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EXAMINATION OF FUNCTIONAL MOVEMENT STATUS, INJURY HISTORY AND SPECIFIC MOTOR PERFORMANCE AMONG YOUNG ELITE FOOTBALL PLAYERS

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Abstract

Purpose: The primary aim of this study was to find any relationship between total and selected FMS scores, recent (within two years) injury status, and specific motor performance. The secondary purpose of the study was to examine, wheather is there any relationship between injuries of the hamstring muscle and injuries of the hip and knee joints of the body.

Material and methods: Youth and junior football players were volunteered to take part in our examination. A total of 45 subjects participated in our study, their age varied from 16 to 19. We implemented a five to one scoring system to identify the status of injuries. Finally, a complete FMS testing and a single leg (unilateral) standing long jump test were performed, involving all participants.Beside evaluating the total FMS scores of the participants, we chose to specifically stress on five test batteries out of seven. Out of the five tests we further focused on three FMS tests.

Results and conclusion: In this given population, we have not found significant relationship between total FMS scores and overall scores (5 to 1) of injury status. Our results also did not indicate any significant correlation between selected FMS scores and single leg standing long jump performance.

Keywords: *FMS, injury status, specific motor performance, football, athletic training*

INTRODUCTION

The Functional Movement Screening (FMS) is a standardized test system, designed for recognizing and identifying principles of movement through individual „movement patterns that support work, sports and daily activities" (DEA, 2017). The FMS test consists of seven exercises, which measures individual movement assymetries, unbalances in certain movements executed in both sides in a 0-21 scale. A 100-point grading scale also exists, some researchers suggest

this kind of scoring system improves the precision of the screening process, however further studies necessary to conduct in this field (BUTLER, 2012). The FMS test is a widely used assessment system to evaluate current and prior injury and training status. Nowadays, any achievement in sport markedly depends on the interaction of factors such as functional status, injury history and physical performance. Researchers such as Kiesel et al. (2007), O'Connor et al. (2011), and Butler et al. (2013) demonstrated, that the higher the total FMS score is the lower the overall risk of injuries, the general cut-off point is fourteen. Fundamental core stability, mobility and strength characteristics may be identified, thus corrected with sport-specific functional movement programme (PERRY, 2013; COOK et al., , 2006). Pain in a particular muscle or joint, mobility, motor control dysfunctions, or isolated performance deficiencies may result in biomechanically incorrect or impaired movement patterns (DEA, 2017; SORENSON, 2009).

By executing and using the correct movement patterns, implementing efficient movement strategies, such as core training programmes may effectively reduce the risk of injuries, however individual differences may apply (CHORBA et al., 2010). Use of FMS scores may provide valuable feedback for skill assessment prior experience, and individual skill level must take into account. In 2009, Sorenson (2009) conducted an in-depth analysis on the reliability of total an individual FMS test scores. The median intra-rater reliability coefficient was calculated as acceptable (greater than 0.80) for all of the individual tests excluding the rotary stability (RS) test.

It is essential for proper functional status and skill assessment to be aware of the athlete's age, history of injuries, in order to improve the quality of the training process, thus overall performance. (BUTLER, 2013; PERRY – KOEHLE, 2013). Because of common human error during the test procedure, individual bias may distract the evaluation of FMS scores in some extent.

PURPOSE

The primary aim of this study was to find any relationship, correlation between total and selected FMS scores, recent (within two years) injury status, and specific motor performance. We hypothesized that the scores for single leg horizontal jump correlate with selected functional status (FMS) scores. The secondary purpose of the study was to examine, wheather is there any relationship between injuries of the hamstring muscle and injuries of the hip and knee joints of the body. Finally, we suggested, that training age and prior experience may influence the results of the study, this is why it is necessary to subdivide the participants into two groups

MATERIAL AND METHODS

Male youth and junior football players were volunteered to take part in our examination. A total of forty-five subjects participated in our study, their age varied from 16 to 19. Three age groups: U16, U17 and U19 members of Nyíregyházi Spartacus - József Bozsik Football Academy were represented in our

research. All examinations involving human subjects were approved by the Hungarian Ethical Committee (ETT TUKEB:15117-4/2018/EÜIG). Based on our prior experience and knowledge, we suggested, that U19 players may greatly differ in physical characteristics, biological maturation and training status compared to their younger counterparts. So, we further divided the entire study population into two groups. Group one consisted of twenty-seven U16 and 17 players, eightteen U19 players were handled separately as group two, accordingly. Later we examined all forty- five participants, in order to test our hypothesis in a larger population and to find any correlation between the selected parameters. We specifically focused on five key areas of injuries typical to football players, which are the hip, the knee, the ankle, the hamstring and the Achilles tendon areas of the body (ZALAI et al., 2015). We used a special questionnaire, which was developed earlier by our research team (PUCSOK et al., 2017). We were interested in specific injuries occured more recently, in the past two years. We implemented a five to one scoring system to identify the status of injuries. We also registered the dominant foot - involved in that given sport or discipline - for future purposes. For injury examination we set up five categories, according to the severity of the injury at the given area of the body, where (5) represented healthy, (4) occasional pain, (3) constant pain/severe strain/partial torn/pulled/dislocation, (2) tendon/muscle torn, (1) surgical treatment or surgical procedure was made. We included other questions, for future scientific studies, about possible treatment and rehabilitation, special exercises/methods used during the preparation and rehabilitation phases of the training. Finally, a complete FMS testing and single leg (left and right) standing long jump, were performed, involving all participants. We assumed, that high level horizontal jumping performance provides a valuable feedback for any football player, regardless of the position they play. However, in a biomechanical analysis, Lan Wu et al. (2003) concluded, that higher take-off angle, thus some kind of prior experience is necessary to achieve higher scores in bilateral standing long jump or broad jump. For this reason, we selected the unilateral version of the broad jump, which may more precisely demonstrate the development of skills such as explosive power, motor control and balance. Beside evaluating the total FMS scores of the participants, we chose to specifically stress on five test batteries out of seven. Out of the five tests we further selected three, we hypothesized, because of the unilateral characteristics of the horizontal jump the straight leg raise (LR), the in line lunge (IL), the hurdle step (HS) tests may provide a more accurate estimate of the injury status, thus motor performance. We excluded shoulder mobility (SM) and rotary stability (RS) tests. We assumed, that in football mobility of the shoulders, however not insignificant, isn't a key factor when evaluating performance. RS test also wasn't part of our testing protocol, one of the exlusion criteria was statistically lower intra-rater reliability (0.73), compared to the other tests, which was calculated by Sorenson in his 2009 study (2009). Second criteria was, its difficulty, when executing by the participants. RS test is designed to mimic complex rotary movements occur in most sports. This particular test is an assessment of the multiplanar trunk stability and extremities range of motion. High level of overall balance and stability are necessary in order

to successfully perform this complex movement (SORENSON, 2009). Thus, insufficient prior training experience may significantly impair the RS scores.

RESULTS

Both group one and two athletes demonstrated no significant correlation between total FMS scores and injury status scores (5 to 1) of all examined five areas. We found no significant relationship between LR, IL and HS test and single leg (unilateral) standing long jump scores.

The results didn't indicate any significant correlation between total FMS and selected (left-right hamstring, hip and left-right knee) injury scores,for members of group one and two.

For all participants, we also didn't find any significant relationship between total FMS scores and injury status scores of the five areas of the body. When we were examined five selected FMS scores, we were able to identify some kind of trend, although the strength of the relationship was weak, except between the scores of deep squat (DS) and injury status of the left hamstring muscle, where we found moderate negativ correlation ($r=-0.54$) ($p<0.05$).

Generally, composite FMS scores didn't show any significant correlation with the results of the unilateral standing long jump.

CONCLUSIONS

The available literature is controversial, we have conflicting results, wheather FMS testing alone or combined with other motor skill tests are the the proper tools for a more accurate evaluation of the injury status and athletic performance (PUCSOK et al., 2017; BESLIJA et al., 2014). Standing long jump is widely used performance test to measure the explosive power of the lower extremities muscle. FMS scores, especially the total scores provide a reasonably good estimate of the likelihood of sustaining an injury. However, reliabilty of the FMS method was questioned by researchers such as Sorenson (2009) and Burton (2006) who conducted a large scale examination involving high-school basketball players . The researcher concluded, that vulnerable athletes may not be identified from the FMS values only, it doesn't appear to be a valid tool, when assessing risk of injuries. According to Parchmann and McBride (2011) FMS testing doesn't seem to be an adequate test, when measuring athletic performance. Our analysis on young football players supported partially the above mentioned assumptions. It seems, in our study population, only the DS test scores demonstrated some kind of - moderate level „predictive power" in terms of the injury status of a selected (hamstring) area. Further in-depth analysis is necessary to explore this phenomena.

We assume, that certain sports share similar performance characteristics in terms of dynamics of movements, and type of injuries. It is critical, to identify these common motor and technical skill patterns, aiming to reduce the occurance of injuries in the selected sport. Ball sports such as football, basketball and

volleyball are both overwhelmingly asymmetrical in nature, with a dominant-side involved in a movement (kick, throw or a serve), so similar injuries may occur in those sports (SHOJAEDIN et al., 2014)).

In summary, the potential of functional movement screening to identify high-risk athletes may not be completely ruled out, however it is necessary to conduct further analysis involving different type of sports. It is a common mistake by a sport professional, especially in the elite level sport, to overly generalize the result of a FMS test. It is a highly specific process to evaluate an athlete's injury and training status. Gender, age, anthropometric measures, training experience, prior injuries, nutritional status may all influence the level of athletic performance.

In the future, we are planning to separately retest a larger population of ballsport athletes using specifically selected FMS tests, combined with other endurance and agility tests, also measure isokinetic power of specific muscle groups, performed on a special pneumatic device (MAGYARI et al., 2017). We suggest that these type of devices provide an even more accurate measurement of the actual power output, than previously developed instruments (ACHE-DIAS et al., 2016).

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