The Efficacy in Predicting Risk of Injury in Collegiate Basketball Players: Functional Movement Screen vs. Traditional Pre-Participation Examination

Gibson, Kyle M., Stuewe, Katherine A., O'Brien, Corey W., (Stow, Robert C.)
University of Wisconsin – Eau Claire, Eau Claire WI

ABSTRACT

Historically, the standard pre-participation examination (PPE) denies 0.3% – 1.3% of athletes, and alone may not adequately identify those individuals at-risk for injury.[2] Kiesel, Pliskey, and Voight recently reported that a pre-season assessment of fundamental movement patterns in professional football players could predict risk of serious injury.[3] To our knowledge these findings have not been reported in other populations (e.g., women) or sports.

Purpose: The purpose of our study was two-fold: 1) to determine if there were differences between the traditional PPE and the functional movement screen (FMS) in the number of athletes cleared for participation and 2) to determine if pre-season FMS score is associated with an increased risk of injury.

Methods: Subjects included men and women NCAA Division III basketball athletes (N=21). Each athlete performed the FMS test and was scored on his or her ability to complete each exercise. The FMS is an evaluation of an athlete's stability and mobility through seven fundamental movements.[1] We used Kiesel et al. findings that a FMS score of 14 or below positively predicts serious injury.[3]

Results: There were nine out of twenty one (43%) subjects that failed the FMS (scored 14 or below) in the study. The standard PPE passed all twenty one (100%) subjects. Final results showed that the group sustained 17 injuries (Men = 6, Women =4) during the basketball season. Of these injuries, six were associated with participants that did not pass the FMS.

Conclusion: 9 out of 21 (43%) did not pass the FMS test based on the Kiesel et al. passing score of 14. Our results established a passing rate of 15. More research needs to be done with the Functional Movement Screen to establish a conclusive passing mark and correlation to PPE and predisposition to injury.

METHOD

This study was conducted at the University of Wisconsin – Eau Claire in the McPhee Physical Education Center in Eau Claire, Wisconsin. The subjects consisted of both male and female NCAA Division III college basketball athletes at the University of Wisconsin – Eau Claire. The age range of the subjects was 18-24 years.

Prior to performing the FMS, all subjects completed a warm-up session by biking five minutes at a self selected intensity and completed a series of six dynamic stretching exercises: Walking knee raise pulls for twenty yards, walking quadriceps stretch for twenty yards, controlled straight leg kicks for twenty yards, side squats for twenty yards switching directions at ten yards, lunges twenty yards and power skips for forty yards.

The subjects then performed the FMS and were awarded a score by the tester based on their ability to complete the specific movements. Each of the seven exercises of the FMS was conducted as shown in Table 1.
***Please note table 1 describes the criteria for a perfect functional movement screen*

Inclusion Criteria: Any athlete that planned on participating in the 2008-09 basketball season at the University of Wisconsin – Eau Claire had the opportunity to take part in the study. All participants at the time of screening were healthy and injury free.

Table 1. Demographic

Gender	N	Mean Height	Mean Weight
Men	13	76.4 in.	200.3 lbs
Women	8	70.3 in.	154.3 lbs.

Table 2: Seven functional movement screen tests with criteria to receive a perfect score

Test	Description	Example
Deep Squat	Upper torso is parallel with tibia or toward vertical Femur below horizontal Knees are aligned over feet Dowel aligned over feet	
Hurdle Step	Hips, knees, and ankles remain aligned in the sagittal plane Minimal to no movement is noted in lumbar spine Dowel and hurdle remain parallel	
In-line Lunge	Dowel contacts remain with L-spine extension No torso movement is noted Dowel and feet remain in sagittal plane Knee touches board behind heel of front foot	
Shoulder Mobility	Fists are within one hand length	
Active Straight Leg Raise	Ankle/dowel resides between mid thigh and ASIS	
Trunk Stability Push-up	Males perform 1 repetition with thumbs aligned with top of the forehead Females perform 1 repetition with thumbs aligned with chin	
Rotary Stability	Perform 1 correct unilateral repetition while keeping spine parallel to board	

RESULTS

Results showed that nine out of the twenty one athletes that participated in this FMS study scored at or below fourteen. All twenty one participants were cleared for participation through a standard PPE. The male and female FMS scores, along with the mean scores for the entire group as well as individually for male and female are represented in Table 3.

Table 3. Individual and group mean FMS scores

FMS Score	N	Female	Male
10	1	0	1
11	1	0	1
12	0	0	0
13	5	2	3
14	2	0	2
15	6	3	3
16	1	0	1
17	4	2	2
18	1	1	0
Mean Score	14.57	15.38	14.08

Table 4. Test Results: ROC Curve cut off (pass) point

Positive if greater than or equal to	Sensitivity	1 - Specificity
9.000	1.000	1.000
10.500	.909	1.000
12.000	.909	.900
13.500	.636	.700
14.500	.636	.500
15.500	.364	.200
16.500	.273	.200
17.500	.000	.100
19.000	.000	.000

CONCLUSIONS

- To our knowledge, we are the first authors to look at college aged men's and women's basketball players FMS scores.
- Although we did not look at the amount of playing time each individual received, it was observed that 17 out of the 21 participants (81%) were underclassman that did not start or play a substantial amount of minutes.
- 9 out of the 21 participants (43%) did not pass the FMS test based on the Kiesel et al. passing score of above 14.
  - Our results established a passing mark of 15 (see Table 4).
- More research needs to be done with the Functional Movement Screen to establish a conclusive passing mark and correlation to PPE and predisposition to injury.

References

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