

ORIGINAL RESEARCH

The relationship between functional movement screening and hip flexion, standing broad jump, triple hop and sprint in recreational futsal players

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Abstract

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The objective of this study was to examine the correlation between a functional movement screening (FMS) test and hip flexion range of motion (ROM), standing broad jump, triple hop, and sprint in recreational futsal players. A research was conducted with 20 male recreational futsal players (aged = 21.35 ± 1.73 years; height = 177.95 ± 5.45 ; weight = 71.05 ± 8.83) to assess their physical abilities using various tests. The assessments contained FMS test, hip flexion range of motion (ROM), standing broad jump, triple hop, and sprint. Since these values showed normal distribution, Pearson correlation test was used. A significant positive correlation between the FMS and hip flexion right ROM ($r = 0.539$, $p < 0.05$) hip flexion left ROM ($r = 0.565$, $p < 0.01$), standing broad jump ($r = 0.562$, $p < 0.01$), triple hop right leg ($r = 0.549$, $p < 0.01$) and triple hop left leg ($r = 0.574$, $p < 0.01$). A significant negative correlation between the FMS and 10m sprint ($r = -0.665$, $p < 0.01$) and 20m sprint ($r = -0.772$, $p < 0.01$). Based on the findings of this study, as FMS scores increase in futsal players, sprint and jump joint range of motion values increase. Therefore, FMS, ROM, standing broad jump, triple hop and sprint tests can be used to both prevent injuries and evaluate the performance of athletes.

Introduction

To successful performance in team sports, players require a high level of functional movement capacity, range of joint motion, proprioception, neuromuscular control, balance, strength, speed, agility, technical abilities and tactical skills (Huxel & Andersen, 2013; Yilmaz et al., 2023; Yilmaz et al., 2024; Yilmaz et al., 2022). Futsal has become increasingly popular among team sports. Futsal is a sport played at high intensity movements with intermittent loads with a short recovery time (Berdejo-del-Fresno, 2012). These high-intensity motions can lead to overload on the joints, resulting in limited range of motion and injury (Witvrouw et al., 2003; De-La-Cruz et al., 2020). Therefore, coaches use multiple tests to protect athletes from injuries and to evaluate their performance.

The FMS test is utilized as a technique for analyzing movement in the musculoskeletal system, to predict sports performance, functional limitations, asymmetry and injuries (Cook et al., 2006a; 2006b). Assessment of functional movement can generally assess body awareness, postural control, stability, flexibility, neuromuscular

coordination, muscle strength, balance, and joint range of motion. (Cook et al., 2006a; 2006b; Kuzuhara et al., 2018; Okada et al., 2011; Cowen, 2010). The Functional Movement Screen (FMS) consists of a series of seven specific movement tests, which include the deep squat, hurdle step, inline lunge, shoulder mobility, active straight leg raise, trunk stability push-up, and rotational stability. The combination of these assessments results in a thorough evaluation, producing a final score that might range from 0 to 21 (Cook et al., 2006a; 2006b). According to some authors, individuals who have a total score over 14 are less prone to experiencing handicap compared to those with a total score below 14 (Kiesel et al., 2007; Lisman et al., 2013). Range of motion (ROM) is a quantitative assessment that evaluates the functionality of joints and is employed in the assessment of musculoskeletal condition (Milanese et al., 2015). Speed is the ability of athletes to do a job at maximum speed using maximum power (Bompa, 2007). Jumping is the capacity of the human body to ascend up from the ground either vertically or horizontally and sustain a brief period of flight (Bartlett, 2014). The assessment of sprinting and leaping capacities has

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significant importance in several sports disciplines, thereby enhancing athletic performance and mitigating the risk of injuries (Fatouros et al., 2000; Loturco et al., 2015).

Previous research has examined the correlation between FMS and speed, power, agility, and aerobic fitness (Bennet et al., 2022), sprint and agility (Lee et al., 2019), sprint and counter-movement jump (Zhang et al., 2022), squat jump, reactive strength and reactive agility (Llyod et al., 2015) in soccer, standing broad jump and sprint in volleyball players (Tuna et al., 2023) and players' jump, sprint, agility and maximal strength in golfers (Parchmann & McBride, 2011). However there is no study in the literature examining the correlation between the functional movement screening (FMS) test and factors such as hip flexion range of motion (ROM), standing jump, triple jump, and sprint performance in recreational futsal players. At this point, the study aimed to investigate the correlation between a functional movement screening (FMS) test and hip flexion range of motion (ROM), standing broad jump, triple hop, and sprint in recreational futsal players, with the aim of contributing to the existing literature.

Methods

Participants

The study included a sample group of 20 recreational futsal players (aged = 21.35 ± 1.73 years; height = 177.95 ± 5.45 cm; weight = 71.05 ± 8.83 kg), who participated voluntarily.

Procedure

This study aimed to determine the relationship between the results of functional movement screening tests and ROM, sprint, standing broad jump and triple hop test performance in recreational male soccer players. The testing took place on separate days. FMS and ROM tests were performed without warming. Prior to the other tests, a conventional 15-minute warm-up was conducted. The ethics committee application of study was approved (E.191848-15.08.2024) by the Osmaniye Korkut Ata University Ethics Committee

Functional Movement Screening Test (FMS)

The FMS test was conducted following the prescribed guidelines. The scoring criteria for the seven tests varied from 0 to 3. A score of 3 indicated excellent condition with normal functional movement. A score of 2 indicated incorrect completion or compensatory movements. A score of 1 indicated completion of the test while the body was unstable. A score of 0 indicated the presence of pain during the test. The maximum possible total score was 21 points (Cook et al., 2014).

Standing Broad Jump

Participants stand with their heels on the starting line and their feet parallel. After being instructed by the researcher, they perform the movement by jumping as horizontally as possible. A depth counter movement in the legs can be performed with free arm swing at their own discretion, as no stimulation is specified regarding the movement of the legs or arms. Each test is conducted twice, with a waiting period of five minutes between each attempt. A tape was used to measure the distance in centimeters from the beginning line to the heel of the foot closest to the starting line. The highest score obtained from the two tries was then recorded (Thomas et al., 2020).

Triple Hop Test

Participants commence the activity by assuming a standing position on the specified foot, with their hands placed on their hips and their toes positioned behind the starting line. Participants were directed to do three consecutive maximum leaps on a single leg in a forward direction, with the first landing on the same leg. The objective was to reduce the amount of time in contact with the ground following the first and second jumps. Upon completing the last jump, participants are instructed to execute a controlled drop and maintain the position for duration of 2 seconds. If the final landing is not successfully made, the attempt is considered invalid and the leap is repeated after a 60-second break. The participants' heel's landing location is measured and recorded to the closest centimeter, which is the distance leaped from the starting line (Bishop et al., 2021).

Sprint

A standard warm-up is done. Subjects then ran 20 m, their times recorded by a 10 m and 20 m paired photocell (Microgate, Bolzano, Italy). Subjects started in a standing position with their front feet 0.2 m away from the starting photocell beam. Evaluation is done in seconds.

Hip Flexion Range of Motion (ROM)

During knee flexion, the opposing limb should be kept in an extended posture, and caution should be exercised to avoid an increase in lordosis. The goniometer's pivot point is positioned in the greater trochanter area. The fixed arm is positioned parallel to the long axis of the trunk, either towards the axilla or the spinal column. The mobile limb is currently aligned with the lateral midline (Otman et al., 2014).

Statistical Analysis

As essential assumption test, a normalcy test was done before analysis. The data since normally distributed,

Pearson's correlation was used. The 95% CI was determined. Statistical significance was defined at $p < 0.05$. For the classification of effect size in correlation values, 0-0.30 weak correlation, 0.31-0.50 medium correlation, 0.51-0.70 high correlation and 0.71-1 correlation coefficient valid in the field of sports sciences, (R) was used (Hopkins et al., 2009). This study utilized SPSS 26.

Results

The study results indicate a significant positive correlation between the FMS and hip flexion right ($r=0.539$; $p<0.05$), FMS and hip flexion left ($r=0.565$; $p<0.01$), FMS and triple hop right leg ($r=0.549$; $p<0.01$), FMS and triple hop left leg ($r=0.574$; $p<0.01$), FMS and standing broad jump ($r=0.562$; $p<0.01$), FMS and 10m sprint ($r=0.665$; $p<0.01$), FMS and 20m sprint ($r=0.772$; $p<0.01$).

Table 1

Correlation between test results functional movement screening and hip flexion, stop jump, triple hop and sprint tests.

Variables	Hip Flexion Right	Hip Flexion Left	Triple Hop Right Leg	Triple Hop Left Leg	standing broad jump	10m Sprint	20m Sprint
FMS	0.539*	0.565**	0.549*	0.574**	0.562**	-0.665**	-0.772**

** Correlation is significant at the $p < 0.001$; * $p < 0.05$; FMS: Functional Movement Screening; m: Meter

Discussion

This study investigated the correlation between between a FMS test and hip flexion ROM, standing broad jump, triple hop, and sprint in recreational futsal players. There was a significant positive correlation between the FMS and hip flexion right ROM, hip flexion left ROM, standing broad jump, triple hop right leg and triple hop left leg. A significant negative correlation was found between the FMS and 10m sprint and 20m sprint. These results indicated that higher FMS scores are associated with increased hip flexion on both sides, improved performance in standing broad jump and triple hop tests and decreased 10m and 20m sprint times.

The study found that as hip flexion values increased, FMS scores also increased. In a similar study, a positive correlation was observed between the FMS total score and hip flexion joint range of motion (Yilmaz, 2024). Chimaera et al. (2017) reported relationship between FMS and lower extremity ROM. Another studies result show that positive correlation between FMS hurdle step and hip flexion ROM in healthy active males (Janicki et al., 2017), between FMS and hip flexion ROM in athletes (Jenkins et al., 2017),

between left active straight-leg-raise and ROM of left hip flexion (Mu et al., 2022). Deep squat, hurdle step, in-line lunge and active straight leg raise movements involve flexion movement in the hip. Thus, the wide of the hip flexion range of motion might provide better performance of these movements used in FMS.

The results of the study show that positive correlation between the FMS and standing broad jump, triple hop right and left leg. Similar studies have shown a positive correlation between FMS total score and squat jump squat jump (Lloyd et al., 2015), countermovement jump in soccer players (Yilmaz, 2024; Silva et al., 2017; Sannicandro et al., 2017), squat jump and countermovement jump in basketball players (Bazanov et al., 2019). These results show that athletes with higher FMS scores have higher lower extremity explosive strength.

A negative correlation found between the FMS and 10m sprint and 20m sprint. The study conducted by Zhang et al. (2022) revealed significant associations between the overall FMS score and the duration of 10-20 m sprints, in-line lunges and 0-20 m sprints, shoulder mobility and 0-10 m sprints, trunk-stability push-ups and 10-20 m sprints, and hurdle step with 0-10 m

sprints in female youth soccer players.. Another study revealed that the FMS total score had statistically significant negative correlation with the 10-m sprint and the 30-m sprint in male soccer players (Lee et al., 2019). FMS may evaluate an individual's muscular strength, balance, range of motion, and coordination simultaneously (Cook et al., 2006a; Cook et al., 2006b). These physical features can positively affect athletes' running coordination, step frequency and acceleration. Therefore, an increase in FMS scores may decrease sprint times.

Conclusions

As athletes develop these attributes; improvements in movement efficiency may occur, which could result in a decrease in step frequency and an increase in acceleration, ultimately reducing sprint times. In this context, the FMS can be considered not only as a tool for injury prevention but also as a potential indicator of enhanced athletic performance, particularly in sports like futsal where range of motion, sprinting, and explosive movements are critical. As such, it may be preferred by sports specialists and coaches.

Ethical Approval

The study was approved by Osmaniye Korkut Ata University Health Sciences Research Ethics Committee (Date: 13.08.2024, No: 4/11).

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Data Availability

Data are available upon reasonable request from the corresponding author.

Authors' Contribution

Research idea: GY, VS, MÇ; Design of the study: GY, VS, MÇ; Acquisition of data for the study: GY; Analysis of data for the study: GY, VS; Interpretation of data for the study: GY, VS; Drafting the manuscript: GY; Revising it critically for important intellectual content: GY, VS; Final approval of the version to be published: GY, VS, MÇ

Conflict of Interest

The authors declare no conflict of interest concerning the authorship and/or publication of this study.

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