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Examining the functional motor screening (FMS) and its relationship with the function of the upper organs scores of Mobarake Sepahan handball players

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Abstract

Purpose: The purpose of this research was to determine the norm of the functional motor screening test in the male handball players of the Sepahan club in Isfahan. **Method:** The method of collecting information is cross-sectional and in terms of practical purpose. For this purpose, 30 male students aged 14-16 from Sepahan Handball Club of Isfahan were evaluated by performing 7 FMS tests (shoulder mobility tests, straight and active leg raising, trunk stability test through Swedish swimming, turning stability, step forward in a line, full squat and stepping on the hurdle) as an evaluation tool in sports injury prevention and testing Davis was used to evaluate the function of upper limbs. Pearson's correlation coefficient at the significance level of $P < 0.05$ was used to examine the relationship between variables. **Results:** The norm of FMS test in 14-year-old students was 14.39±1.66, in 15-year-old students it was 15.85±1.47, and in 16-year-old students it was 15.29±1.21. Also, there is a significant relationship between functional motor screening tests and Davis test ($r=0.465$, $p=0.002$). **Conclusion:** In many sports activities, the movements of the upper and lower limbs need to have sufficient stability in the central area, if there is no stability in this area, energy transfer does

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not take place well. And on the other hand, considering the significance of the relationship between the functional motor screening test and the Davis test, use this test to diagnose and identify people at risk of physical deformity and injury at different ages and plan bodybuilding and corrective exercises based on it.

Keywords: functional motor screening test, Davis test, male students, Sepahan handball

INTRODUCTION

Recently, sports science experts, physiotherapists and doctors believe that evaluating functional movements and training strategies can be useful in improving sports performance, preventing and reducing the rate of sports injuries (Parchmann et al 2011). Functional movement is defined as the ability to produce and maintain balance between stability and movement along the movement chain while a person executes basic movement patterns accurately and efficiently (Okada et al 2011). Therefore, functional physical fitness components have been proposed as the ability to stand, sit, or move correctly and efficiently during daily, recreational, and sports activities. Over the years, sports science experts have tried to reduce musculoskeletal injuries and improve sports performance by teaching correct techniques (Mills et al, 2005). Due to the increase in participation in sports activities, the high number of competitions and the greater seriousness of the competition, the number of injured young athletes is also higher in secondary school students than in elementary school students (Maffulli 1992). According to a report, in the United States, in high school students participating in sports activities, more than two million people have been injured, of which 500,000 people need a doctor's visit and 30,000 people have been hospitalized, which is the amount of Sports-related injuries may be associated with long-term disability (Powell et al, 1999). schools, physical education instructors try to strengthen and increase physical fitness factors by using exercises and performing physical fitness tests, and less attention is paid to identifying people at risk of physical abnormalities and injuries. There are several tests to evaluate the quality of functional movement patterns (Everard et al, 2017). In an effort to introduce a standard protocol for evaluating functional movements. functional movement screening tests (FMS) are a set of 7 basic movement patterns that a person must have balanced movement and stability (involvement of the system) for its correct execution. neuro-

muscular/motion control) and have the ability to identify limitations and changes in normal movement patterns (Cook et al, 2014).
These basic movement patterns are designed in such a way to evaluate a person's movement patterns, manipulation and stability. The focus of functional motor screening tests is on the end organs (where the degree of weakness and imbalance is evident due to reduced mobility and stability). The inability to perform these basic movement patterns has been observed even in high-level active people (Cook et al, 2006).
Defects in the implementation of these basic movement patterns will lead to the activation of compensatory movement patterns, which will lead to the continuous use and strengthening of these compensatory patterns, leading to the weakening of the biomechanical pattern and ultimately increasing the potential for small and large injuries. Performing the movements of functional movement screening tests requires the use of proprioception and sense of movement. The sense of proprioception in each part of the closed movement chain must function correctly in order to perform an optimal and integrated pattern. Different parts of the body act like chains connected to each other, that's why defects in one part are transferred to other parts. post-injury rehabilitation should not be limited to the site of the injury, but should evaluate the athlete as a whole before returning to a high level of performance. One of the advantages of functional motor screening tests is to evaluate a person as a whole and not separate parts (Bardnet et al 2015).
one of the important factors in preventing injuries and improving performance is the quick detection of asymmetries, defects in movement and stability, because these things lead to changes in movement patterns (formation of compensatory movement patterns) in the closed movement chain and eventually damage. to be Functional movement screening tests are designed to identify individuals with compensatory movement patterns in the closed movement chain. In this way, the imbalance on the left and right sides of the body, movement and stability defects are identified. When the defect in the movement pattern is determined by the functional movement screening tests, basic strategies can be used to eliminate imbalances and compensatory movement patterns (Cook et al, 2010).
The basic strategies include seven simple tests (deep squat, stepping over the obstacle, linear launch, shoulder mobility, active leg raising, trunk

stability swimming and rotational stability). Each of these tests is graded according to the {3-0} scale, and the combined score of functional motor screening tests is calculated from the total of these seven tests out of 21.
In the research of Bonaza et al (2017) they reported that people who have a combined score of functional motor screening tests are less than 14. 2.7 times (odds ratio) more people who have combined scores of functional motor screening tests above 14 are exposed to musculoskeletal injuries. Some studies have also reported that there is no significant relationship between dysfunction or movement asymmetry during functional movement screening tests and high risk of injury (Newton et al, 2017).
Cook et al (2006) high FMS scores indicate correct musculoskeletal stability and movement, which improve sports performance and reduce the rate of sports injuries Cook et al (2006) also reported that low FMS scores have harmful effects on sports performance and increase the amount of sports injuries Few studies have examined FMS norm preparation (Bushman et al 2016).
Shojauddin et al (2012) evaluated 100 students (50 men and 50 women) with an average age of 23.21±2.12 years with functional motor screening tests, and the off-cut score for screening tests obtained a functional movement score of about 17 and reported that if an athlete scores less than 17 in the FMS tests, he is about 4.7 times more prone to lower limb injuries than people with a higher score.
Schneider (2011) in the research entitled "Determining the norm of functional movement screening in active young people", 209 subjects (108 women and 101 men) with physical activity and age range of 18-40 years were tested with functional movement screening tests. evaluated that in general, the subjects scored an average of 15.7 out of a total of 21 points in the test, and there was also a significant difference in the functional motor screening scores between men and women who had reported a history of injury and those who had not. They were not injured, they did not observe (Schneider et al (2011).
Perry and Cohen (2012) in a research titled "Determining the norm of functional movement screening among the elderly", 622 men and women with an average age of 50.91 years, of which 395 were men (63.5%) and 227 were women. (36.5%) were evaluated with functional motor screening tests and they came to the conclusion that the average scores obtained in the 7 stages of the test in both genders was 14.14 and they found that with

increasing age and BMI , the subjects obtained lower grades (Perry and Cohen, 2012).

Domhnaill et al (2013) prepared an FMS test norm for football players, which was prepared from 62 elite and sub-elite level athletes, and the ICC in this study was reported between 0.81 and 0.91. As a result of this study, there is no significant relationship between the FMS test and the age, BMI, height and weight of the players, The average score of this test is reported as 16 in elite athletes and 14.71 in the sub-elite group (Domhnaill et al 2013).

It is important to prepare norms and standards for different ages because these reference information are specific to each age group, in the sense that they have value and validity only in relation to a certain age group and are not suitable for other age groups. Norm development can be a predictor of students' condition and prevent the risks of abnormalities and damages that may occur in the future. As mentioned, there are few researches that have examined the preparation of norms. Also, previous research has been done on people who exercise recreationally and are athletes, and less has been done on students. Therefore, the purpose of this research was to investigate the scores of functional motor screening and its relationship with the function of the upper organs in male students aged 16 to 14 from Sepahan Handball Club.

METHOD

Based on the nature and method of data collection, the current research is cross-sectional and practical in terms of purpose. The statistical population consisted of 30 male students of the first secondary level of Isfahan province who were members of the Mobarake Sepahan youth handball team (average height 173.47 ± 11.03cm and weight 68.06± 11.11kg) who were selected as a statistical sample.

The criteria for entering the research included: age range 14-16 years, membership of the youth handball club Foulad Mobarake Sepahan 1402-1401.

The exclusion criteria from the study included: a history of injury and surgery in the past year, the presence of a prosthesis in the lower limb, the presence of excessive joint laxity (checked using the Bitton index). The subjects completed the voluntary participation in the research before starting the research. At the beginning of the session, the subject warmed

up by walking fast for 10 minutes, then did stretching exercises. The set of functional movement screening tests (FMS) was performed based on the instructions of Cook et al. This set of tests were designed to evaluate the simultaneous movement and stability using seven movement tests.

Davis Test

This test examines muscular strength and endurance and the stability of the closed kinetic chain of the upper limb. This swimming test is modified by Davis and Dickoff-Hoffman. Its test-retest reliability is reported as 0.92. Two pieces of sports band were placed at a distance of 90 cm. The subject was asked to take swedish in this space in swimming mode, then move his arms crosswise at full speed in a time interval of 15 seconds. The number of hand contact counts as a person's score.

FMS functional monitoring test evaluation kit

This kit included a graduated plate, three bars and a rubber band. Also, the scoring sheet was used to record the score of the functional motor screening test

Functional motor screening

Each subject was evaluated based on his performance in seven functional movements. The scoring method of these tests was done based on the instructions of Cook and colleagues as follows.

• Performing the movement correctly without compensatory movements: 3 points

P Performing movements with compensatory movements: 2 points

• Inability to perform movement without compensatory movement: 1 point

• Causing pain while performing the movement or performing the detection test: 0 points

Five of the seven tests (stepping over the obstacle, launch, shoulder flexion, active straight leg raising, and rotational stability) were scored independently on the right and left sides of the body. Due to the existence of a relationship between the neuromuscular asymmetry between the right and left sides, the FMS scoring system emphasized asymmetry and the lowest score was considered as the overall score for that movement. To obtain the final score, the total scores of each test were added together.

Therefore, the subject could receive a final score of zero (if there was pain in any movement test) to (if the subject scored 3 in each test).

Statistical Analysis

After collecting research data, all research data were analyzed using SPSS version 22 software and using descriptive and inferential statistics. In order to check the relationship between the scores of the functional motor screening test and the Davis test, the Pearson correlation coefficient was used at a significance level of $P < 0.05$ to check the relationship between the variables.

RESULTS

The demographic characteristics of the subjects are reported in Table 1.

Table 1: Level and standard deviation of research subjects

Variable	14 years	15 years	16 years	all groups
Height (cm)	163.18± 13.08	172.12± 9.57	185.13± 10.45	173± 11.03
Weight (kg)	63.48± 11.12	68.33± 10.23	72.37± 11.98	68.06± 11.11
BMI (kg/m^2)	21.08± 3.14	22.02± 5.49	21.14 ± 4.06	21.7± 4.23

Table 2 show that in 14-year-old students, the norm of the functional motor screening test is 14.39±1.66.

Table 2: Total score of total FMS score based on Z score of 14-year group

Variable	Number	min score	max score	range	confidence interval	mean	standard deviation
Total FMS score	10	12	20	8	-14.95	14.39	1.66
Based on the z score	10	-2.04	2.42	4.46	14.37	0.00	1.00

Table 3 shows that the norm of functional movement screening test of 15-year-old students is 16.15±1.89.

Table 3: Total score of total FMS score based on Z score of 15 years group

Variable	Number	min score	max score	range	confidence interval	mean	standard deviation
Total FMS score	10	10	19	8	-16.49	16.15	1.89
Based on the z score	10	-2.83	1.52	4.35	15.8	0.00	1.00

Table 4 shows that the norm of functional motor screening test in 16-year-old students was 16.16±1.76.

Table 4: Total score of total FMS score based on Z score of 16-year-old group

Variable	Number	min score	max score	range	confidence interval	mean	standard deviation
Total FMS score	10	11	20	8	-16.55	16.16	1.76
Based on the z score	10	-2.44	2.44	4.45	15.87	0.00	1.00

Table 5 shows the grouping and Screening test score of functional motor screening test scores.

Table 5: Grouping of functional motor screening test scores

Screening test score	Grouping
12 – 13/6	Very Weak
13/7 – 15/3	Weak
15/4 – 17	Medium
17/1 – 18/7	Good
18/8 – 20/4	Very good

The results of the Pearson correlation test showed that there is a significant relationship between the functional motor screening test and the Davis test to evaluate the function of the upper limbs (r=0.465, p=0.002).

DISCUSSION

The aim of the current research was to prepare the norms of the functional motor screening test and its relationship with the function of the upper organs of 14-16-year-old male students from Mobarakeh Steel Handball Club in Sepahan, in order to provide limits for the functional motor screening in different age groups. Due to the increase in the occurrence of sports injuries, screening of athletes before the season is common nowadays. Screening is done in order to prevent harm and also to improve implementation strategies (Chorba et al, 2010).

Cook et al (2006) have introduced functional motor screening tests considering pre-season screening and factors related to performance. The findings of the present research show that the average score of the functional motor screening test in 14-year-old students is 14.39±1.66, in 15-year-old students it is 15.85±1.47, in 16-year-old students it is 1.21±1. It was obtained on 29/15. Also, there is a significant relationship between functional motor screening tests and Davis test (r=0.465, p=0.002).

In this regard, related studies by Abraham et al (2015) reported a lower norm compared to the current research findings. One of the reasons for this difference can be mentioned is that the subjects are different. Therefore, only healthy students were used in this research (Abraham et al, 2015),

In the researches Bardnet et al (2015) differences in different age groups are the reasons for the difference between the obtained results (Bardnet et al (2015).

In the current study, the age range was 14-16 years, while in the study of Abraham et (2015), the age range of the subjects was 10-17 years, and in the study of Bardnet et al (2015), it was 13-18 years old. Another reason for the difference is the difference in the level of competition and skill, performance ability, training and sports requirements of the athletes.

Schneider et al (2011) in their research entitled "Determining the norm of functional movement screening in active young people" evaluated 209 subjects (108 women and 101 men) with physical activity and age range of 18-40 years with functional movement screening tests. They stated that the subjects scored an average of 7.15 points out of the total of 21 points in the test, and there was a significant difference in the performance screening scores between men and women who had reported a history of injury and those who had no history of injury did not observe (Schneider et al, 2011).

Perry and Cohen (2012) in a research entitled "Determining the screening norm of functional movements in the middle-aged", 622 men and women with an average age of 50.91 years, of which 395 were men (63.5%) and 227 were women (% 36.5) were evaluated with functional motor screening tests, they came to the conclusion that the total average scores obtained in the 7 stages of the test in both sexes was 14.14 and they found that with increasing age and BMI, the subjects have scored less (Perry and Cohen, 2012)

Domhnaill et al (2014) prepared a functional motor screening test norm for soccer players, which was prepared from 62 elite and sub-elite level athletes, and the ICC in this study was reported between 0.81 and 0.91. The average The score of this test was reported as 16 in elite athletes and 14.71 in the sub-elite group (Domhnaill et al, 2014).

Agresta et al (2014) in a study aimed at preparing the norm of the functional motor screening test in healthy endurance runners, investigated the difference of gender and level of experience in the performance of the functional motor screening test. In this study, 45 healthy endurance runners (24 men and 21 women, 31 people with more than 3 years of experience and 14 beginners with less than 3 years of experience (with an average age of 34.8 years) participated. These researchers found the norm of the FMS functional screening test score in all subjects to be 2.03. reported 12.71 ± 13.13 ± 1.7 ± 1.7 in men and 13.3 ± 1.9 ± 1.9 in women, and there was no significant difference between the two sexes Also, the norm of functional movement screening test was 13.1±1.9 in experienced runners and 13.1±5.3 in beginner runners, and no significant difference was observed between the two levels of experience (Agresta et al, 2014).

Abraham et al (2015) in their research entitled "Determining the norm of functional movement screening in high school students" 1005 female students (457 people) and male students (548 people) based on the entry and exit criteria of the study with functional movement screening tests. evaluated that in general, the average scores of the functional motor screening in both sexes were 14.59 points and in men and women 14.17 and 14.93 points respectively out of the total of 21 points of the test (Abraham et al (2015).

Ardanet et al (2015) in a research developed the norms of functional movement screening of student athletes. 167 students (90 girls and 77 boys - 128 uninjured and 39 injured) with an average age of 15.2 years participated in this study. The findings of this study showed that there was no significant difference between the score of the functional motor screening test of the two groups without injury and the injured group (p=0.954), also the norm of the score of the functional motor screening test in the uninjured group was 13.11±1.69 and In the injured group, 13.00±2.32 was reported (Ardanet et al (2015).

According to the findings of the present study and other studies, the total score of the functional movement screening is different in different groups (athletes and non-athletes), age (adolescent, young, middle-aged and elderly) and gender (male and female) and cannot be A reference score was used to identify and prevent injury in all people. Therefore, according to the fact that people who get a poor score in screening use compensatory patterns in regular activities, if these compensatory activities continue, the unfavorable patterns will strengthen and lead to wrong biomechanics and create physical abnormalities and the possibility of injury in They become the future. This topic will be very useful in corrective actions to identify people at risk and to prevent injury in people with physical deformities, and it can be used as a valid model in the prevention of sports injuries in line with medical tests to determine the performance level of people. Use it before starting sports exercises.

CONCLUSIONS

According to the results of this research, while presenting the norms of the functional motor screening test of male students aged 14-16 years old from Mobarakeh Steel Handball Club in Sepahan, it can be stated that this group of students is in a better condition than previous studies in terms of the examined indicators. are going to In many sports activities, upper and lower limb movements require sufficient stability in the central region. If there is no stability in this area, the energy transfer does not take place well

Since this age group is at the beginning of official sports competitions, and on the other hand, injuries cause people to stay away from sports for a long time, and the possibility that the negative effects of these injuries will remain permanent is high. Screening before competitions, in order to participate in sports training and injury prevention, can be very important that sports medicine specialists and sports team coaches can use the value of norm scores to detect and identify people at risk of physical abnormalities and injuries at different ages. represent and develop and plan a special program for the purpose of injury prevention for students, according to the scores of each of the functional movement screening tests on the norm scale.

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