Sir Syed Journal of Education & Social Research
Vol. 4, Issue 1, 2021 (January – March)
ISSN 2706-6525 (online), ISSN 2706-8285 (Print)
ISSN 2706-9362 (CD-ROM), ISSN 2706-6525 (ISSN-L)
DOI: https://doi.org/10.36902/sjesr-vol4-iss1-2021(295-303)

SJESR
Sir Syed Journal of Education & Social Research

Functional Movement Screening: A study on National Level Judo Players of Pakistan

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Abstract

Background: *Functional Movement Screening (FMS) is a tool to screen the musculoskeletal factors of injury or dysfunctionality patterns in sports. The establishment of functional movement screening (FMS) has built a bridge between physiotherapy, rehabilitation, and physical training, to realize the integration of multiple disciplines. This study tends to investigate musculoskeletal risk factors through the FMS of Judo players in Pakistan.* ***Method:*** *A total of 10 national-level athletes were selected who had been national-level competitors in Pakistan. Different movement patterns/drills prescribed by FMS were performed by them under a secure environment. These movement patterns were designed to provide observable performance of basic locomotor, scheming, and stabilizing movements by putting a person in severe positions where weaknesses and imbalances become noticeable if proper movement and motor control are not utilized。 FMS score sheet was used for marking along with total scores of all drills.* ***Conclusion:*** *Results showed that the majority of the Judo athletes were found under standardized grading out of whom only three players were able to get marked above 16 out of 21. Athletes were unaware of FMS and the majority of athletes failed to perform FMS drills which caused them problems in their balance, flexibility, and agility.*

Keywords: Judo, Functional Assessment, FMS (Functional Movement Screening), Stability, Flexibility

Introduction

FMS (Functional Movement Screen) is a test method used to test irregular movements in human movement. It was proposed by American physical fitness expert Gray Cook in the 1990s and gradually applied to physical therapy rehabilitation (yu Zhang, 2020). Evaluation of the athletic ability of professional sports players and in the early 1920s published the FMS scoring content, scoring standards, and corresponding operating steps, used to find asymmetry, inflexibility, and unstable motion in the human body. Innovatively build a bridge between the medical rehabilitation field and sports, and provide good support for remote mobilization training (Dymel et al., 2020).

There are seven movements in the FMS test, including two symmetrical movements and five asymmetrical movements, which are squat (symmetry), trunk stability push-ups (symmetry), hurdles (asymmetry), and straight lunges. Squat (asymmetry), shoulder flexibility (asymmetry), active straight leg elevation (asymmetry), rotational stability (asymmetry), in addition to three exclusionary movements. The total score is 21 and is divided into 14 points (Bagherian et al., 2019). If the score is lower than 14, the risk of sports injury is higher, and the risk is lower if the score is higher than 14. FMS can find athletes' movement obstacles and wrong movement patterns. It is also the basis for athletes' training. It can find out the weaknesses of movement patterns through scores and then train to improve the quality of movement (Cook et al., 2017).

The theoretical basis of functional movement screening (FMS)

Action is the basis of human movement. People's daily activities and sports are composed of actions. Movements can be done through the innervations of the brain's nerves, or they can be performed unconsciously, such as when the body shakes suddenly while sleeping, but no matter what activities the human body wants to perform, movement is the most important prerequisite (Bunn & Silva, 2018). Throughout the development of the human body, from head and neck control to climbing, standing, walking, running, jumping, throwing, rotating, etc., are the most basic movements for the human body to complete various movements, but when the human body completes movements

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outside the tolerance range, it will cause compensation, the movement of the human body is completed more efficiently through the transmission capacity of the power chain (Bakken, Targett et al. 2018). Poor quality movements will produce compensation, which will damage the energy in the process of transmission, and the deformation of the movement will become larger and larger after a long time. , Gradually accumulate as a hidden danger of injury, affecting the quality of the action (Ferrauti et al., 2019).

The establishment of functional action screening (FMS) has built a bridge between physiotherapy, rehabilitation, and physical training, and realized the integration of multiple disciplines. It is simple to operate, low in price, and suitable for a wide range of people. Through the test, it is possible to identify the human body's obstructive actions, the proprioceptive feelings in the actions, and other information (Akkoç et al., 2019). This test reflects the flexibility, stability, coordination flexibility, and other qualities in the basic movement patterns of the human body. Screening discovers the compensatory phenomena in the human body's movement patterns and formulates corresponding corrective training plans based on these deficiencies to provide effective support for the improvement of human movement ability and the reduction of the probability of injury (Ferrauti et al., 2018). Functional movement screening (FMS) is different from traditional exercise performance testing in that FMS focuses on the quality of the actions performed by the human body during the test, emphasizing the control of actions, not the quantity (Newton et al., 2017). When the human body performs the same exercise with a heavy load or continuous motion, compensation and injury are prone to occur if the movement is obstructed. In traditional tests, testing is done for sports performance. The focus of training is on volume and intensity, not on the quality of movements in sports. It increases the hidden danger of injury. In the best performance pyramid proposed by Cook, the first stage is functional movement screening. In this stage, it is the foundation for athletes to train, to compete, to improve the stability; control, and flexibility of athletes to achieve higher sports goals (Hammes et al., 2016).

Fundamental Movement Patterns in FMS

The analysis of fundamental movements is added into screening to prepare an athlete for a wide range of activities which he requires to participate in or return to their sport so that it can be determined who possesses or cannot perform certain essential movements Warren, M., et al. (2018).

The FMS comprises seven movement patterns that require mobility and stability are

- Deep Squat
- Hurdle Step
- In-Line Lunge
- Shoulder Mobility
- Active Straight-leg Raise
- Trunk Stability Push-up
- Rotary Stability

Judo

Judo is generally characterized as a modern martial art, which has made itself to the surface into a combat and Olympic sport. It was created in 1882 by Jigari Kano as a physical, mental, and moral subject in Japan (Bakken et al., 2017). Judo's most prominent feature is its competitive element, where the objective has to either throw or takedown an opponent to submit with a joint lock or choke. Thrusts by hands and feet and strikes as well as weapons defenses are a part of judo, but only in pre-arranged manner. A judo practitioner is called a judoka (Moran et al., 2017).

Injury Prediction through FMS

Early counteraction and the executives of Judo injuries is a procedure that assumes a crucial job in retreating judo injury and improving execution. Prevention of judo injury is one of the BASIC principle obligations of sports clinical staff at all levels. Normally, a player's movement ability requires steady checking and routine account during far-off preparation periods (Dorrel et al., 2018)). In a few cases, quality irregular characteristics and muscle adaptability maybe got identified if conventional techniques are utilized. Functional Movement Screening (FMS) is currently considered as a possible instrument to beat this disadvantage. This is a screening appraisal that offers high bury analyzer and intra analyzer unwavering quality when utilized by clinicians, physical advisors, and coaches in the assessment of shortages in explicit functional movement designs (Letafatkar & Sarbizhan, 2019).

The role of functional movement screening

Regarding how to better help coaches find problems with athletes' body functions, Cook proposed a functional movement test, a predictive system for physical problems. Functional movement testing is a grading and ranking system to identify movement problems. Before proposing treatment and correction methods, they first confirm which conditions are acceptable and which are impossible for athletes (Roh, 2019). Coaches often decide whether an athlete is good or bad based on the athlete's strength, joint range of motion, and sports performance, but they never evaluate an athlete from the perspective of movement quality (Bonazza, et al., 2017).

When an athlete with poor skills shows clumsy movements, in most cases, the coach can be aware of the problem with his movements, but the coach often cannot confirm what the athlete lacks. Due to the lack of athletes' defects, coaches often ignore the problem of poor physical function behind these defects. In the end, this clumsy movement has become a normal phenomenon after countless repetitions, while the problem of athletes' poor physical function has never been has been solved (Kiani Shikhabadi, Mahdavinejad et al. 2020).

Functional movement test provides trainers with a basic, operable and simple movement quality evaluation system. It is designed to rank the basic movement patterns of the human body. By observing these movement patterns, you can confirm human movements. The asymmetric development of the restricted parts of the body and while grading and sorting them (Mokha, et al., 2016).

Material and Methods

Scoring the Functional Movement Screening

There are a total of 7 exercises in the functional movement test, each of which has a score of 0-3 and a total score of 21 points. If the score is below 14 points, it is recommended to go to a rehabilitation specialist for rehabilitation. Any pain during the test is given 0 points (Moore, et al., 2019).

Table 1 FMS score and Injury Frequency

Sr.	Name	Frequency of injuries (Last two years)	Deep Squad	Hurdle Step	In-Line Lung	Shoulder Mobility	Active Straight-leg Raise	Trunk Stability Push-up	Rotary Stability	Total FMS Score
1	Rashid	3	3	2	2	2	3	3	2	17
2	Vijjay	4	3	2	2	2	2	3	2	16
3	Arshad	5	2	2	2	2	2	3	1	14
4	Adnan	3	3	2	2	2	1	3	2	15
5	Aqib	4	2	2	3	2	2	2	2	15
6	Hafeez Ullah	5	2	2	2	2	2	2	2	14
7	AnayatUllah	7	2	1	1	1	2	2	1	10
8	Umair	5	2	1	1	2	2	2	2	12
9	Junaid Khan	1	3	2	2	3	3	3	2	18
10	Arshad Khan	4	2	2	2	2	2	2	2	14

Table 1 shows the FMS scores of players and their frequency of injuries in the past two years. This table reveals that almost all players lie behind the test fitness standard. Player 1 got a 17 score out of 21 cumulative of all seven tests. Player 2 got a 16 score cumulative of all seven tests of FMS. Player 3 got 14 score cumulative of all seven tests and player 4 got 15 scores out of 21 cumulative of all seven tests of FMS while player 5 also got 15 scores in all seven tests whereas player 6 got 14 scores in all seven tests, player 7 got 10 score cumulative of all seven tests of FMS, player 8 got 12 score out of 21 cumulative of all seven tests while player 9 got highest 18 score out of 21 in all seven tests and the player 10 got 14 scores out of 21 cumulative of all seven tests.

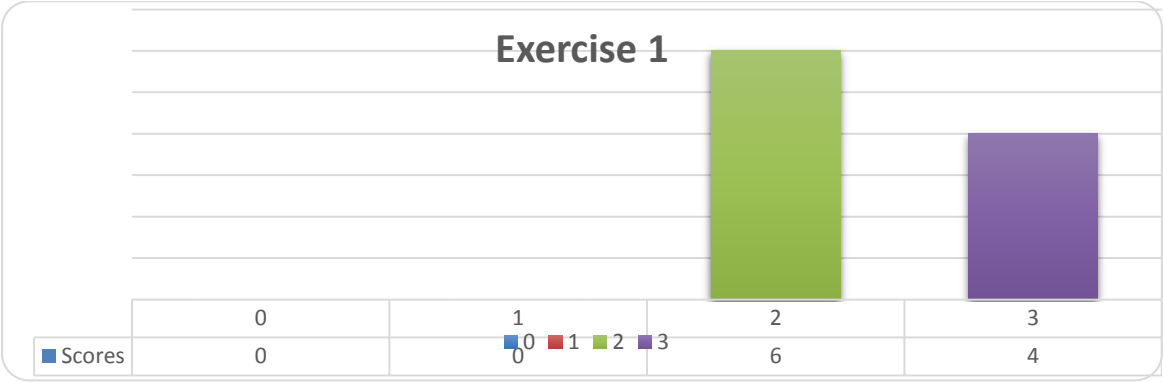
The results of the FMS test are reciprocal to the rate of injuries of the players. A player whose injury rate is less has scored a higher FMS score whereas the player whose injury rate is higher has scored a lower FMS score.

Description of the FMS Test

The target population of this study was 10 male athletes who belonged to the Pakistan Wapda judo team. All of them were national champions and international medal holders which they had won in Asian championships and South Asian games (Martin et al., 2017). FMS technique was first time used in Pakistan as a functional assessment tool for the Pakistan Wapda judo team. Based on data analysis

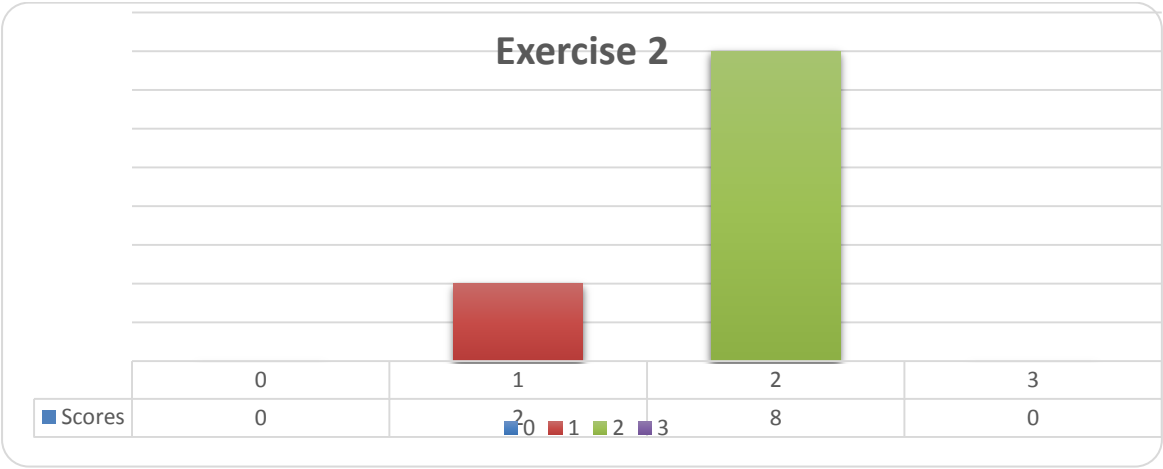
we can achieve the following results, which are represented in the graphs below (Smith et al., 2017). In graphs the blue color shows the 0 scores, the red color shows the 1 score, the green color shows 2 score and the purple color shows that the athlete could get a 3 score in the following exercises.

1. Deep Squat



Purpose: The Deep Squat example challenges all-out body mechanics and neuromuscular control. It is utilized to test respective, efficient, functional mobility and stability of hips, knees, and lower legs. The pole overhead needs two-sided balanced mobility and stability of shoulders, scapular locale, and thoracic spine. The pelvis and center must build up stability and control all through the whole movement to accomplish the full example (Newton et al., 2017). According to data analysis of Pakistan Judo team, 0 players get 0 and 1 score 6 players get 2 score and 4 players get 3 score as shown in figure1-1.

2. Hurdle Step

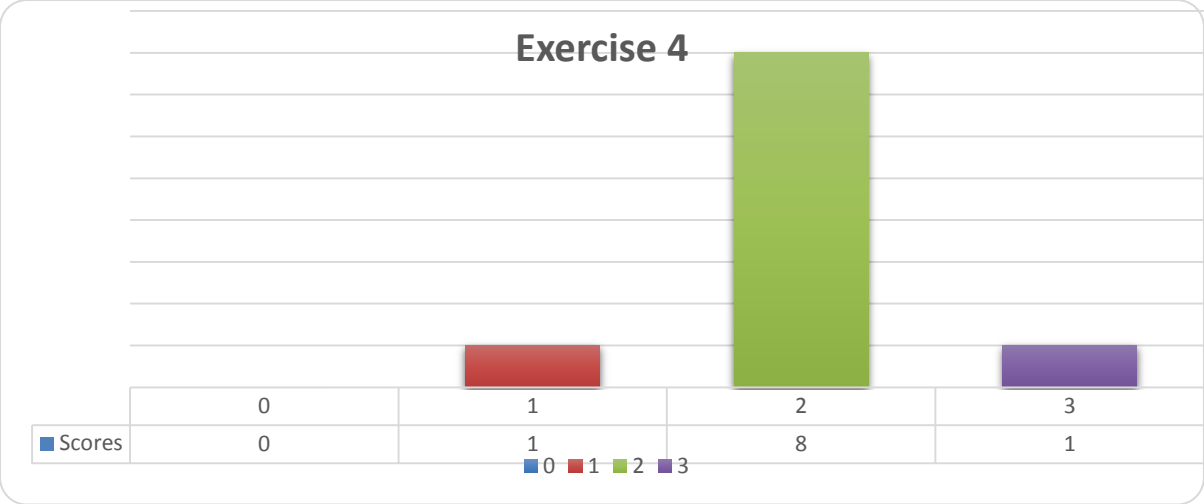


Purpose: The hurdle step design is an indispensable piece of motion and speeding up. This movement challenges the body's step and step mechanics while testing the stability and control in a solitary leg position. It requires respective mobility and stability of hips, knees, and lower legs. This test additionally adds difficulties of stability and control of pelvis and center as it offers a chance to watch functional balance (Marques et al., 2017). According to the data analysis 0 players get 0 score, 2 players get 1 score, 8 players get 2 score and 0 players get 3 scores as shown in figure1-2.

3. In-line Lunge

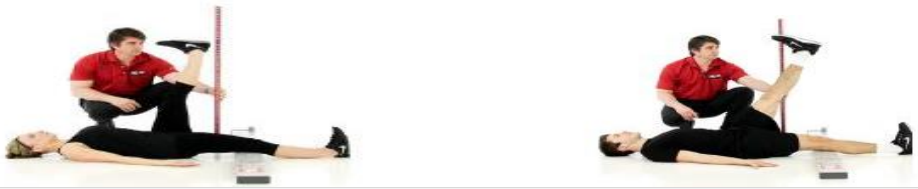
Purpose: The Inline Lunge puts the body in a situation to animate worries during turn, deceleration, and horizontal movements, in addition to it puts the limits in a split position while the furthest points are in a contrary example. The Inline Lunge extraordinarily requests spine adjustment and its test difficulties hip, knee, lower leg, and foot mobility and stability (Landis et al., 2018).In this test 0 players get 0 score, 2 players get 1 score, 7 players get 2 scores and 1 player get 3 score as shown in figure1-3.

4. Shoulder Mobility



Purpose: This example exhibits the regular correlative beat of the scapular-thoracic area, thoracic spine and rib confine during corresponding furthest point shoulder movements. This likewise watches two-sided shoulder scope of movement, consolidating expansion, inward turn and adduction in one limit, and flexion, outside pivot, and snatching of the other (Shore, E., et al. (2020). In this test 0 players get 0 score, 1 player get 1 score, 8 players get 2 scores and 1 player get 3 score as shown in figure1-4.

5. Active Straight Leg Raise

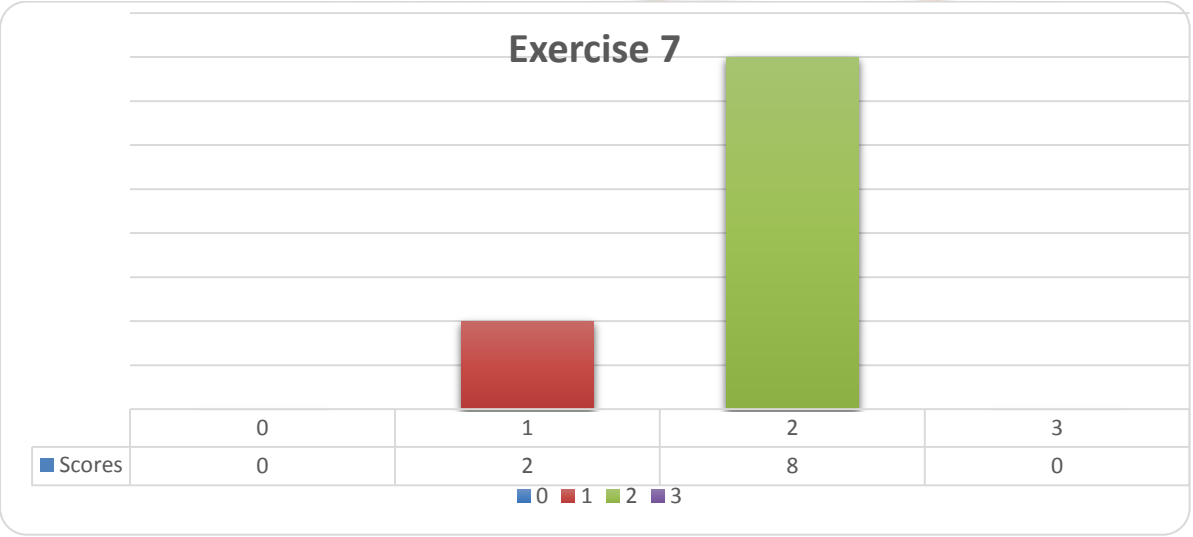


Purpose: The Active Straight-Leg Raise design does not just recognize the dynamic mobility of the flexed hip, yet takes a gander at the center stability inside the example, just as the accessible hip augmentation of the substitute hip. This example additionally provokes the capacity to separate the lower limits while keeping up stability in the pelvis and (center Lisman et al., 2018). According to the data analysis in this test 0 players get 0 score, 1 player get 1 score, 7 players get 2 scores and 2 players get 3 scores as shown in figure1-5.

6. Trunk Stability Push-up

Purpose: This example is utilized as an essential perception of reflex core adjustment, and isn't a test or proportion of chest area quality. The goal is to start the movement with the furthest points in a push-up design without the remittance of movement in the spine or hips. The movement tests the capacity to settle the spine in the sagittal plane during the shut dynamic chain, chest area balanced movement (Duke, S. R., et al. (2017). According to the data analysis of the Pakistan judo team 0 players get 0 and 1 score, 5 players get 2 scores and 5 players get 3 scores as shown in figure1-6.

7. Rotary Stability



Purpose: This example is troublesome; it requires appropriate neuromuscular coordination and vitality to move through the middle. This example covers multi-plane pelvis, core, and shoulder support stability during a consolidated upper and lower limit movement. The movement displays reflex adjustment and weight moving in across the movement and the organized endeavors are spoken to and stability is seen in essential climbing design (Whittaker, J. L., et al. (2017).In this test 0 players get 0 score, 2 players get 1 score, 8 players get 2 scores and 0 players get 3 scores as shown in figure1-7

Conclusion

Multiple screening activities were performed to assess injuries and movement dysfunctional possibilities in Judo athletes. After careful assessment, it has been observed during screening drills

and FMS score sheet that Pakistani Judo athletes were having many possibilities to get injured during training or competitions. Only three players could manage to get to the standardized level of flexibility, agility, and body balance. The score sheet reveals that the majority of the players managed to get only 10 to 14 marks out of 21 which show's that probability of injury or movement dysfunction is very high in judo players.

Suggestions

- Players may be trained to improve their balance, agility, and flexibility.
- Players may focus on their health-related component of training to prevent them from injury and dysfunctions.
- Corrective measures may be taken to ensure muscle strength in players.

Acknowledgments

The research by the author reported herein was supported by the Capital University of Physical Education and Sports Beijing, CHINA. We would also like to thank the Judo athletes and coaches of Pakistan for helping us in this study.

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