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Functional Movement Screening (FMS^{TM}) of Recreational Gym Trainees and Amateur Football Players

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Abstract
Background: Functional movement screening (FMS) is widely used to evaluate movement patterns to identify asymmetries and ability to perform fundamental movements. This study evaluated and compared FMS performance among recreational gym trainees (static training emphasis) and amateur football players (dynamic training emphasis), aged 19-20 years. The objective was to determine how activity-specific training influences FMS performance across seven tests assessing mobility, stability, and motor control. Fifty male participants (RGT= 25 & AFP = 25) completed the FMS test protocol. Between group differences were assessed by independent samples t-test (α =0.05), prior to that statistical assumptions like homogeneity of variance and normality were verified. RGTs exhibited superior performance in deep squat (2.92 ± 0.27 vs 2.48 ± 0.50, p<.001), in-line lunge (2.96 ± 0.20 vs 2.68 ± 0.47, p<.001), and trunk-stability push-ups (2.96 ± 0.20 vs 2.64 ± 0.48, p<.001). AFPs excelled in shoulder mobility (2.80 ±0.40 vs 2.00 ± 0.76, p<.001), and active straight leg raise (2.92 ± 0.27 vs 2.60 ± 0.57, p=.001). Overall FMS scores were similar (RGTs=18.56 vs AFPs=18.88), both exceeding the injury risk threshold of 14. Both RGTs and AFPs showed functional competency and suggest FMS differences reflect training adaptation rather than deficits.
Key Words: Functional Movement Screening (FMS^{TM}), Movement Pattern, Football Players, Gym Trainees.
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1. Introduction

Many people are focused on getting fit and healthy these days. They're working on things like flexibility, strength, and how long they can keep going. The authors of this piece think that some people are doing advanced exercises even though they don't move very well. It's like they're trying to get in shape without fixing the way they move. They often avoid the things they're not good at when they work out (Cook et al., 2014). Functional movement screening is a prevalent method employed to evaluate Movement patterns, rather than as a standalone injury prediction method (Eckart et al., 2025; Moore et al., 2019; Warren et al., 2018 & Shultz et al., 2013). The review on FMS by Kraus et al., (2014) showed evidence that FMS can be used to assess general functional asymmetries and postural stability in different populations. Until now, most of the studies have focused on the Functional Movement Screening (FMS) of a single game or activity by using the FMS test. However, the important component of this equation is to focus on comparison among different activities andhighlighting the importance of FMS in such activities that are dynamic and static in nature. As we know that, the FMS test is unique in assessing and measuring the asymmetry of the body through the study of basic movement patterns of the body (Łyp, M. et al., 2022).

1.1 Purpose: A study was designed to assess and compare the functional movement pattern in Recreational Gym Trainees and Amateur Football Players. Movements in Football being predominantly dynamic in nature reports more injuries (Łyp, M. et al., 2022) as compared to Gym strength activities which are predominantly static in nature and demand for controlled and symmetrical movements (Cook, et al., 2014). The question then becomes

how do functional movement patterns differ between RGTs and AFPs, considering the fundamental differences in movement demands between static and dynamic activities.

1.2 Hypothesis: The RGTs would demonstrate superior FMS scores in static stability patterns (Deep Squat, Trunk Stability Push-Up), while AFPs would excel in dynamic movement patterns (Active Straight Leg Raise, Shoulder Mobility).

2. Methodology

2.1 Participants: 50 male participants aged 19-20 years (25 Recreational Gym Trainees and 25 Amateur Football Players) were selected through random sampling for this cross-sectional study.

2.2 Ethical Approval and Informed Consent: This study was approved (NO:-CUK/Phy.Edu./DISS/2023/01/01) by the Departmental Research Committee of the Department of Physical Education, Central University of Kashmir. All procedures followed the declaration of Helsinki.

2.3 Test Procedure: Functional Movement Screening (FMS^{TM}) test was used to assess the functional mobility by 7 test items that measure squatting ability, stepping over obstacles, lunging in a straight line, raising a straight-leg, maintaining trunk-stability during push-ups, and assessing rotary-stability among Recreational Gym Trainees and Amateur Football Players. The nature of both events emphasizes that training and execution of skills require mobility, stability, and balance in a certain way. In the gym, most functional movements are performed in a static position, while football requires one to perform functional movements in a dynamic position.

2.4 Scoring: The assessment involves testing five movement patterns using bilateral testing, which gives two scores for each pattern. The lower of the two scores is the final score, but both are important for understanding the results and data collection process. Three tests—Shoulder-Mobility, Trunk -Stability Push-Up, and Rotary-Stability—have additional "clearing tests" that are graded as either pass or fail. If someone fails any of these clearing tests, their overall score for that assessment is zero. Each part of the assessment uses a scoring system where 3 is excellent, 2 is average, and 1 is below average.

2.5 Statistical Analysis: For the statistical procedure, the researcher applied descriptive and inferential statistics to check the differences among the groups. Between group differences were assessed by independent samples t-test (α =0.05), prior to that statistical assumptions like homogeneity of variance and normality were verified. Analysis was done with the help of IBM SPSS Statistics (Version 20.0Windows IBM).

3.Results

The mean and SD of Recreational Gym Trainees for deep squats were (2.92) and (0.27), and for Amateur Football Players were (2.48) and (0.50). For the hurdle step were (2.88) and (0.33), and of Amateur Football Players were (2.92) and (0.27). For inline lunge were (2.96) and (0.20), and for Amateur Football Players were (2.68) and (0.47). For shoulder mobility was (2.00) and (0.76), and of Amateur Football Players were (2.80) and (0.40). For active straight leg raises were (2.60) and (0.57), and for Amateur Football Players were (2.92) and (0.27). For trunk stability push-up were (2.96) and (0.20), and for Amateur Football Players were (2.64) and (0.48). For rotary stability were (2.24) and (0.43), and for Amateur Football Players were (2.44) and (0.50), respectively.

The calculated p-valuewas (p<.001) for deep squats, In-line-Lunge, Shoulder-Mobility, Active-Straight-Leg Raises, and Trunk -Stability Push-Ups at a 0.05 level of significance and significant difference were found between the two groups. In case of Hurdle-Step and Rotary-Stability, the calculated p-value was (p=.64) and (p=.14), respectively at 0.05 level of significance, and no significant difference was found between the groups.

3.1 Hypothesis Testing: The hypothesis, *"The RGTs would demonstrate superior FMS scores in static stability patterns (Deep Squat, Trunk Stability Push-Up), while AFPs would excel in dynamic movement patterns (Active Straight Leg Raise, Shoulder Mobility)"* was ***accepted.***

Over all Functional mobility score (FMS) of Recreational Gym Trainees was 18.56 and that of Amateur Football Players was 18.88, suggesting a lower risk of injury.

4.Discussion

Table 1 shows statistical differences in five FMS variables, Deep-Squat, In-Line Lunge, Trunk -Stability, Shoulder-Mobility, Active-Straight Leg Raise and no statistical difference in Hurdle -Step, Rotary-Stability. Table 2 shows the overall FMS scores differ by only 0.32 points (1.5% of 21-point scale) which means both groups showed functionally equivalent movement competency. The statistical differences in RGTs reflects bilateral, controlled training emphasis, while statistical differences in AFPs reflect dynamic, multi-planar sport demands. However, no differences were found in fundamental skills common to both activities. Analyzing basic movements to prepare athletes for different sports activities is important. This helps identify who can or cannot perform essential movements. This explanation will cover the Functional Movement Screen and provide evidence of its application. Additionally, it will discuss four more movement patterns: Shoulder-Mobility, Active-Straight - Leg Raise, Trunk -Stability Push-up, and Rotary-Stability, leading to a total of seven key movements (Cook et al., 2014)

Based on the data of Deep Squat, Recreational Gym Trainees exhibit a higher mean score of 2.92 alongside a lower (SD) of 0.27, in contrast to Amateur Football Players, who have a lower mean value of 2.48 and a higher (SD) of 0.5. This indicates that, on average, Recreational Gym Trainees have enhanced bilateral, symmetrical, functional mobility in their Hips, Knees, and Ankles, as well as in their Shoulders and Thoracic Spine, along with improved stability and motor control of their core muscles compared to Amateur Football Players. Additionally, the lower standard deviation for Recreational Gym Trainees reflects less variability in their functional mobility scores, whereas the higher standard deviation for Amateur Football Players reveals more variability. In Hurdle Step, the mean score for Recreational Gym Trainees is 2.88 with a (SD) of 0.33, and the mean score for Amateur Football Players is 2.92 with a (SD) of 0.27. This indicates that Recreational Gym Trainees and Amateur Football Players have similar bilateral functional mobility and stability of the Hips, Knees, and Ankles. However, the Recreational Gym Trainees have a slightly higher standard deviation, indicating more significant variability in their functional mobility scores than Amateur Football Players.

The in-line lunge Scores of Recreational Gym Trainees showed a higher mean score of 2.96 and a minor standard deviation of 0.20. While Amateur Football Players have a lower mean score of 2.68 and a more significant standard deviation of 0.47. This indicates that average Recreational Gym Trainees possess better Hip and Ankle Mobility and Stability, Quadriceps Flexibility, and Knee Stability compared to Amateur Football Players. Additionally, a minor standard deviation for gym trainees indicates less variability in their functional mobility scores. The more significant standard deviation for the Amateur Football Players suggests more score variability.

Shoulder Mobility scores of Recreational Gym Trainees have a mean score of 2.00 and a (SD) of 0.76. While Amateur Football Players have a mean score of 2.80 and a (SD) of 0.40. This reveals that Amateur Football Players possess greater bilateral and reciprocal shoulder ranges of motion, which include internal rotation with adduction on one side and external rotation with abduction on the other, compared to Recreational Gym Trainees. Furthermore, the minor standard deviation for Amateur Football Players shows that their functional mobility scores are more consistent. In contrast, Recreational Gym Trainees' more significant standard deviation reflects greater scores of variability. Based on Active Straight Leg Raise data; Recreational Gym Trainees have a mean score of 2.60 and a (SD) of 0.57. While Amateur Football Players have a higher mean score of 2.92 and a minor (SD) of 0.27. On average, Amateur Football Players demonstrate greater flexibility in their Hamstrings and Gastrosoleus while maintaining a stable Pelvis and Core, along with the Active extension of the Opposite leg, compared to Recreational Gym Trainees. Additionally, the minor standard deviation for Amateur Football Players reflects less variability in their functional mobility scores. In contrast, the more significant standard deviation for Recreational Gym Trainees indicates more score variability.

The Trunk Stability push-up data showed that the Recreational Gym Trainees have a higher mean score of 2.96 and a minor (SD) of 0.20. While Amateur Football Players show a lower mean score of 2.64 and a larger (SD) of 0.48. This indicates that, on average, Recreational Gym Trainees exhibit better Trunk Stability in the Sagittal plane during a Symmetrical upper extremity push-up compared to Amateur Football Players. Furthermore, the minor standard deviation for Recreational Gym Trainees shows less variability in their functional mobility scores. In contrast, Amateur Football Players' more significant standard deviation indicates greater scores of variability.

Based on the data on Rotary Stability, Recreational Gym Trainees show a mean value of 2.24 and a (SD) of 0.43. While Amateur Football Players show a mean value of 2.44 and a (SD) of 0.50. This implies that there might not be a significant difference in multi-planar trunk stability between Recreational Gym Trainees and Amateur Football Players during a combined upper and lower extremity motion. Functional mobility was assessed by 7 test items that measure squatting ability, stepping over obstacles, lunging in a straight line, raising a straight-leg,

maintaining trunk-stability during push-ups, and assessing rotary-stability among Recreational Gym Trainees and Amateur Football Players. The nature of both events emphasizes that training and execution of skills require mobility, stability and balance in a certain way. In the gym, most functional movements are performed in a static position, while football requires one to perform functional movements in a dynamic position.

The researcher aimed to assess and compare the functional movement of these two groups. The Recreational Gym Trainees showed excellent movement on both sides of their hips, knees, ankles, shoulders, and upper back, along with their core muscles as the stability was significantly better than Amateur Football Players. Additionally, the Recreational Gym Trainees surpassed the Amateur Football Players in mobility and stability of their hip and ankle movements, and also demonstrated better knee stability and greater flexibility in their quadriceps. Finding in the present study showed very promising and notable improvements in overall FMS scores, indicating the effectiveness of such intervention programmes in functional movement patterns (Dinc, et al., 2017). When compared with each other, the scores of both groups were almost the same, and when compared with FMS norms, both groups showed better functional mobility. This indicates that gamers and Amateur Football Players had fewer chances of injury during the competition.

FMS is used to screen athletes and try to find out the predictive values of FMS about injuries (Chorba. et al., 2010). Athletes scoring 14 or lower on the FMS were found to have dysfunctional movement patterns, potentially leading to a higher risk of injury. In contrast, our results showed FMS scores above 14 (precisely 18.56 and 18.88), suggesting a lower risk of injury (Kiesel et al., 2007). These results are at par with the findings of our study. The overall FMS^{TM} of Recreational Gym Trainees was 18.56 and of Amateur Football Players were 18.88. This indicates that both the groups have a good FMS score. Over findings are supported by the systematic review and meta-analysis carried by Maleki, et al. (2025), assessed how various exercise interventions can positively influence FMS scores, indicating potential improvements in movement quality. Notably, resistance training, core stability training, and functional training demonstrated the most significant positive impacts on FMS results. While FIFA training also showed some effect, it was less pronounced. They recommended the use of targeted exercise programs, especially those emphasizing resistance and core stability, to enhance FMS scores and, consequently, optimize movement patterns. Besides that, Clark, et al. (2022) concluded that functional training, muscle strengthening, core stability training, and resistance significantly improve the movement pattern.

5.Conclusion

The study aimed to assess and compare functional movements of individuals involved in competitive football and those engaged in gym training. Functional movements refer to the specific movements and exercises that mimic real-life activities and are important for overall physical performance. This research has investigated functional movement patterns of Amateur Football Players and Recreational Gym Trainees. Screening was done by using the functional movement tests designed for flexibility, strength and stability such as; the deep squat, shoulder mobility, the Active-straight leg raise, the trunk-stability push-up, hurdle-step, in-line-lunge, and rotary-stability. These tests are designed to examine the movements required by the participants in their respective sport or activity. It was concluded that, RGTs exhibited superior performance in deep squat, In-line lunge, and trunk stability push-ups. AFPs excelled in shoulder mobility, and active straight leg raise.

Overall FMS scores were similar for RGTs and AFPs and both exceeding the injury risk threshold. RGTs excel in controlled, bilateral movements while AFPs excel in dynamic, multi-planar movements. Both groups demonstrated low injury risk. Both RGTs and AFPs showed functional competency and suggest FMS differences reflect training adaptation rather than deficits.

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Author Contribution: The co-corresponding authors contributed in literature exploration, writing, reviews and editing.

Conflict of Interest: The authors declare no conflicts of interest of relevance to this topic.

Ethics Approval: This study was approved (NO:- CUK/Phy.Edu./DISS/2023/01/01) by the Departmental Research Committee of the Department of Physical Education, Central University of Kashmir. All procedures followed the declaration of Helsinki.

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Table 1: Mean, SD and t-test results for Recreational Gym Trainees and Amateur Football Players

Group Statistics					
Variable	**Group**	**N**	**Mean**	**Std. Deviation**	**Sig. (2- tailed)**
Deep-Squat	Recreational Gym Trainee	25	2.92	0.27	0.000
	Amateur Football Players	25	2.48	0.50	
Hurdle-Step	Recreational Gym Trainee	25	2.88	0.33	0.64
	Amateur Football Players	25	2.92	0.27	
In-Line-Lunge	Recreational Gym Trainee	25	2.96	0.20	0.00
	Amateur Football Players	25	2.68	0.47	
Shoulder-Mobility	Recreational Gym Trainee	25	2.00	0.76	0.00
	Amateur Football Players	25	2.80	0.40	
Active-Straight-Leg Raise	Recreational Gym Trainee	25	2.60	0.57	0.01
	Amateur Football Players	25	2.92	0.27	
Trunk-Stability -Push Up	Recreational Gym Trainee	25	2.96	0.20	0.00
	Amateur Football Players	25	2.64	0.48	
Rotary-Stability	Recreational Gym Trainee	25	2.24	0.43	0.14
	Amateur Football Players	25	2.44	0.50	

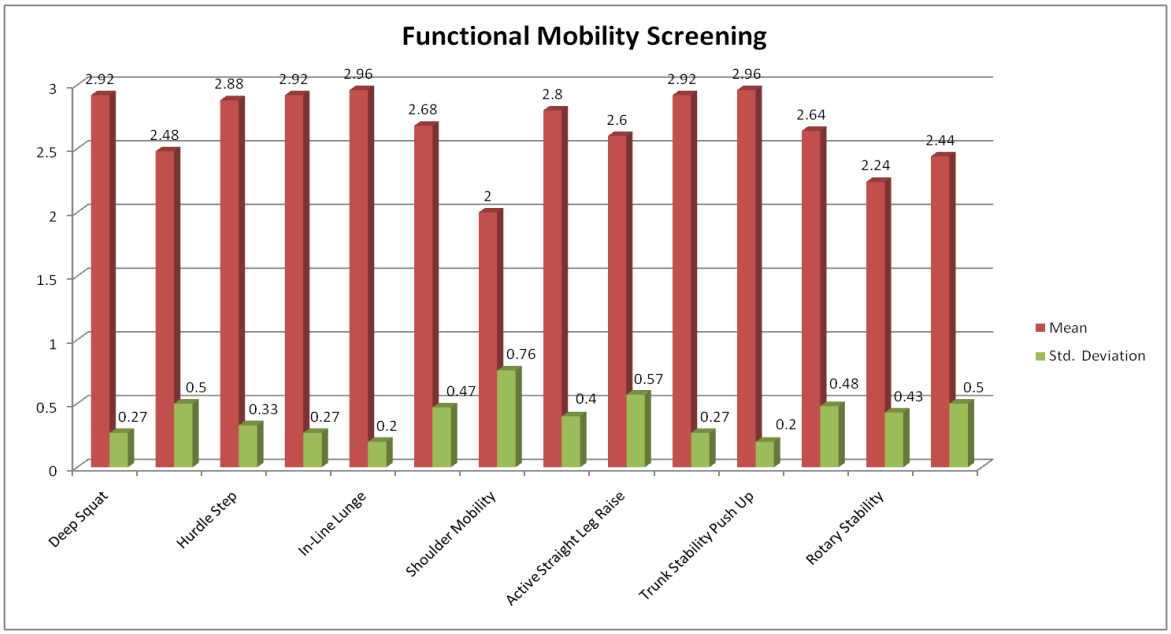


Fig. 1: Mean and SD of Recreational Gym Trainees and Amateur Football Players