

Prediction of Athletic Injury with a Functional Movement Screen™

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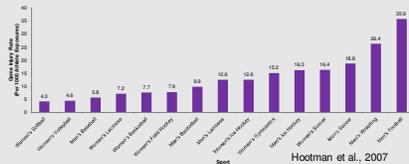
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Abstract

PURPOSE: To determine if a Functional Movement Screen™ (FMS) or bilateral body mass asymmetry test predict injury in intercollegiate football players. **METHODS:** Participants (N=81) were tested using the FMS protocol. Seven tests were scored on a 0 to 3 scale resulting in a possible total score of 21. Intra-rater reliability was estimated for FMS on all participants by viewing videotaped procedures. Inter-rater reliability was estimated on 18 participants viewed in real time by two raters. Bilateral body mass asymmetry was assessed by weighing participants on two identical scales with one foot on each scale. Injury reports were obtained from the athletic training staff. Musculoskeletal injuries were classified via NCAA Injury Surveillance System criteria. **RESULTS:** Mean (±SD) age was 20.0 (±1.5) years, mean FMS score was 15.4 (±1.7), and mean bilateral mass asymmetry was 4.0 (±3.5) kg. Intraclass correlation coefficients for intra-rater (.94) and inter-rater (.92) composite score reliability were high. Twenty-three players (28%) scored low (≤14) on the FMS. Forty-three injuries (17 direct contact, 12 indirect contact, 11 non-contact, 2 overuse injuries, and 1 unknown mechanism) to 31 players were reported. Injury rate did not significantly differ ($p > .05$) by FMS score category [36% with low FMS and 41% with high FMS scores were injured]. No significant relationship was found between bilateral body mass asymmetry and injury rate ($p > .05$). **CONCLUSION:** Preliminary analysis indicated that neither composite FMS scores nor bilateral mass asymmetry scores predict injury in intercollegiate football players.

Background

- Football has one of the highest injury rates in college sports.



- Dick et al. (2007) noted that even though strength and conditioning programs have improved since the late 1980s, injury rates have not changed.
- The Functional Movement Screen™ (FMS) was designed to quantify movement quality (Cook, 2001).
- Several researchers have claimed that the FMS accurately predicts injury in athletes (Chorba et al., 2010; Kiesel et al., 2007) and Marine Corps Officer Candidates (O'Connor et al., 2011).
- Many professional and collegiate athletic teams have used the FMS in working with their athletes.
- Kiesel et al. (2007) reported that individuals scoring ≤14 were at greater risk of injury compared to those individuals scoring ≥15.
- Limitations of previous FMS research include:
 - Inaccurate reporting of sensitivity and specificity
 - Limited and incomplete operational definitions of injury
 - Insufficient research base to determine if a cut-off of 14 on the FMS provides the most accurate threshold for predicting injury
- The ability of the FMS to predict injury in college football players has not been examined.

Purpose

- To determine the ability of the (FMS) or the bilateral body mass asymmetry test to predict injury in intercollegiate football players.

Methods

- Study design**
 - Prospective, longitudinal (1 season) study
- Participants**
 - N = 81 College-age male football players
 - 68% African American, 32% Caucasian

	Mean ± SD	Minimum Score	Maximum Score
Height (m)	1.87 ± 0.07	1.74	2.01
Body Mass (kg)	104.34 ± 22.22	74.10	149.30
BMI (kg·m ⁻²)	30.05 ± 5.25	22.82	43.68
Age (years)	20.0 ± 1.5	17	23

- Injury Definition**
 - An orthopedic injury must have met three criteria:
 - occurred in an organized practice or game, and
 - required medical attention from an athletic trainer or physician, and
 - resulted in one or more days lost past the onset of injury
- Injury Classifications**
 - Direct Contact (Acute injury that occurred at the site of player-to-player contact)
 - Indirect Contact (Acute injury that occurred away from the site of player-to-player contact)
 - Non-contact (Acute injury that occurred in the absence of player-to-player contact)
 - Overuse (Chronic injury with an insidious onset and no definable time of injury)
- Functional Movement Screen™**
 - 7 different movements scored on a 0-3 scale
 - Deep Squat
 - Hurdle Step
 - Inline Lunge
 - Shoulder Mobility
 - Active Straight Leg Raise
 - Trunk Stability Pushup
 - Rotary Stability
- Bilateral Body Mass Asymmetry**
 - Shoulder width
 - Standardized width
 - 1/3 of height
- Interrater reliability**
 - Real time with two raters (n = 18)
 - One FMS™ certified professional, other rater trained with certified rater
- Intrarater reliability**
 - Determined via videotaped screens of participants (n = 80)



Bilateral body mass asymmetry test



Inline Lunge movement of FMS



Hurdle Step movement of FMS

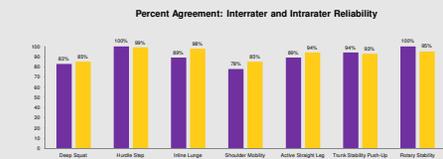
Results

- Injuries**
 - 43 orthopedic injuries (17 contact, 12 indirect contact, 11 non-contact, and 2 overuse) to 31 players (40% of sample)
 - 390 total practices missed (9.07 practices per injury);
 - 61 games missed (1.42 games per injury)
- FMS and Bilateral Body Mass Asymmetry**
 - Players were tested an average of 11.16 (± 15.23) hours after their previous workout
 - 23 players (28% of sample) scored at or below 14

	Mean ± SD	Minimum Score	Maximum Score
FMS Score	15.43 ± 1.74	11	18
Shoulder Width Difference* (kg)	5.45 ± 5.89	0	31.6
Standardized Difference* (kg)	3.88 ± 3.46	0	19.3

* Bilateral body mass asymmetry test

- Reliability**
 - Intraclass Correlation Coefficient (ICC)
 - ICC = .92 (Interrater); ICC = .94 (Intrarater)



Sensitivity and Specificity

	Cutoff	% of sample meeting cutoff	Sensitivity	Specificity
FMS Score	≤ 14	28%	.36	.59
FMS Score	≤ 15	47%	.36	.57
BMI (kg·m ⁻²)	≥ 30.0	39%	.43	.60
Shoulder Width Difference*	≥ 5% of body mass	40%	.52	.68
Standardized Width Difference*	≥ 5% of body mass	28%	.31	.74

*Bilateral body mass asymmetry test

Conclusions

- The FMS can be used reliably with collegiate football players; however, validity of the FMS to predict athletic injury is questionable.
- Cutoff scores of 14 or 15 on the FMS did not accurately predict injury.
- The FMS did not predict injury more accurately than anthropometric-derived measurements.