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Original Article

Functional Movement Screen Differences in Male and Female Footballers and as an Injury Prevention Tool

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ABSTRACT

Functional Movement Screen evaluates seven key movement tasks crucial for smooth kinetic chain performance in sports. It assists sports therapists and coaches in identifying faulty patterns during preparticipation. **Objectives:** To compare FMS composite scores between male and female footballers and evaluate FMS as an injury predictor tool. **Methods:** Between March and June 2021, a cohort study was conducted on 264 footballers (132 males and 132 females) in Islamabad and Rawalpindi football academies. Players voluntarily underwent seven Functional Movement Screen tests. After participating in competitive or friendly matches, follow-ups were conducted to assess FMS composite scores and document any injuries sustained during the games. Data analysis was performed using SPSS 25.0, and information on FMS scores and injuries was collected through FMS scoring sheets and a self-structured questionnaire. **Results:** There was statistically significant difference between male and female footballers composite scores of FMS ($p<0.005$). Female footballers (15.13 ± 2.32) scored less on mean score of FMS as compared to male footballers (17.03 ± 2.884). FMS was a good predictor of injury with 37.7 % variance on linear regression ($p=0.005$). **Conclusions:** Female footballers scored less composite score of FMS as compared to male footballers. FMS before participation can be a good predictor for detecting injuries in male and female footballers.

INTRODUCTION

As popularity of football continues to increase, so does probability of incurring injuries while playing the sport, whether at a professional or recreational level [1]. Achieving optimal performance while minimizing the risk of injury can be a challenging endeavor in various professional sports [2]. Football carries a risk of both collision and non-contact injuries, with higher prevalence of acute injuries among male and female players [3]. A standard pre-participation exam, which includes assessing health status and musculoskeletal system, used to screen for underlying medical problems and injury risks [4]. Thorough movement screening is a valuable technique for quantifying an athlete's physical abilities, identifying asymmetries or weaknesses in the kinetic chain, and assessing stability and mobility [5]. It is important to conduct pre-participation screenings to identify potential injury risks in athletes. Intrinsic risk factors include imbalances in muscle strength and endurance, structural abnormalities in musculoskeletal system, issues with neuromuscular control, core weakness, and imbalances in muscles on opposite sides of body [6]. Athletes undergo a thorough pre-participation examination, checking health, medical issues, and musculoskeletal condition—a standard injury screening method [7]. This assessment identifies any

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flawed movements in athlete's kinetic chain. When compensatory patterns are detected beforehand, coaches or sport physical therapists can conduct a detailed evaluation [8]. They provide regimen of corrective exercises, enabling smooth game performance and restoring athlete's kinetic chain [9]. However, these screenings may not capture all intrinsic risk factors that could lead to injury during sports participation [10]. One tool that may be beneficial for this purpose is functional movement screening (FMS) developed by Cook et al [10-12]. It assesses wide range of abilities required for participation in high-level functions, evaluates range of motion (ROM), muscular imbalances and core strength by means of seven different movement [4]. It assesses movement patterns, identify limitations and asymmetries that could lead to injury in various sports, such as soccer and basketball, as a pre-participation evaluation tool [10, 13]. It comprises five bilateral tests: hurdle step, inline lunge, shoulder mobility, active straight leg raises, and rotary stability, which help identify any asymmetries in athletes [13]. Three additional clearance screen tests, including shoulder impingement test, which assesses pain in shoulder joints, spinal extension test, which checks for pain in lower back, and flexion spinal test, which evaluates pain while in a flexed spine position. These screening tests provide in-depth analysis of an athlete's mobility, range of motion, and ability to perform sports-specific movements on field. A composite score of less than 14 on FMS indicates a high risk of injury [10-12]. Balance between mobility and stability are required to perform seven main movements and three clearing tests [14]. There was total seven movements to perform. Each movement scored a 3 if participant was able to complete movement task satisfactorily without use of any adjustment, a score of 2 indicated movement task was performed with compensation, whereas a score of 1 indicated movement task was not completed. Any task that caused pain was assigned a score of 0. Tasks were scored separately for right and left side of body; the lowest score of raw score was included in final score. Total composite scores varied from 0 to 21 points, and 0 to 3 points ranged for individual task scores [10]. Prior studies reported that during pre-participation FMS can predict injuries in various athletes [15-17]. Studies including FMS as an injury and evaluation tool have subjects which includes athletes playing multiple sports and generally involved male footballers, but the studies comparing scores of FMS among female footballers with male footballers were scarce. This research was conducted to check differences between male and female footballer composite scores and FMS as an injury predictor tool.

METHODS

A cohort study from March to July 2021 in Islamabad and Rawalpindi included 267 male and female footballers aged 12-22 years, training at least 3 times per week or 1/5 hours per week. Non-probability quota sampling was used. Sample size was calculated by using Raosoft Software. Margin of error was 5%, confidence level was 90%, population size was 10,000 and the response distribution was 50%. Players were excluded who had recent lower extremity injury, brain injury, concussion, cervical spine injury (past year), shoulder surgery, ACL repair, meniscal repair, Achilles' tendon repair, ankle fracture, recent eye/ear disorders, and ongoing musculoskeletal physical therapy. FMS served as a 'Pre' assessment tool for injury/dysfunction risk before friendly or competitive matches. A self-formulated questionnaire gathered athlete demographics, field position, and training frequency. Participants were initially shown seven movements, consisting of deep squat, hurdle step, inline lunge, shoulder mobility, active straight-leg raise, trunk stability push-up, and rotary stability. Each participant underwent FMS in a single session before engaging in a football match. Five of the seven tasks (hurdle step, inline lunge, shoulder mobility, active straight-leg raise, and rotary stability) were performed on both the right and left sides. Additionally, three clearance screens for shoulder internal rotation/flexion, end-range spinal flexion, and end-range spinal extension were employed to identify pain presence. Task instructions were provided, participants made three attempts for each task, following approach by Cook et al [10, 11]. FMS demonstrates moderate to good inter-rater (0.82) and intra-rater reliability [18]. After football match, athletes were assessed for injuries on same day. In this study, injury was defined as a musculoskeletal injury meeting specific criterion: (a) occurring due to football match participation (friendly or competitive), (b) requiring medical attention or resulting in at least one day of missed training/match. Athletes reported injuries on a self-formulated questionnaire, specifying injury type (contact or non-contact) and injury area (upper limb, lower limb, or trunk/spine). Descriptive statistics were used to examine data collected (e.g., mean and standard deviation). Point Biserial Correlation coefficient was used to analyze association between total summed score and male and female footballers. The research related to human use has complied with all relevant national regulations and institutional policies, has followed the tenets of the Declaration of Helsinki, and Ethical approval was obtained from the Research Ethical Committee of Riphah International University. Ref: RIPHAH/RCRS/REC/Letter-00926 (Dated: 12th February, 2021). A written consent form was signed by each player/parent who participated in study. Participants were provided with right to ask any question about study and they were free to refuse any part of study without affecting their relationship

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with investigator.

RESULTS

Two hundred sixty-four football athletes were included. Table 1 shows demographic details. There were statistically significant differences between male and female footballers (p=0.005).

Table 1: Demographic Data

Demographic Variables	Males	Females
Age	16.85 ± 2.80	16.26 ± 2.98
Height (meters)	1.68 ± 2.80	1.59 ± 0.07
Weight (kg)	57.59 ± 0.11	51.06 ± 7.88
Body Mass Index	20.22 ± 2.91	20.02 ± 2.59

Out of 264 players, 75 reported post-match injuries (46 lower limb, 28 upper limb, 1 spine/trunk). Of these, 17 were contact injuries, and 58 were non-contact injuries. One eighty-nine players reported no injuries. Results for mean and SD among both genders of FMS composite score are presented in the Table 2. FMS scores ranged from minimum score 9 to highest score was of 21.

Table 2: Mean of FMS Composite Score

Total Composite Score FMS	Mean ± SD
Male (n=132)	17.03 ± 2.884
Female (n=132)	15.13 ± 2.323

Gender and Injury status with FMS Cut off Value are presented in Table 3.

Table 3: Gender and Injury status with FMS Cut off Value

Gender			Did you get injury after match		Total	p-value
			No	Yes		
Male	FMS cutoff value	<14	8	21	29	<0.001
		>14	92	11	103	
	Total		100	32	132	
Female	FMS cutoff value	<14	7	34	41	<0.001
		>14	82	9	91	
	Total		89	43	132	

Spearman's correlation was applied to check association between composite scores and injury occurrence in male and female footballers, value of r= -0.633 for male footballers and r= -0.618 for female footballers, showed negatively moderate correlation. Table 4 shows association between composite score of both male and female footballers by applying point biserial correlation.

Table 4: Gender and Injury Status with FMS Total Score

Total score of FMS				r-value	p-value
Gender	Did you get injury after match	Mean ± SD	N		
Male	No	18.06 ± .064	100	-0.342	<0.001
	Yes	13.81± 2.729	32		
	Total	**17.03± 2.884**	**132**		
Female	No	16.12± 1.814	89		<0.001
	Yes	13.07± 1.869	43		
	Total	**15.13± 2.323**	**132**		

A linear regression established that FMS could statistically significantly predict injury, F (1, 263) = 156.031, p<0.001, FMS score explains 37.3% of the variability for the occurrence of injury in male and female footballers. Table 5 shows impact of FMS score on Injury in male and female footballers. R2 value of .37 revealed that the predictor variable (FMS score) explained 37.3% variance in the outcome variable (Injury status) with F (1, 263) = 156.031, p<0.001. The findings revealed that FMS score positively predicted injury (β= -.61, p< .001).

Table 5: Regression Coefficients of FMS Composite Score as Injury Predictor

Variables	B	β	SE	P
Constant	1.80			
FMS score	- .009		.130	.000
R2	.37	-.611	.008	.000

Note. N= 264

DISCUSSION

The main aim of this study was to determine the differences in FMS scores between male and female footballers playing the football academies of the twin cities. There were statistically significant differences between male and female footballers these results are supported by work done earlier [12]. Results of FMS composite scores of female footballers were significantly lower as compared to male footballers these were consistent with previous studies [12-15]. In this study male footballers performed well on tasks which required power and strength and female footballers performed well on tasks which required more flexibility these results are also in notion with work done earlier [6, 12]. A cutoff value <14 was used in this study which was interpreted by Kiesel et al., the present study was in accordance with work done previously [16]. In present study those who scored <14 reported more injuries as to those who scored >14 on total composite score. These results were also consistent with work done earlier [6, 15]. Study done by Schneiders et al., also supports notion that those who scored 14 or less are more likely a potential player of injury [19]. The cut off value <14 is not supported by the work done by Smith et al., it reports that this value <14 was not statistically significantly with non-contact injury prediction, this might be due to because in this study, the researcher was only finding relation between FMS score and injury type which was non-contact injury, not all type of injury occurrence were studied in this work but specifically non-contact injury status was determined [5]. Study done by Mokha et al., didn't support this notion that <14 score can predict injury, it rather states that presence of an asymmetry in the athlete is more likely to predict injury as compared to the composite score of FMS [17]. Łyp et al., reported in study

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cut off value <14 was predictive of injury in athletes [20]. Mean score of FMS score reported in this study was 16.08 ± 2.78 which is in accordance with the mean score reported by previous studies. Mean score reported by Abraham et al., was 14.59 this is less than present study, this might be because study included only players with ages 10 to 18 whereas in current study participants from age 12 to 22 were included and as body matures the intrinsic factors gets better the athlete can perform well on FMS test [21]. Chorba et al., reported a mean score of 14.3, which is lower than current study [15]. This difference may be attributed to their inclusion of athletes from various sports, unlike our study focusing solely on footballers. Non-contact injuries in present study were 58, these results are supported by the work done earlier that footballer/soccer players sustains more non-contact injuries as compared to contact injuries [4, 5]. The greatest number of injuries were of lower limb in present study, 46 players reported injuries of the lower limb these results are also supported by previous literature [4, 6]. Linear regression was used to check if FMS can be used as an injury predictor tool the results were that it is statistically significant that FMS can work as a predictor with 37.3% variance to find out the injury risk in male and female footballers these are in accordance with the work done previously [16].

CONCLUSIONS

This study concludes that there is a significant difference between male and female footballers' composite score of FMS. Female footballers scored less on the FMS tests as compared to the male footballers. There is an association between the composite scores of male and female footballers and the occurrence of injury. FMS score <14 is a good predictor of injuries in male and female footballers.

Authors Contribution

Conceptualization: FA, DL, SH, KB, UK
Methodology: FA, SH
Formal analysis: DL
Writing-review and editing: FA, DL, SH, KB, UK
All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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REFERENCES

[1] Conley KM, Bolin DJ, Carek PJ, Konin JG, Neal TL, Violette D. National Athletic Trainers' Association position statement: Preparticipation physical examinations and disqualifying conditions. Journal of Athletic Training. 2014 Jan; 49(1): 102-20. doi: 10.4085/1062-6050-48.6.05.

[2] Hoover DL, Killian CB, Tinius RA, Bellar DM, Wilkinson SG, Esslinger FT, et al. Predictive Validity of a Functional Movement Screen in Professional Basketball Players. Medicina (Kaunas, Lithuania). 2020 Dec; 56(12). doi: 10.3390/medicina56120724.

[3] Yang J, Tibbetts AS, Covassin T, Cheng G, Nayar S, Heiden E. Epidemiology of overuse and acute injuries among competitive collegiate athletes. Journal of Athletic Training. 2012 Mar; 47(2): 198-204. doi: 10.4085/1062-6050-47.2.198.

[4] Conley S and Lategan L. Injury prevalence and functional movement screen™ scores in young football players. South African Journal for Research in Sport, Physical Education and Recreation. 2019 Apr; 41: 1-11.

[5] Smith PD and Hanlon MP. Assessing the Effectiveness of the Functional Movement Screen in Predicting Noncontact Injury Rates in Soccer Players. Journal of Strength and Conditioning Research. 2017 Dec; 31(12): 3327-32. doi: 10.1519/JSC.0000000000001757.

[6] Shojaedin SS, Letafatkar A, Hadadnezhad M, Dehkhoda MR. Relationship between functional movement screening score and history of injury and identifying the predictive value of the FMS for injury. International Journal of Injury Control and Safety Promotion. 2014 Oct; 21(4): 355-60. doi: 10.1080/17457300.2013.833942.

[7] Ayub F, Naseer A, Javed S. Role of Agility and Dynamic Balance in Performance of University Football Players of Pakistan. "The Spark' A Hec Recognized Journal. 2020 Jan; 4: 181-9.

[8] Shore E, Dally M, Brooks S, Ostendorf D, Newman M, Neman L. Functional Movement Screen (FMS) as a Predictor of Occupational Injury among Denver Firefighters. Safety and Health at Work. 2020 Sep; 11(3): 301-6. doi: 10.1016/j.shaw.2020.04.006.

[9] Smith LJ, Creps JR, Bean R, Rodda B, Alsalaheen B. Performance of high school male athletes on the Functional Movement Screen™. Physical therapy in sport: Official Journal of the Association of Chartered Physiotherapists in Sports Medicine. 2017 Sep; 27: 17-23. doi: 10.1016/j.ptsp.2017.07.001.

[10] Cook G, Burton L, Hoogenboom B. Pre-participation screening: the use of fundamental movements as an assessment of function - part 1. North American Journal of Sports Physical Therapy. 2006 May; 1(2): 62-72.

[11] Cook G, Burton L, Hoogenboom B. Pre-participation screening: the use of fundamental movements as an

DOI: https://doi.org/10.54393/pjhs.v4i12.1191

assessment of function - part 2. North American Journal of Sports Physical Therapy. 2006 Aug; 1(3): 132-9.

[12] Anderson BE, Neumann ML, Bliven KCH. Functional movement screen differences between male and female secondary school athletes. The Journal of Strength & Conditioning Research. 2015 Apr; 29(4): 1098-106. doi: 10.1519/JSC.0000000000000733.

[13] Triplett CR, Dorrel BS, Symonds ML, Selland CA, Jensen DD, Poole CN. Functional Movement Screen Detected Asymmetry & Normative Values Among College-Aged Students. International Journal of Sports Physical Therapy. 2021 Apr; 16(2): 450-8. doi: 10.26603/001c.19443.

[14] Bertrandt J, Szarska E, Łakomy R, Lepionka T, Anyżewska A, Lorenz K, et al. An Attempt to Utilize the Body Composition Analyzer and the Functional Movement Screen (FMS) Test to Determine Injury Risk in Soldiers. Military Medicine. 2020 Jul; 185(7-8): e1128-e33. doi: 10.1093/milmed/usz476.

[15] Chorba RS, Chorba DJ, Bouillon LE, Overmyer CA, Landis JA. Use of a functional movement screening tool to determine injury risk in female collegiate athletes. North American Journal of Sports Physical Therapy. 2010 Jun;5(2):47-54.

[16] Kiesel K, Plisky PJ, Voight ML. Can Serious Injury in Professional Football be Predicted by a Preseason Functional Movement Screen? North American Journal of Sports Physical Therapy. 2007 Aug; 2(3): 147-58.

[17] Mokha M, Sprague PA, Gatens DR. Predicting Musculoskeletal Injury in National Collegiate Athletic Association Division II Athletes from Asymmetries and Individual-Test Versus Composite Functional Movement Screen Scores. Journal of Athletic Training. 2016 Apr; 51(4): 276-82. doi: 10.4085/1062-6050-51.2.07.

[18] Teyhen DS, Shaffer SW, Lorenson CL, Halfpap JP, Donofry DF, Walker MJ, et al. The Functional Movement Screen: a reliability study. The Journal of Orthopaedic and Sports Physical Therapy. 2012 Jun; 42(6): 530-40. doi: 10.2519/jospt.2012.3838.

[19] Schneiders AG, Davidsson A, Hörman E, Sullivan SJ. Functional movement screen normative values in a young, active population. International Journal of Sports Physical Therapy. 2011 Jun; 6(2): 75-82.

[20] Łyp M, Rosiński M, Chmielewski JP, Czarny-Działak MA, Osuch M, Urbańska D, et al. Effectiveness of the Functional Movement Screen for assessment of injury risk occurrence in football players. Biology of Sport. 2022 Oct; 39(4): 889-94. doi: 10.5114/biolsport.2022.107482.

[21] Abraham A, Sannasi R, Nair R. Normative values for the functional movement screentm in adolescent school aged children. International Journal of Sports Physical Therapy. 2015 Feb; 10(1): 29-36.