI rate is high among youth male soccer players. This rate varies according to age groups and increases with age. However, MSI features are not affected by age. Age affects FMS test scores. The composite FMS score increases with age. This difference is due to test results regarding muscle strength. Although there was no statistically significant difference, it was observed that the MSI rate of participants with a composite FMS score below the cut off point was higher than that of participants with a composite FMS score above the cut off point. It can be said that composite FMS score is not an effective factor in increasing time loss, but asymmetries may be a factor that may cause increase in time loss. FMS test scores performed in the youth male players at the beginning of the season are not successful for predicting the MSI's during the relevant season. However, it may be possible to predict the MSIs that can be seen in youth male soccer players with the averages of the FMS tests to be performed at the beginning of the season and within. Therefore, new studies are needed.

Informed Consent: Retrospective study

Compliance with Ethical Standards: The study was received the ethical compliance in accordance with the decision of the 92nd meeting 2019/2021 of 12.07.2019 of the Council on the Ethics of Pharmaceutical and Non-Medical Research of the Meram Faculty of Medicine of Necmettin Erbakan University.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - ED, SA; Design - ED, SA; Supervision - ED, SA; Fundings - ED; Materials - ED; Data Collection and/or Processing - ED, SA; Analysis and/or Interpretation - ED, SA; Literature Search - ED, SA; Writing Manuscript - ED, SA; Critical Review - ED, SA

Conflict of Interest: No conflict of interest was declared by the authors.

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