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Use of the FMS as a tool for evaluating and preventing injuries in professional football players

Alessandro Iamele[1], Mario Vetrano[2], Enzo Ruberti[3]

[1]*Department of Medicine and Psychology ,"Sapienza University" ,Italy*
[2]*Department of Medicine and Psychology, PhD ,"Sapienza University" ,Italy*
[3] *Department of Neurology and Psychiatry, PhD. s., "Sapienza University" ,Italy*

Abstract:*The basic motor sequences behind the seven Functional Movement Screen (FMS) tests place athletes in a condition that exposes the limitations of mobility, stability and balance. Since the number of football players is increasing, also the number of subjects likely to be injured could proportionately increase with it.The purpose of the study is to verify whether there is any correlation between the final FMS score and risk of non-traumatic injury in a group of professional football athletes.A group of athletes born in 1999/2000 playing in a professional football team were examined between March and September 2016 by use of the FMS (n = 18).All participants in the study were evaluated at half competitive season while incidences of muscular or articular injury were monitored during the rest of the season. Specifically, verifications were made as to whether any injuries that were not linked to direct trauma occurred to those who scored ≤14 in the FMS tests.Based on data reported in literature by Kiesel et all, which places the FMS score ≤ 14 as a risk value, the study revealed that 71% of athletes who suffered injury obtained a total score equal to or below the FMS risk value.*

Keywords: *injury, movement, screening, test*

INTRODUCTION

The Functional Movement Screen includes seven tests that measure balance, mobility and stability [1]. The basic motor sequences behind the tests focus on the neurological development phases of the child, the so-called "primitive movement patterns" ,which start developing from birth and will help perform increasingly complex movements during hisentire development process. Through these seven simple motor sequences, the intention therefore is to try to evaluate and categorize the human movement without expecting to determine the reason of a dysfunctional motor sequence, but only wanting to expose and discover dysfunctional and/or painful basic motor patterns [2]. The reliability of this system has been confirmed by a study conducted by Leeder et all, [3] which focused on analyzing reliability of the FMS inter-operator scores by using a group of non-trained subjects with a group of twenty qualified physiotherapists working with elite athletes at the English Institute of Sport. Furthermore, the study also examined whether the clinical experience level of the examiners had an impact on the reliability of the scores. The study also demonstrated that inter-operator reliability of the test had a high interclass coefficient of 0.906. To these are added the studies of Deydreet all [4] and Minick et all. [5]. The results of the studies therefore indicate that the FMS is a tool that has good repeatability even when used by inexperienced operators and that the level of clinical expertise of the operator does not affect reliability of the tests. The FMS could therefore be atool that can be used for screening in athletes.

It has also been reported in literature that an FMS sum score of ≤ 14could indicate higher chances of musculoskeletal injury [6]. The results of these studies indicate that athletes scoring FMS ≤ 14 have a3.85 (95% CI = 0.99 - 15.13) risk of injury odds ratio[7].

The purpose of the study was to determine a connection between risk of injury and FMS score, also based on older literature data.

MATERIALS AND METHODS

The Functional Movement Screen scoring process and evaluation criterion allows four possibilities, with values ranging from zero to three, where "three" is the best possible score. The evaluation of these scores is very simple and can be summarized as follows. Score 3: This score is given when the patient, on executing the test, is able to perform the test without any compensation, complying with the criteria established for the test. Score 2: This score is given when the patient is able to complete the required motor sequence but requires compensation models in order to complete the movement. Score 1: This score is given when the patient is unable to complete the motor pattern required by the test, not even with compensation. Score 0: This score is given when the patient experiences pain at any time during the testing. In this case, the FMS will be interrupted and the patient is sent to a doctor or health professional for solving the painful symptoms [8]. Each of the seven tests is done three times and the final score of the single test will be determined by the one that scored the highest from the three attempts. In the case of a bilateral evaluation, a score will be given for each side, and the score for the side with the lowest value will be considered the final score for that particular test.

There are also three "Clearing Tests" that give a positive or negative score, highlighting the presence or absence of pain. An example is the Yocum test, used as clearing test for the shoulder mobility test [9].

The official training at FMS™ Italia was performed in preparation of the tests. The official FMS Test Kit was used for testing.

Before testing, all athletes were informed on the purpose of the study and what the Functional Movement Screen is about. Subjects were informed of the benefits and risks of the investigation prior to signing an institutionally approved informed consent document to participate in the study. As heet describing the fundamental principles of the FMS method and the tests to be carried out was handed to each athlete. Personal data, FMS test score and pathologies occurred in the past and/or during the observation period were then requested. The tests were placed in the following order: Deep Squat (DS), Hurdle Step (HS), In-line lunge (ILL), Shoulder mobility (SM), Active straight-leg raise (ASLR), Trunk stability push-up (TSPU), Rotary stability (RS). The work was an observational study that aimed to find out whether professional football athletes with a Functional Movement Screen score of ≤14 were more likely to suffer an injury during the competitive season as reported in the study of Kiesel [10]. All participants in the study were evaluated at half competitive season while incidences of muscular or articular injury were monitored during the rest of the season.

During research, eighteen athletes (N=18) born in 1999-2000 (16±1 years old) that played in a football team performing in competitive sports were examined by use of the FMS tests, and possible non-traumatic injuries were observed in the period between March and September 2016. After testing ,the average score of all athletes was 14.6,while a value of 15 was the most represented score.

Also, regarding dispersion of the data, the standard deviation value is 2.72.

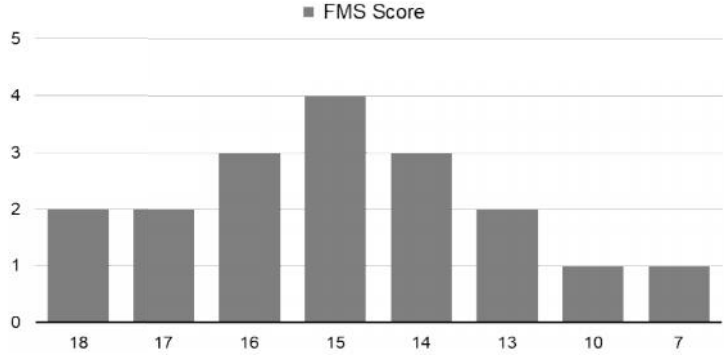
The odds ratio, with a value of 6.25, was also calculated, meaning that each athlete is approximately 6 times more likely to suffer injury during the sports season if the final FMS score is ≤ 14.

RESULTS

The work was an observational study that aimed to find out whether professional football athletes with a Functional Movement Screen score of ≤14 were more likely to suffer an injury during the competitive season as reported in the study of Kiesel [10]. All participants in the study were evaluated at half competitive season while incidences of muscular or articular injury were monitored during the rest of the season.

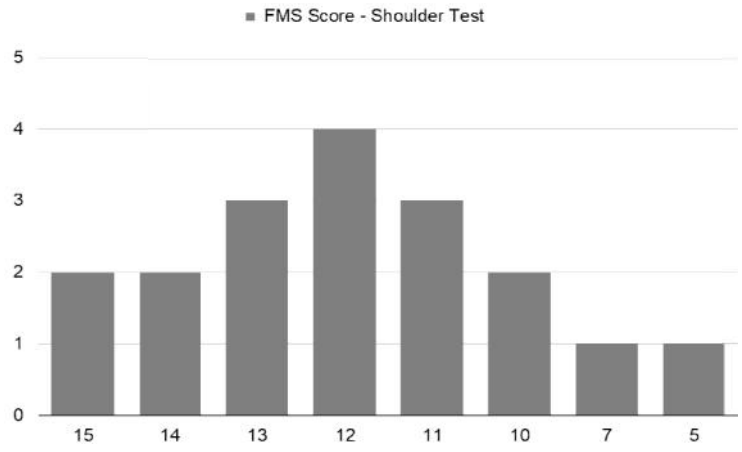
Specifically, verifications were made as to whether any injuries that were not linked to direct trauma occurred to those who scored ≤14 in the FMS tests. With the data obtained through testing, as shown in CHART 1, the most represented average score from the FMS tests was 15, obtained from four athletes, followed by scores of 16 and 14 in three athletes.

Chart.1



What stands out the most are the ≤ 14 scores obtained from the athletes, which show a reduction of quality of motion, highlighted by use of the FMS. By graphically displaying the scores (CHART 2) obtained from two groups of athletes, the first having FMS score > 14 and the second with score ≤ 14, 38.9% of the athletes (7 out of 18) can be seen to have an FMS score ≤ 14,placing them at risk.

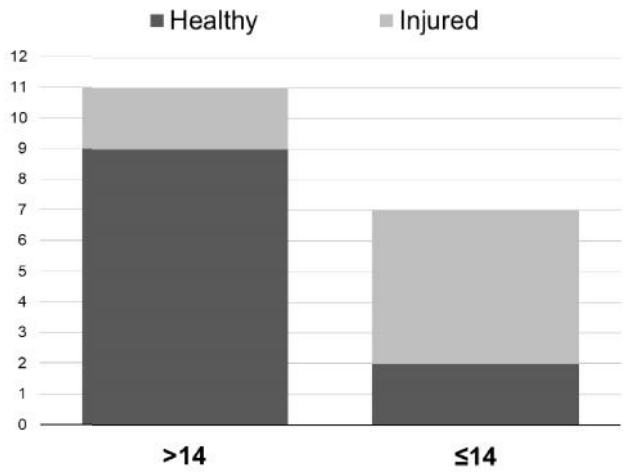
Chart.2



Seven athletes of each group suffered injury during the testing period, five of these fall into the 38.9 percentage of athletes that obtained a score of ≤ 14 and two into the 61.1% with a score of> 14.

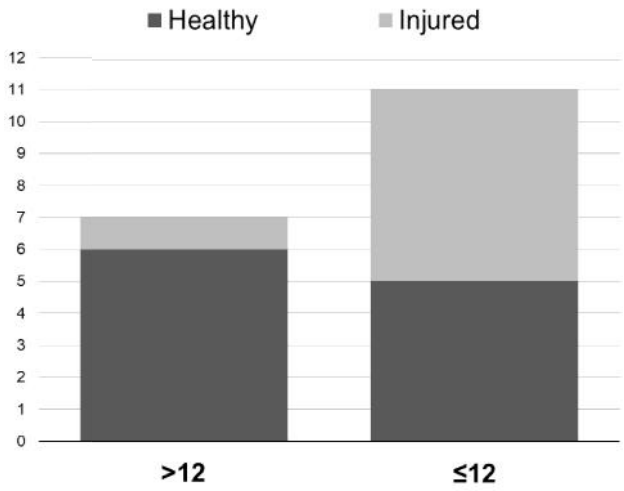
During the study, however, the average testing score increased in the shoulder Mobility (SM) test, where seventeen out of eighteen (17/18) athletes scored the highest and only one athlete obtained a score of two. Given the poor implementation of the upper limbs both in training and competition and considering also the specific sport chosen, if we were to exclude the SM test for purpose of the study, the maximum achievable score would be eighteen (3 times 6 tests) and the risk of injury score would be ≤ 12, which is calculated by multiplying the score of 2, which represents sufficiency for each test, by the number of tests, 6. By creating another graphical analysis, CHART3 shows that the average score is 12, a value that would represent a warning sign.

Chart.3



The percentage of subjects at risk is now reverted compared to the previous values, with 61.1% of the athletes scoring ≤ 12, and therefore at risk, and 38.9% scoring> 12.By excluding the shoulder mobility test, as shown in CHART 4, six of the seven athletes who suffered injury obtained an average final score of ≤ 12,therefore with higher chances of suffering injury.

Chart.4



This made it possible to prove, based on this study and the data obtained through it, that by allowing to perform the FMS tests in both a complete and partial way, the method represents an excellent tool that could be used for evaluating and preventing injuries in professional football players.

DISCUSSION

Some studies [11] [12] show that each sport develops a specific postural adaptation leading to an alteration of the normal postural balance of the subject. This imbalance could be one of the causes for injury that often characterize certain sports [13] [14]. Furthermore, as published by other studies in literature, poor neuromuscular control and deficient motor patterns can expose young athletes to an increased risk of injury [15] [16] [17].

From here we highlight the importance of finding strategies for evaluating athletes in order to prevent accidents from occurring. The FMS, based on this study and other studies already in literature [18], could be a method that can be used in this regard. However it should be noted that there are other studies in literature hypothesizing the opposite, stating that the FMS is not reliable for identifying those who are more likely to be injured [19] [20], also when taking into account some variables that can influence the FMS score, such as age [21] [22] and body mass index (BMI) [23] [24] [25] [26].

CONCLUSION

The results of this study show that the Functional Movement Screen can be a viable method for evaluating and preventing non-traumatic injuries in a group of young professional football players.The FMS can also be used as a database for obtaining information about the athlete if the accident were to occur.

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