

Functional Movement Screening: A Novel Tool for Injury Risk Stratification of Warfighters



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Abstract

Musculoskeletal injuries are common in military basic training and can result in significant morbidity and losses to the force. The Functional Movement Screen (FMS) is designed to evaluate functional human movements for identifying and proactively addressing functional limitations and theoretically decrease risk of future injury. Prior research on athletes has shown increased injury risk with scores ≤ 14 . The system has been used by many professional athletic teams, but never studied prospectively in a systematic way without intervention. This study evaluated the potential utility of this screen for assessing a large military population and correlated FMS score with injury during training.

Introduction

The FMS consists of 7 movements, with each receiving a score of 0-3 points, to yield a maximal score of 21 points. The screen tests posture, range of motion, muscle performance, motor control, balance, and pain-free movement. Functional impairments can lead to pain and increased risk of injury.

Purpose

To assess the feasibility of screening a large military population and identify whether FMS score predicted injury.



Methods

- Prospective observational study in Officer Candidate School (OCS) at Marine Corps Base Quantico.
- Volunteers had a baseline FMS during in-processing for OCS and medical records were tracked for injury during OCS.
- Graduation rates due to injury were compared with initial FMS score
- This study was approved by the National Naval Medical Center and Uniformed Services University IRBs.

Study Population

- Cohort of 934 Marine officer candidate volunteers during in-processing; informed consent obtained on all subjects.

Main Outcome Measure

Each candidate participated in the FMS, which analyzed seven movements, each with a score of 0-3, for a FMS top score of 21 points. Initial FMS scores versus subsequent injury data was analyzed and attrition rate due to injury was compared with initial FMS score.

Statistical Analyses

FMS scores were loaded in EXCEL 2003. Simple descriptive statistics analyzed using SPSS v16.0. Chi square analysis was performed to evaluate the risk ratio of having a score of ≤ 14 and attrition for injury as well as FMS score ≥ 15 and attrition for injury.

Results

The mean FMS score was 16.7 ± 1.8 with a range of 6 to 21 (Figure 1). Only 14% had scores ≥ 19 and 0.2% had scores ≤ 10 . The most frequent score was 17, with 23% of all volunteers being assigned that score.

FMS Score Distribution

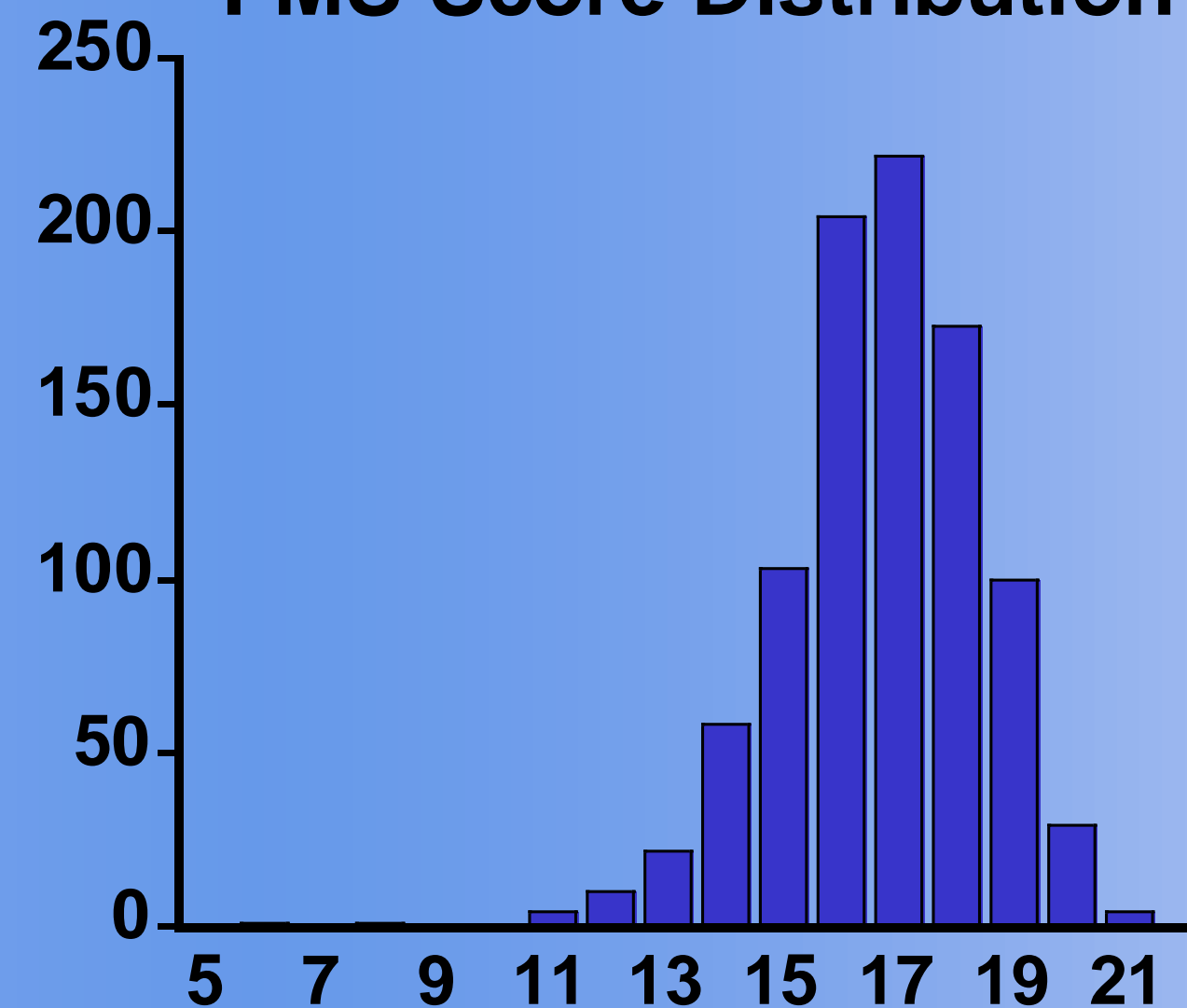


Figure 1. Total FMS score vs. number of candidates with each score. 10.1% of the 934 participants had a score of ≤ 14 .

Attrition for injury in those who had scores ≤ 14 was 14.9% vs. 7.1% for those who had scores ≥ 15 (Chi-square $p < 0.01$. The risk ratio (injury attrition/graduated) = 2.08, 95% CI=1.14-3.82, $p < 0.02$. This shows that those with scores of ≤ 14 were more than twice as likely to not complete OCS for injury. Table 1 shows the percentage of candidates with FMS scores ≤ 14 who graduated compared to those who had scores ≥ 15 , as well as attrition rates from injury.

FMS Score	Graduated	Attrition for Injury
≤ 14	85.1	14.9
≥ 15	92.9	7.1

Table 1. Marine officer candidates with overall FMS scores ≤ 14 and ≥ 15 expressed as a % of those who graduated. Chi-square analysis ignoring "attrition for other than injury" in percentages. Risk ratio (injury attrition/graduated) = 2.08, 95% CI= 1.14-3.82, $p < 0.02$.

FMS Scores by Graduation

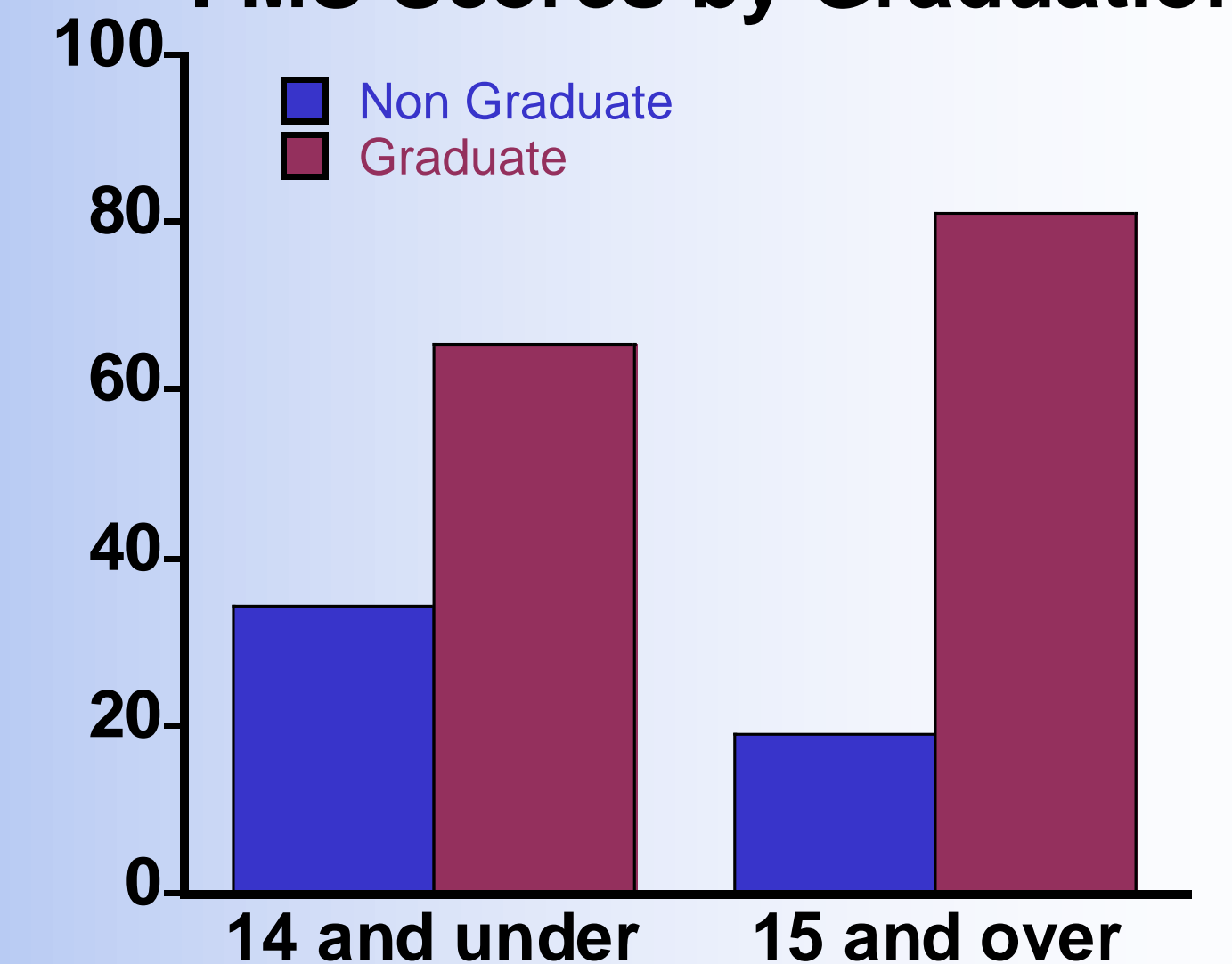


Figure 2. FMS Scores by graduation

Conclusions

Our preliminary analyses demonstrate that FMS can be conducted on a large cohort of military personnel to yield a wide range of scores. Only 10% of participants had a score ≤ 14 , and these candidates were twice as likely to not graduate due to injury than those with higher scores.

Future follow-on studies are needed to determine if targeted interventions addressing dysfunctional movement patterns and impairments could effectively "prehabilitate" individuals and reduce future injury rates. This would help preserve Force strength.

Acknowledgements

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