EVALUATING THE RISK OF MUSCULOSKELETAL INJURY AMONG FITNESS TRAINERS BY USING FUNCTIONAL MOVEMENT SCREENING – AN ANALYTICAL STUDY

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Abstract-
INTRODUCTION AND AIM: Fitness trainers are those who train people on exercises and workouts for different age groups tend to get musculoskeletal injury like strain, sprain,ligament or tendon tear, SLAP injury etc. FMS is a screening tool used to detect the risk ofmusculoskeletal injury. It is always done in healthy adults with no recent complaint of painor injury. The Aim of the study is to evaluate the risk of musculoskeletal injury among fitness trainers.
METHODS: The analytical study were carried out for 30 fitness trainer's trough conventional sampling technique, where the subjects were recruited based on inclusion andexclusion criteria.
PROCEDURE: The recruited subjects were surveyed through the FMS and the data is tabulated and statistically evaluated.
RESULTS: Statistical method of data analysis shows significant difference in both groups. This study shows that both the groups are at the risk of developing musculoskeletal injurywhere some of the fitness trainers FMS score seemed to be less than or equal to 14 , peoplebetween 31-40 years are at increased risk compared to 20-30 year old.
CONCLUSION: according to the study subjects between 31-40 years of age are more prone to musculoskeletal injury and females are more prone to musculoskeletal injury.

Keywords: **Fitness trainers, FMS, musculoskeletal injuries.**

1. INTRODUCTION

The fitness trainers are those who lead, instruct, and motivate individuals or group of people in exercises, cardio workouts, strength training etc. They work with all age groups.They demonstrate how to perform various exercises to minimize injuries and improve fitness. Exercises done in fitness centers have the potential to be harmful, and injuries incurred by exercisers can cause disruptions in daily life, financial loss, temporary or permanent disability, or in extreme cases, death. The danger of harm from pure exposure increases along with the growth of fitness centers .[(22)]Lifting heavy weight during workout in an improper way is the most common cause of injury. There are numerous musculoskeletal injuries occurring in fitness trainers some of them are overexertion, strenuous or unnatural movement, injury occurring when moving in an equipment, injury due to equipment malfunction, hit with the dumbbells or other equipment's, strains, sprains, SLAP tear, spinal disc injuries, tendon and ligament injuries, etc. Functional Movement Screen (FMS) aid in identifying individuals who may be at risk for injury or who may have flaws that could hinder performance. It consists of seven distinct movement patterns that are graded based on the symmetry, mobility, and stability displayed by the subject. The designers of the FMS wanted to create a movement screen that would reveal functional limitations and allow for a more positive approach to injury prevention. [(1,2)] FMS is made up of seven tests or exercises that put a person's ability to execute simple movement patterns which include muscle strength, mobility, the range of motion, rhythm, balance, and proprioception to the test. [(3-4)] The main objective of the FMS is to assess the body's kinetic chain system, in which the body is assessed as a network of interdependent segments that frequently cooperate to start movement in a proximal to distal direction [(3,5] Five of the seven FMS tests are evaluated differently for the left and right sides, [(6)] making it possible to find asymmetries that have been linked to an increased risk of injuries. Functional movement screening involves seven categories such as deep squat, hurdle step, in-line lunges, shoulder mobility, active straight leg raise, trunk stability push up and rotatory stability. During trunk stability, upper extremities are pushed up symmetrically while the trunk's stability in the sagittal plane is measured [(7]. The deep squat is a test which puts your entire body mechanics to the test. The deep squat is used to assess the functional mobility of the hips, knees, and ankles on a bilateral, symmetrical basis. The hurdle step is made to test how well the body can execute a step while maintaining good stride mechanics. Kiesel et al[(8)] determined that athletes who scored 14 or less on the FMS™ possessed dysfunctional movement patterns that may correlate with greater risk of injury. The aim of the study is to evaluate the risk of musculoskeletal injury among fitness trainers.

METHODS

This is an analytical type of study in which over 30 fitness trainers both male and female were analyzed. Convenient sampling method is used to collect samples. Fitness trainers who are between 20-40 years are included. Trainers with ligament laxity, muscle spasm, undergone recent surgeries or fractures are not included.

PROCEDURE

The recruited subjects were provided with informed consent form and a information sheetwhich contains the protocols, procedure. FMS consists of 7 movements in which for eachmovement scores of 0-3 based on the level of movement achieved.

1. The Deep Squats

The Deep Squat tests both neuromuscular control and overall body mechanics. We employit to evaluate the functional stability and mobility of the hips, knees, and ankles on a bilateral, symmetrical basis.The shoulders, scapula, and thoracic spine must be bilaterally

symmetrically mobile and stable to do the dowel overhead. To complete the full pattern, the pelvis and core must maintain stability and control throughout the entire movement.

2. The Hurdle Step

The hurdle step type is essential to both acceleration and movement. This exercise tests stability and control while putting the body's step and stride mechanisms to the test. The hips, knees, and ankles need to be bilaterally mobile and stable for the hurdle step. As it provides a chance to see functional symmetry, the test also puts the pelvis and core through their paces in terms of stability and control.

3. Shoulder Mobility

By calculating the distance in inches from distal wrists creases to the end of the third digit,the tester first calculates the length of the hand. The person is then told to create fists withboth hands, inserting the thumb into each fist. They are then instructed to position one shoulder to extended, abducted, and internally rotated maximally while positioning the other maximum abducted, flexed, and externally rotated. During test, the fists must be kepttightly closed and placed just on back in a single, fluid motion. The distance between two closest bony prominences is then measured by the tester. Up to three bilateral runs of the test should be made.

4. The Active Straight Leg Raise

The person begins by assuming the beginning position, which entails lying supine with thehead flat on the floor, legs over the 2 x 6 board, and arms in anatomical position. A dowel is then positioned at this location, perpendicular to the ground, between the tester's identification of the midpoint between both anterior superior iliac spine and the midpoint of the leg's patella on the floor. The subject is then told to slowly elevate the test leg whilemaintaining an extended knee and dorsiflexed ankle. The head must be in the contact withthe floor, the opposing knee (the down leg) should be on the ground with the toes pointingupward, and the test must be completed. When the end of the range is reached, take note of where the upward ankle is in relation to the non-moving leg. If the malleolus is not able

symmetrically mobile and stable to do the dowel overhead. To complete the full pattern, the pelvis and core must maintain stability and control throughout the entire movement.

5. The Trunk Stability Push-Up

The person lies down face down with their feet together. the hands are in the appropriate location at shoulder width apart. Men and women begin the exam with different arm postures. Women start with both thumbs at chin level, while men start with thumbs at the top of their foreheads. The ankles are dorsiflexed and the legs are fully extended. The person is instructed to complete one pushup while in this position. The lumbar spine shouldn't "lag" (or arch) throughout the movement; the body must be elevated as a single unit.If the person is unable to complete a push-up in this position, their thumbs are shifted to the next position, which is shoulder level for women and chin level for men, and the push-up is retried. A trunk stability push-up should only be done three times.

6. Rotary Stability

The person stands in the starting quadruped position with the 2 x 6 board across their kneesand hands and their shoulder and hip at 90-degree angles to their body. The ankles must be dorsiflexed and the knees should be at a 90-degree angle. The person then extends the same-side hip and knee while flexing the shoulder. Only enough height is added to the legand hand to allow them to clear the ground by around 6 inches. The knee is then flexed till the arm and knee touch while the same shoulder is stretched. Bilaterally, with a maximum of three tries on each side .If the person fails this test (gets a "3"), they are then told to execute a diagonal pattern that use the opposite hip and shoulder in the same way that wasspecified for the first test. Additionally, they have three chances to pass this test.

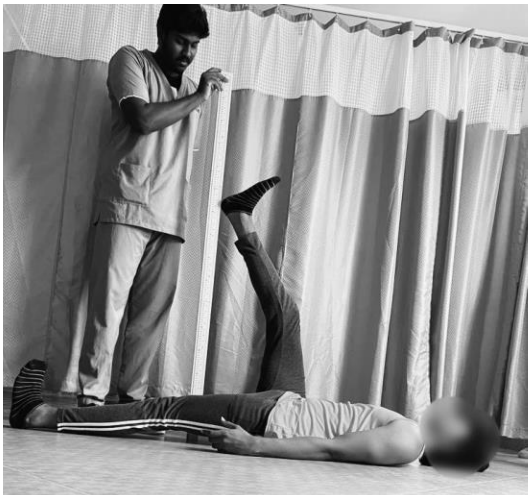
7.The In - Line Lunge

The Inline Lunge sequence puts the body in such a position to mimic rotational, lateral, and deceleration loads. The inline lunge positions the upper extremities in an opposing or reciprocal pattern while the lower extremities are in a split stance. Since it specifically necessitates spine stabilization, it mimics the natural counterweight that the lower and upper extremities utilize to balance one another. Additionally, the mobility of the hip, knee,ankle, and foot is tested.

(**Figure 1:** deep squat)

(**Figure 2:** shoulder mobility)

(**Figure 3:** hurdle step)



(**Figure 4 :** active straight leg rase)

(**Figure 5**: trunk stability push -up)

(**Figure 6:** In – line lunge)

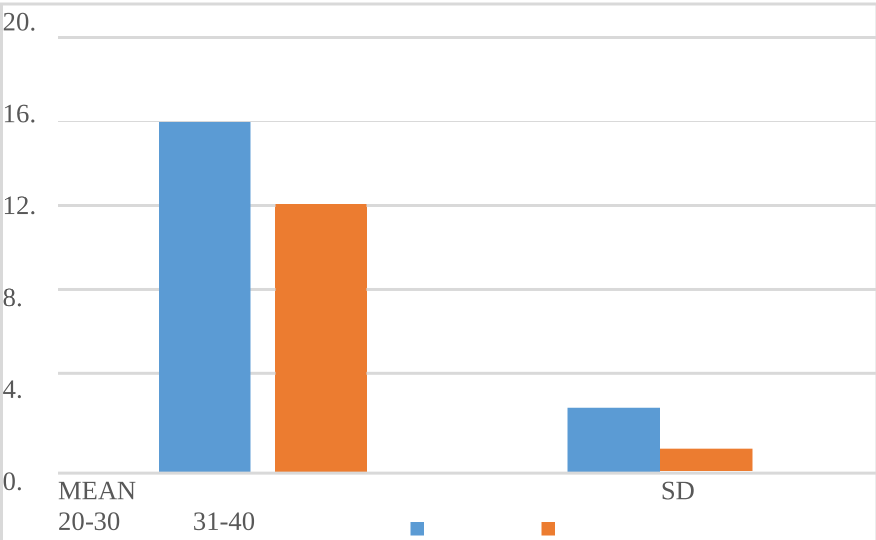
(Figure 7: Rotary stability)

STATISTICAL ANALYSIS

The collected data is tabulated and analyzed using functional movement screening.

functional movement screening is done in all the fitness trainers from age 20-40, where thedata of 20-30 aged is tabulated in one group and the data of 31-40 aged people is tabulatedin another group.

- 20 to 30-year-old heavy weight trainers.
- 20- 31 to 40-year-old heavy weight trainers.



Graph 1: comparing the FMS score of 20-30 and 31-40

RESULT

Among 30 fitness trainers of 20-40-year-old, 15 of them were between 20-30 years and 15of them were between 31- 40 years. Fitness trainers undergoing compensatory movementswithout injury or trauma are assessed for their risk of musculoskeletal injury using functional movement screening. 30 people of 20-40-year-old fitness trainers are included in the study, where 15 of them is between 20-30-year-old and 15 of them is on the age. Table 1 shows the data of FMS score between group one and two. Statistical method of data analysis shows significant difference in both groups .The mean difference of 20 to 30year is 15.93 and 31 to 40 is 12.27, and the standard deviation of 20 to 30 year is 2.28 and31 to 40 year is 1.03. This study shows that both the groups are at the risk of developing musculoskeletal injury where some of the fitness trainers FMS score seemed to be less thanor equal to 14, people between 31-40 years are at increased risk compared to 20–30-year- old.

DISCUSSION

Gulgin H et al 2014,According to the current study, the dependability of individual test results may be less acceptable for evaluating function independently, especially when usinga varied group of evaluators. However, skilled evaluators can utilize the composite FMSTM to examine fundamental movement pattern and get a total score. [10] Six of the twelve individual tests that

make up the FMSTM showed complete agreement between the raters (Table 3). Hurdle step L, Hurdle step R, and Shoulder Mobility L were three of the twelve tests that showed moderate agreement (66%), while squat, rotary stability R, and rotary stability L showed only modest agreement (33%).
Moran RW et al 2017, In conclusion, the strength of the link between both the FMS score and subsequent injuries is insufficient to support the use of the score as a tool for injury prediction. (11) The extent of the effect in football was "unclear," and there was "moderate" evidence to advise against using FMS composite scores to forecast injuries. The genuine size of correlation for any demographic analyzed was not larger than "minor," regardless of the strength of the evidence or the sport under investigation.
Warren M et al 2018, Additionally, the FMS has strong translation validity, low criteria validity, and sensitivity. Despite the fact that FMS is regularly used to describe the likelihood of an injury, predictions and association are frequently mixed up in study. The data that are now available do not provide strong evidence for injury prediction, as well as less consistency with in relationships with injuries.(12)
Frost DM et al 2012, The therapeutic use and implementation of a targeted exercise program progression to improve FMS performance need more research to assure consistency among practitioners, even though the FMS may be able to diagnose movement abnormalities.(18) Frost DM et al 2015, The FMS may not correctly reflect movement dysfunction because the FMS movement patterns might be influenced by knowledge of how to do a particular activity or by interpreting it.(19)When employing the FMS as a screening tool, future research should distinguish between actual and suggested movement dysfunction; this would increase the FMS's clinical utility when used in clinical settings.. However, conducting the examination can potentially offer other benefits. Newton F et al 2017, The FMSTM, for instance, may help applied practitioners in providing effective physical development programs for huge squad of players who they are unfamiliar with.
(13) The Functional Movement Screen, a tool for screening fundamental movement patterns, has generated a lot of interest and is routinely included in pre-participation evaluations .
Stanek JM et al 2017, Almost majority of this attention has examined participants' total scores and attempted to relate particular scores to increased injury risks. (14) According to a research study that demonstrated an OR was calculated at 4.70, an athlete with a total FMS score of less than 17 is thought to have a 4.7 times greater chance of suffering a lower-limb injury during a typical season.
Shojaedin SS et al 2014,The FMS values acquired from this cross-sectional study for collegiate athletes will aid in the evaluation of test results when players are tested for both musculoskeletal injury and performance concerns. (15) The FMS offers advantages in diagnosing movement deficits, and with more practice, these particular motions' ability

may advance. Bardenett SM et al 2015,It cannot, however, be used to anticipate season- long injuries in sportsmen. [16] The results of the current study demonstrated a relationship between pre-season FMS scores and injuries amongst Kharazmi University athletes. Letafatkar A et al 2014,Additionally, the risk of sustaining a lower - limb injury was increased by 4.7 times in people with FMS scores below 17. [17] Nicholas A bonanza et.al in 2016, in this systemic review and meta-analysis studied about whether FMS is a good interrater and interrater reliability and validity and has good prediction for musculoskeletal injuries. He has also concluded that it has an excellent interrater and intra rater reliability

A bad FMS score does not disqualify athletes from participating at the top level or distinguish between athletes of different skill levels. However, it appears that performing poorly on the FMS is connected with having a high BMI. The inverse relationship betweenBMI and FMS scores may be explained by the tendency of overweight or obese people toengage in less physical activity or exercise, as FMS scores are positively correlated with exercise participation and physical activity. Elizabeth Parenteau-G et.al in their reliability study, concluded that FMS is a reliable test for young elite hockey players. Further research should be done to assess the predictive validity of the FMS test within this population so that physiotherapists may eventually use it as an injury prevention tool.

CONCLUSION

This study was concluded that the fitness trainers of both age groups are at moderate risk of injury where 31-40 years are at increased risk comparatively. Information to society is that strengthening the core stability muscles is as important as training the superficial muscles to avoid the risk of injuries. Information to the medical professionals is that the therapists should assess segment wise and co-relate those segments for assessment.

LIMITATIONS

Only Fitness trainers are included in the study and they are of 20-40 years of age. Those Fitness trainers should have no complaints of pain and no recent trauma or injury.

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