The Functional Movement Screen as a Predictor of Occupational Injury among Denver Firefighters

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Acknowledgements

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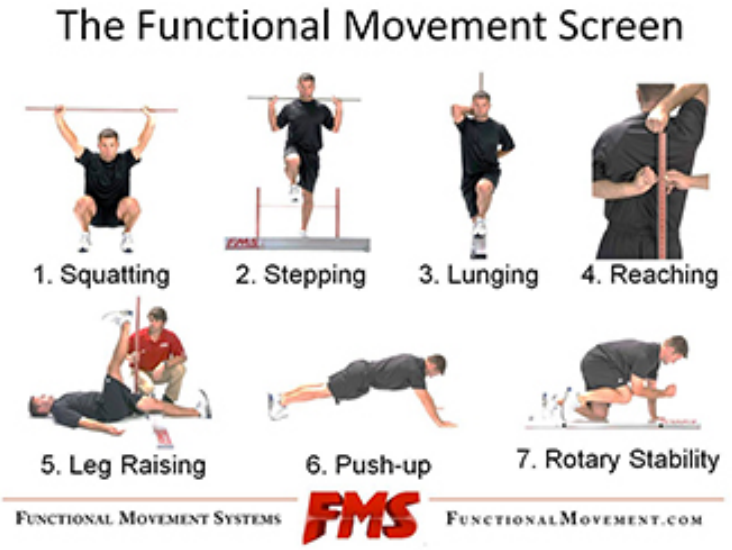
Functional Movement Screen (FMS)

- The FMS was developed to assess an individual's fundamental movements
- Proper form on these tasks is needed to improve flexibility, power, and strength
- FMS can be used recognize injury risk and be a tool to track fitness level and/or injury recovery

Functional Movement Screen (FMS)

1. Deep Squat
2. Hurdle Step
3. In-line Lunge
4. Shoulder Mobility
5. Active Leg Raise
6. Trunk Stability Push-up
7. Rotary Stability



FMS as a predictor of injuries

Composite FMS score predicted injury in:

- Professional athletes
- Collegiate athletes
- Secondary school athletes
- Military members

Mixed evidence that composite FMS score predicts injury in:

- Firefighters
- Police officers

Injuries among firefighters

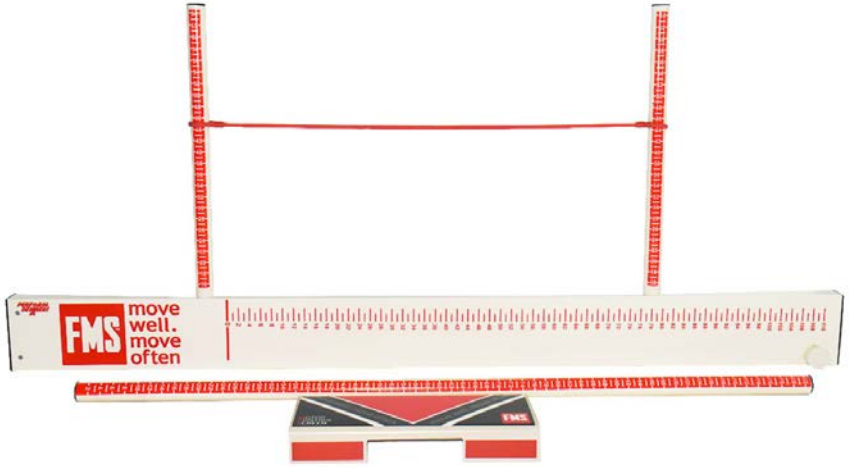
Nationally-2017:

- 58,835 workplace injuries occurred
- 48% of these were strain, sprain, and muscular pain
- Strain, sprain, and muscular pain injuries accounted for 56% of all non fireground injuries

Locally-2016 :

- 93 Denver firefighters sustained a workplace injury

FMS Use among Denver Firefighters



- The Denver Fire Department (DFD) began using the FMS with new recruits in 2015
- The FMS test was part of their wellness initiative

Study Purpose

- Determine if an FMS Score of 14 or less was predictive of an occupational injury among Denver firefighters
  - Injuries defined as a workers' compensation claim

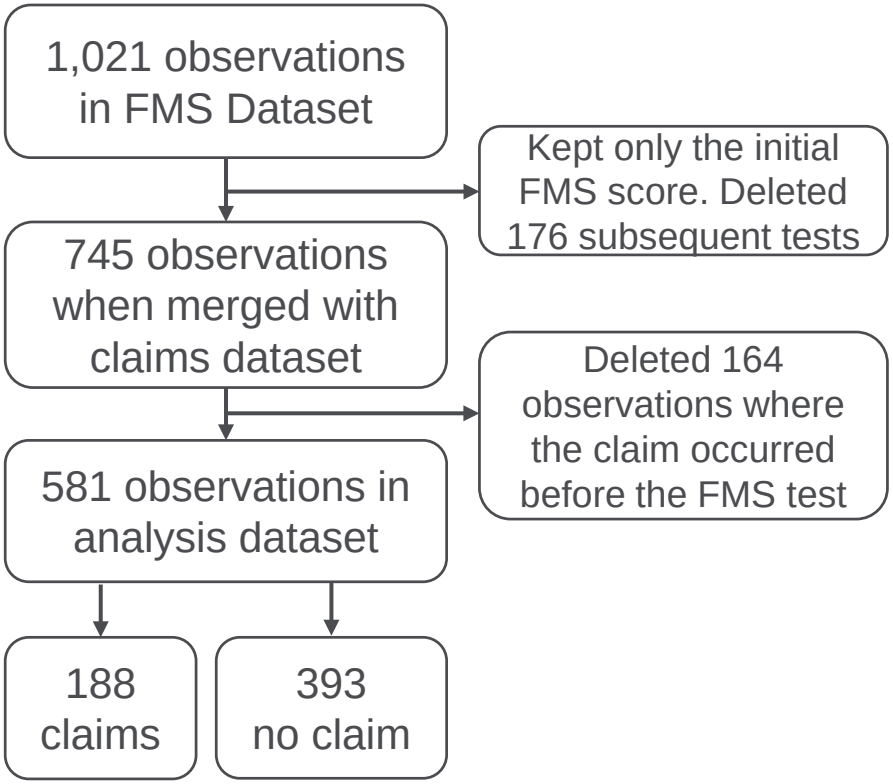
Hypotheses

Hypothesis 1: An FMS Score of 14 or less will be associated with a WC Claim compared to no claim

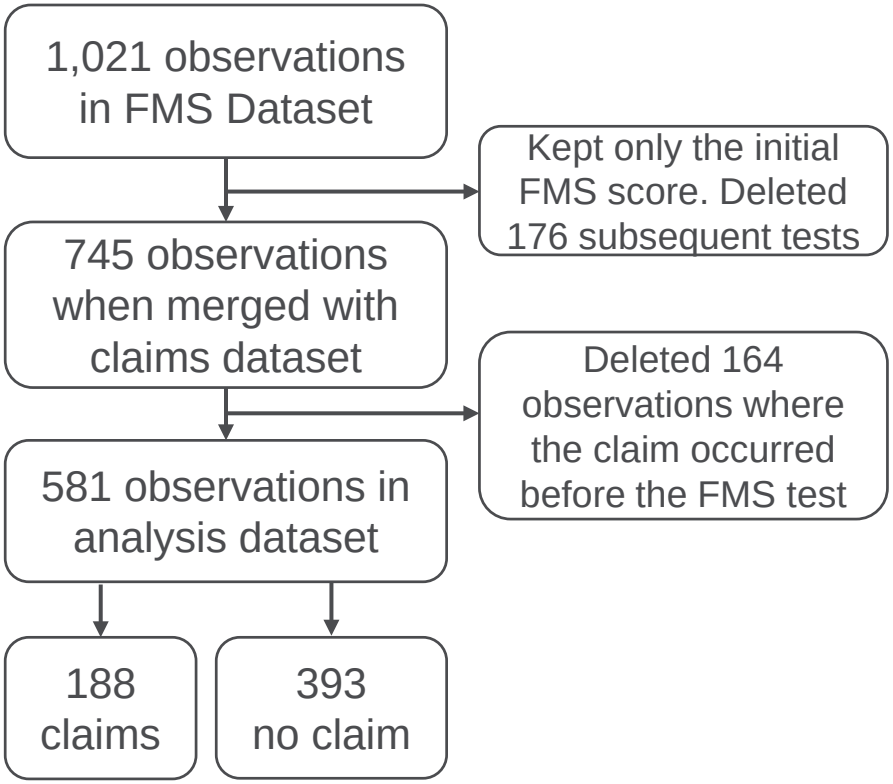
Hypothesis 2: An FMS Score of 14 or less will be associated with an overexertion WC claim compared to no claim or another type of claim

Hypothesis 3: Lower scores on the deep squat, shoulder mobility, and rotary stability sub-tests will be associated with an occupational injury

Study Population



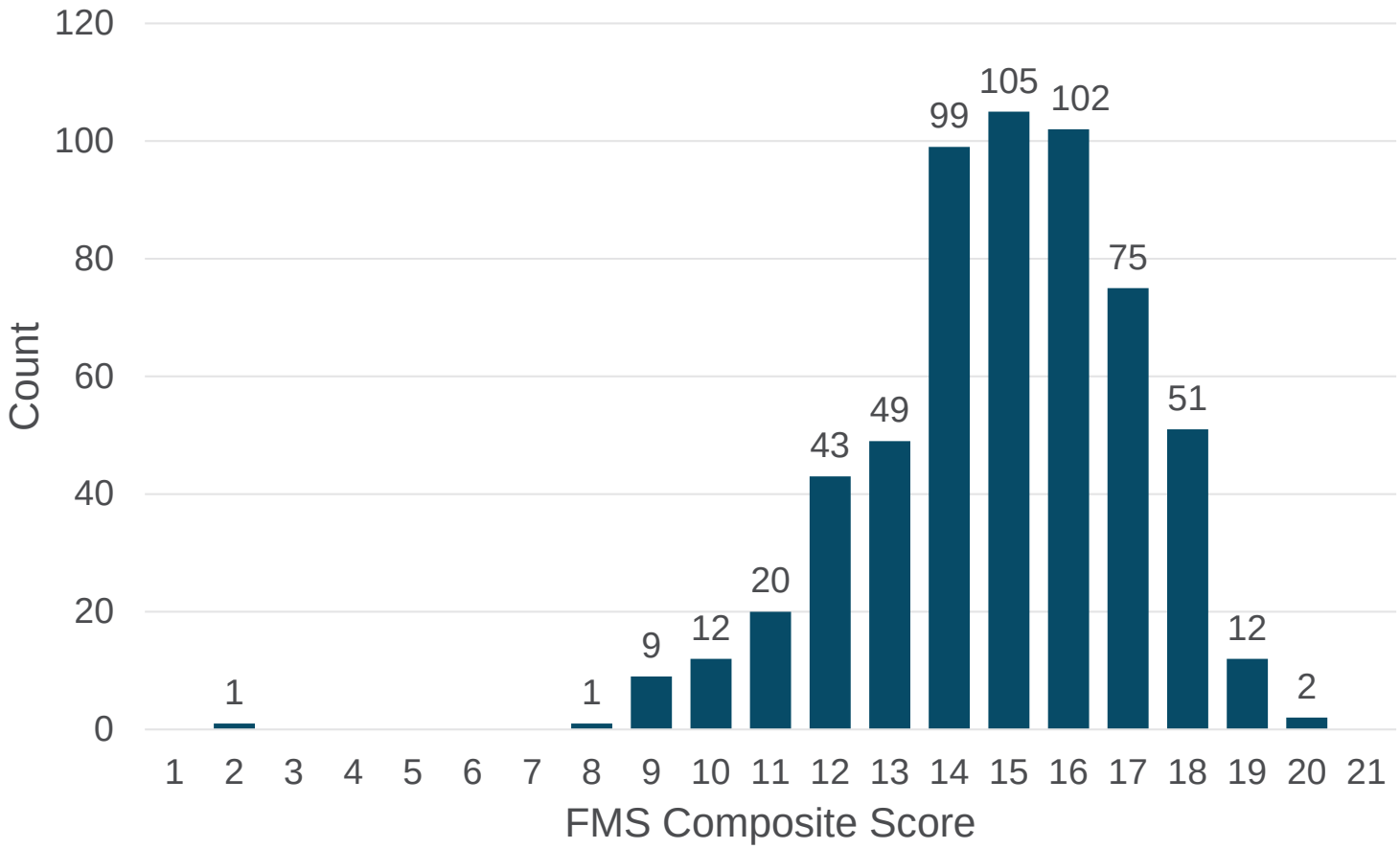
Study Population



Sample Demographics – Overall

- Mean age – 38 years
- Mostly male – 93%
- Mean height – 70 inches
- Mean weight – 194 lbs
- Resting heart rate – 69 beats per minute
- Mean Blood Pressure – 122 / 76
- VO_2 Max – 45 mL/kg/min
- Number of claims – 188 (32%)

Distribution of FMS Scores



FMS Scores by Claim Status: Any Claim

Table 1. FMS Scores and Sub-scores by Claim Status			
Any Claim vs. No Claim			
	Overall N = 581	Claim N = 188	No Claim N = 393
	Mean (SD)	Mean (SD)	Mean (SD)
Composite Score	14.9 (2.3)	14.8 (2.3)	14.9 (2.2)
Deep Squat	2.0 (0.6)	2.0 (0.6)	2.1 (0.6)
Hurdle Step	2.0 (0.3)	2.0 (0.3)	2.0 (0.3)
In-line Lunge	2.0 (0.7)	2.0 (0.6)	2.0 (0.7)
Shoulder Mobility	2.1 (0.7)	2.1 (0.8)	2.1 (0.7)
Active Leg Raise	2.2 (0.6)	2.3 (0.6)	2.2 (0.6)
Trunk Stability Push-up	2.7 (0.6)	2.6 (0.6)	2.7 (0.6)
Rotary Stability	1.8 (0.4)	1.9 (0.4)	1.8 (0.4)

FMS Scores by Claim Status: Over-exertion Claim

Table 2. FMS Scores and Sub-scores by Claim Status			
Over-exertion claim vs. No Claim, Any Claim			
	Overall N = 581	Over-exertion Claim N = 72	No Claim, Other Claim N = 509
	Mean (SD)	Mean (SD)	Mean (SD)
Composite Score	14.9 (2.3)	14.7 (2.2)	14.9 (2.3)
Deep Squat	2.0 (0.6)	2.0 (0.5)	2.1 (0.6)
Hurdle Step	2.0 (0.3)	2.0 (0.3)	2.0 (0.3)
In-line Lunge	2.0 (0.7)	1.9 (0.7)	2.0 (0.7)
Shoulder Mobility	2.1 (0.7)	2.0 (0.7)	2.1 (0.7)
Active Leg Raise	2.2 (0.6)	2.3 (0.6)	2.2 (0.6)
Trunk Stability Push-up	2.7 (0.6)	2.7 (0.6)	2.7 (0.7)
Rotary Stability	1.8 (0.4)	1.9 (0.4)	1.8 (0.4)

Logistic Regression Results

Claim vs. No Claim

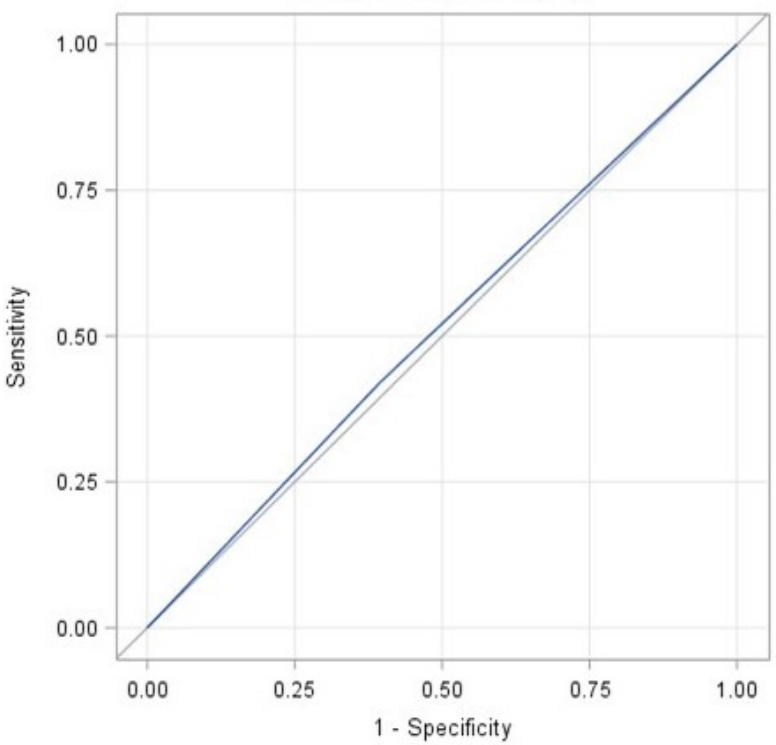
- FMS ≤ 14: OR = 1.27 (95% CI 0.88-1.83)
- Age: 0.96 (95%CI 0.94-0.98)

Over-exertion Claim vs. No Claim, other claim

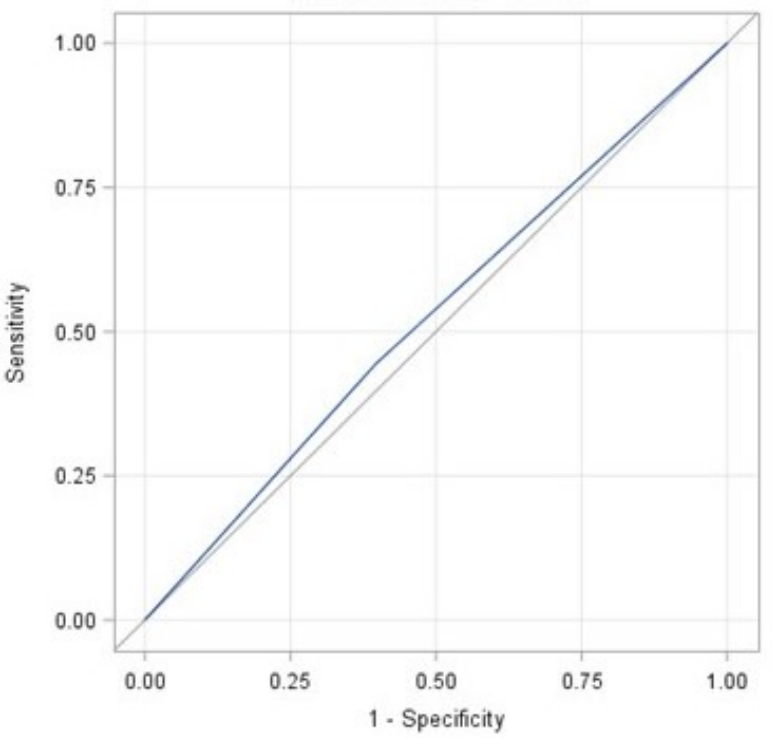
- FMS ≤ 14: OR = 1.33 (95% CI 0.81 - 2.21)
- Age: 0.97 (95% CI 0.94 - 0.99)

ROC Curves

Claim vs. No Claim



Over-exertion Claim vs. No Claim, Other Claim



Sensitivity and Specificity: Claim vs. No Claim

Table 3. Sensitivities and Specificities for Claim vs. No claim		
FMS Score	Sensitivity	Specificity
10.0	0.48	0.96
12.0	0.17	0.87
13.5	0.23	0.77
14.5	0.42	0.61
15.5	0.59	0.42
16.5	0.75	0.24
17.5	0.88	0.11
18.5	0.98	0.03
20.0	1.00	0.0

Sensitivities and Specificities: Over-exertion claim vs. No claim, other claim

Table 4. Sensitivities and Specificities for Over-exertion Claim vs. No Claim, Other Claim		
FMS Score	Sensitivity	Specificity
10.0	0.06	0.96
12.0	0.13	0.85
13.5	0.21	0.76
14.5	0.44	0.60
15.5	0.65	0.43
16.5	0.81	0.25
17.5	0.89	0.11
18.5	0.99	0.03
20.0	1.00	0.00

Conclusions

- In this sample, the FMS is not predictive of an occupational injury

Limitations

- Convenience sample
- Narrow distribution of FMS score

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