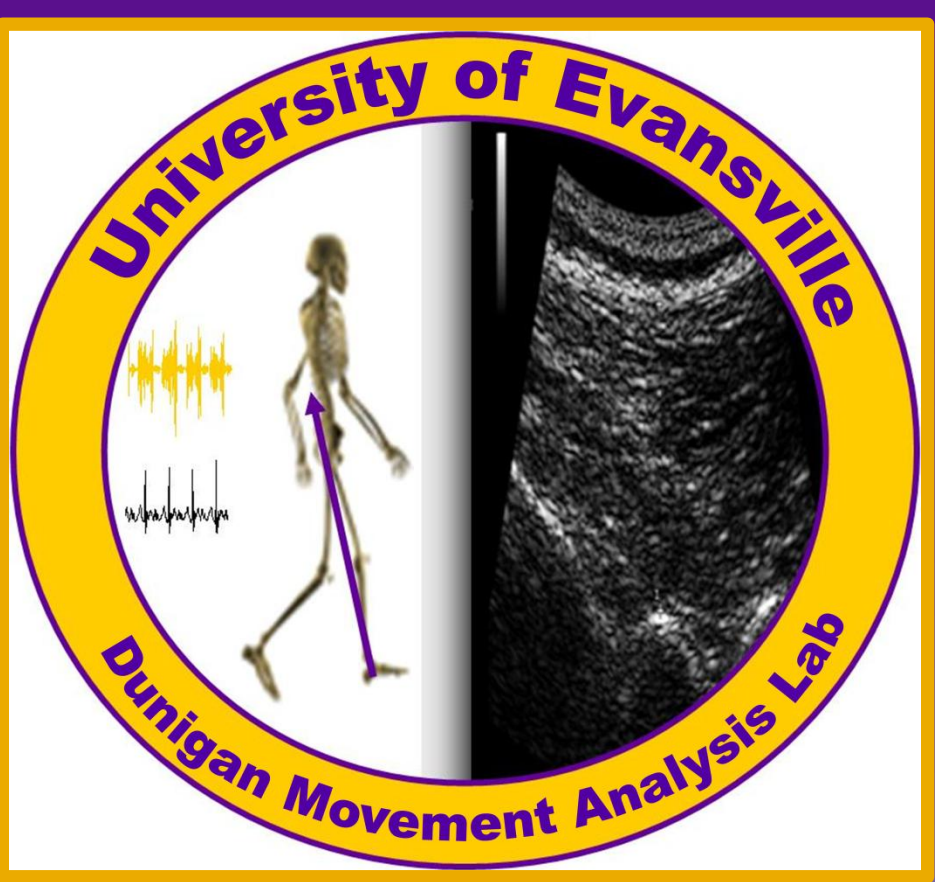




# Fundamental Movement Dysfunction as Measured by the FMS Shifts the Probability of Predicting a Musculoskeletal Injury in Firefighters

Kyle Kiesel PT PhD ATC CSCS<sup>1,2</sup> Phil Plisky PT DSc OCS ATC CSCS<sup>1,2</sup> Robert Butler PT PhD<sup>1,2</sup>

<sup>1</sup>University of Evansville, Evansville, IN, USA <sup>2</sup>ProRehab PC Evansville, IN, USA



## Abstract

**INTRODUCTION:** Firefighters face many occupational risks including musculoskeletal injury. Injury rates of firefighters are among the highest in all occupations. Previous research has demonstrated that improving flexibility did not decrease injury incidence, but did reduce time-loss and severity of injury. Firefighters perform unpredictable awkward movements making standardized flexibility and ergonomic programs limited in utility for this population. Sports medicine professionals have begun to utilize fundamental movement testing and training programs. Because of the nature of firefighting, and the need for firefighters to stay fit as they age, a more comprehensive movement oriented testing and training program may be beneficial. A study on firefighters demonstrated that those who have been injured scored lower on a standardized functional movement test than those who have not been injured.

**PURPOSE:** To examine the relationship between firefighters' scores on a fundamental movement screen, the Functional Movement Screen™ (FMS) and the likelihood of a time-loss injury over the course of a 16-week training academy. **METHODS:** A retrospective analysis was conducted examining the relationship between a subject's composite FMS score (0-21) and their likelihood of injury. **RESULTS:** A score of 13 was calculated as the cut point at which the FMS is considered positive to rule in an injury. This is the point which maximized specificity (0.82) and sensitivity (0.60). The OR was 7.1 (CI<sub>95</sub> 1.7-29.5), the LR+ was 3.5; (CI<sub>95</sub> 1.4-6.3), and the LR- was 0.48 (CI<sub>95</sub> 0.21-0.85). Based on a pre-test probability 0.27, the post-test probability was 0.56. **DISCUSSION:** Data revealed that firefighters with a score of ≤13 on the FMS™ shifted the probability of sustaining an injury over the course of a training academy. These results should be considered as preliminary and should only serve to generate a hypothesis to be tested in a prospective study.

## Background

- Emerging evidence suggests injury risk is multifactorial and individual impairment measures such as isolated strength and flexibility have minimal predictive value.
- The fundamental movement patterns comprising the Functional Movement Screen™ (FMS) place the individual in positions where ROM, stabilization, and balance are assessed simultaneously.
- Professional American football players and military personal scoring ≤14 on the FMS are more likely to be injured.
- Unaware of injury prediction ability of the FMS in a occupational athlete population, such as firefighters.

## Purpose

- To examine the relationship between firefighters' scores on a fundamental movement screen, the Functional Movement Screen™ (FMS) and the likelihood of a time-loss injury over a 16-week training academy.

## Methods

- Subjects
  - 56 firefighters
  - 16-week training academy
- Data Collection
  - Prior to entry into academy
  - Functional Movement Screen (see below)
    - Assess movement quality
    - Standardized scoring
    - Scored 0-3 ordinal scale
      - 0 = painful
      - 1 – 2 = substitutions in non-painful movement
      - 3 = functional non-painful movement
  - Injuries tracked by medical personnel
  - Injury defined as "any missed training time due to musculoskeletal complaint"
- Statistical Analysis
  - ROC Curve created to establish FMS cut-point between injured and non-injured subjects
  - Standard measures calculated for:
    - test accuracy
    - predictive ability
    - post-test probability of time loss when scoring below the determined FMS injury cut-point



Figures 1-3 .Firefighter specific movement patterns

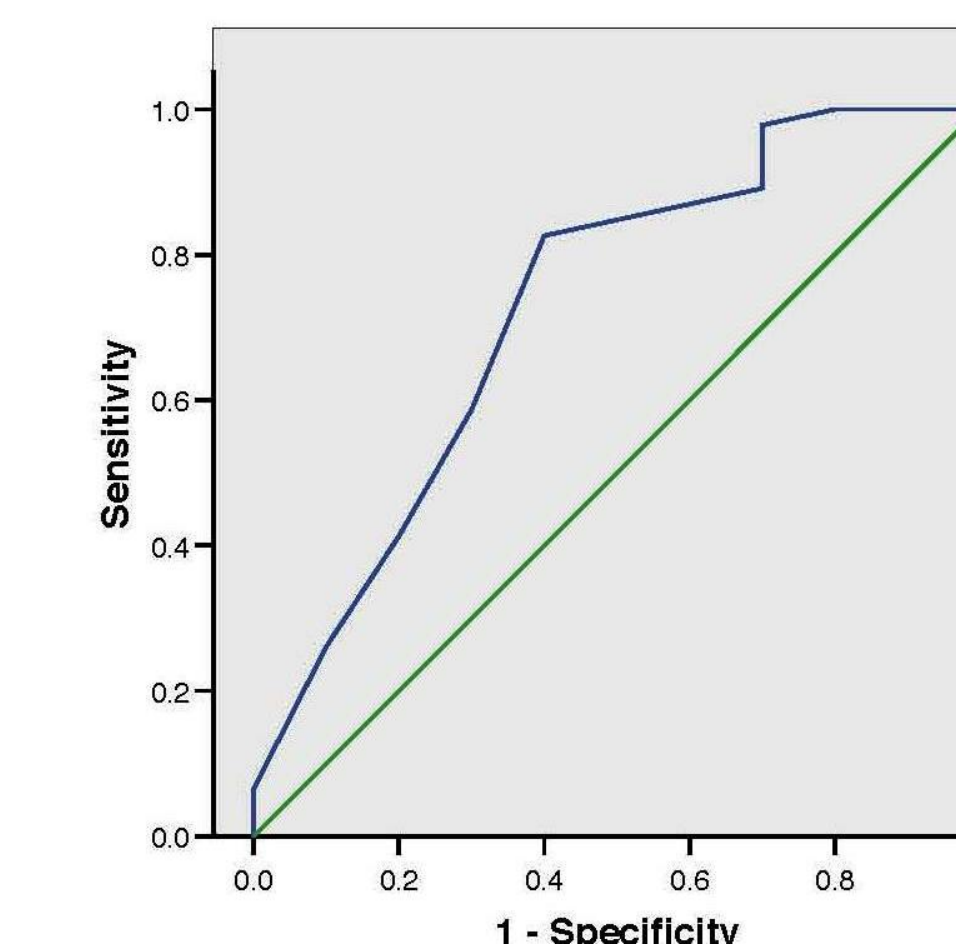


Figure 4. ROC curve for the various FMS cut points in prediction of injury

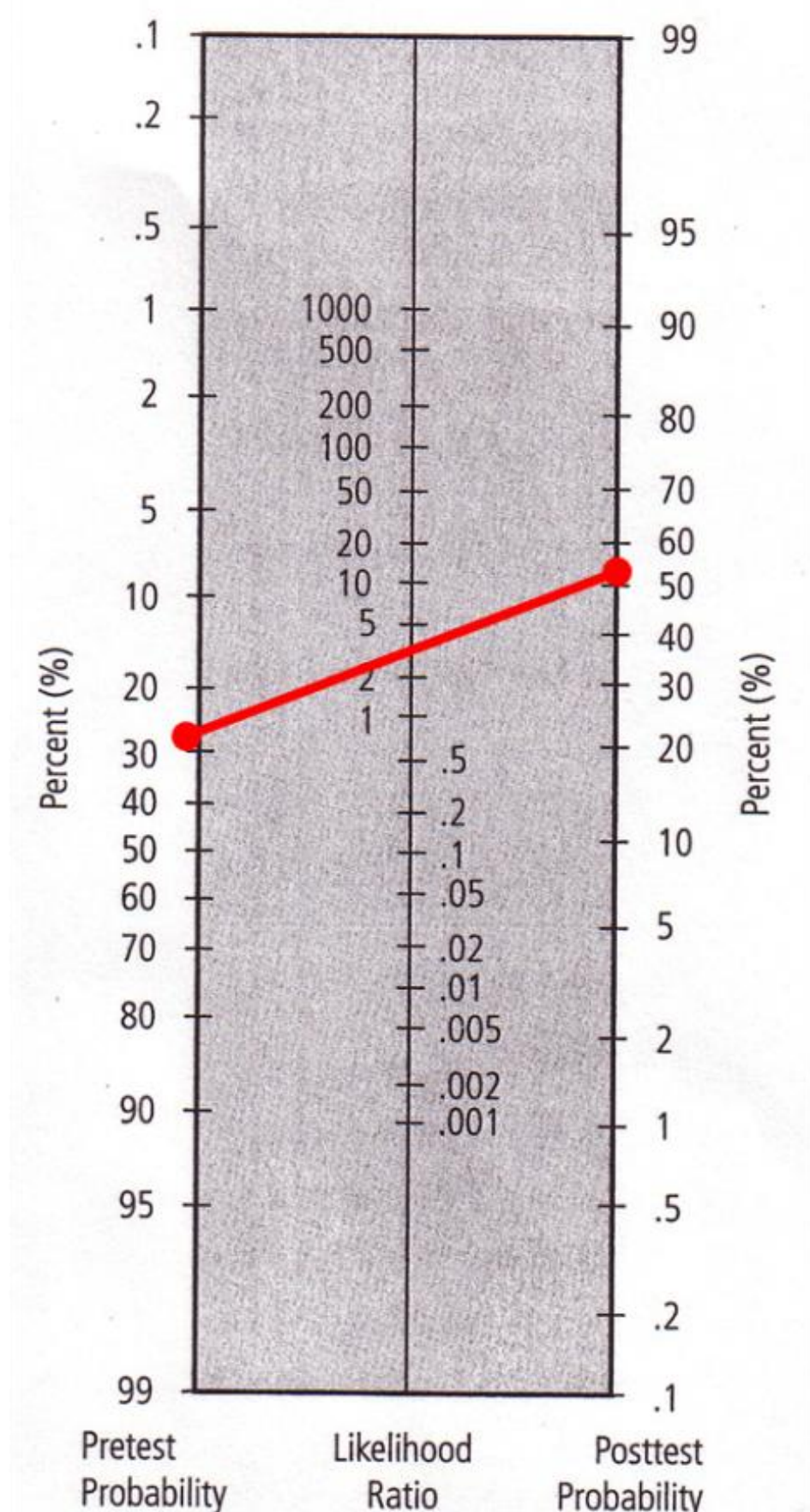
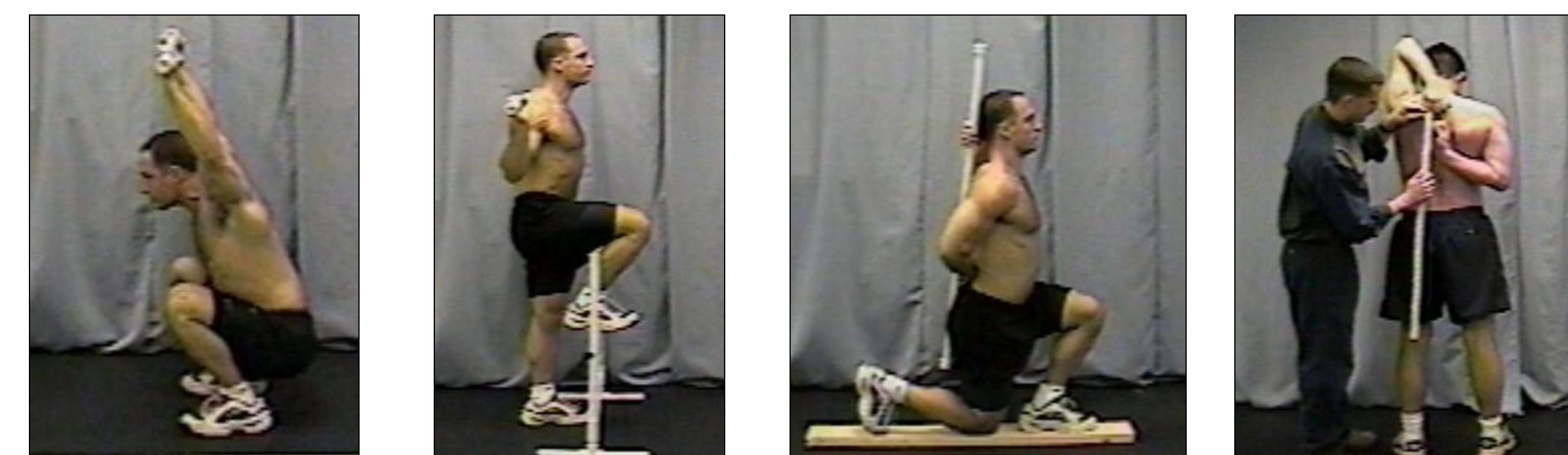


Figure 5. Nomogram depicting the change in injury detection probability

## The Functional Movement Screen



Deep Squat Hurdle Step In Line Lunge Shoulder Mobility



Rotary Stability Active SLR Trunk Stability Push-up

## Results

- ROC Curve analysis
  - Cut point = 13
    - Specificity = 0.82
    - Sensitivity = 0.60
    - OR = 7.1 (CI<sub>95</sub> 1.7-29.5)
    - LR + = 3.5 (CI<sub>95</sub> 1.4-6.3)
    - LR - = 0.48 (CI<sub>95</sub> 0.21-0.85)

## Discussion/Conclusion

- Firefighters with a score of ≤13 on the FMS substantially shifted the probability of sustaining an injury over the course of a training academy from 27%-56%.
- Similar findings have been documented in professional football players and military personal
  - May be beneficial in developing injury mitigation programs
- These data may serve to advance the science of injury prevention, but should be considered as preliminary and should only serve to generate a hypothesis to be tested in a prospective study.

## Selected References

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