



ABSTRACT

INTRODUCTION: Firefighters injury rates are among the highest of all occupations with approximately 50% occurring at the musculoskeletal system. Research suggests that poor movement quality increases one's risk of a job-related injury and that corrective exercise interventions with integrated movements may reduce overall injuries. Moreover, evidence suggests that exercise routines based on a standardized movement assessment tool have the potential to reduce lost time due to injury as well as the incidence of injuries. Thus, exercise prescription based on standardized movement assessment tool scores may be an effective strategy to improve movement literacy. PURPOSE: Investigate the effectiveness of auto-generated corrective exercise programming on movement literacy scores among firefighters with lower baseline performance scores. METHODS: Eleven male firefighters (mean age 44) with baseline Functional Movement System (FMS™) scores less than 14/21 were recruited from October 2021 through September 2022. Baseline FMS™ assessments using the most current procedures included detailed explanations of the 7 movement screens as well as 5 clearing procedures and scoring criteria. The certified FMS™ professional performed each test first, prior to scoring, to demonstrate what was expected and firefighters were permitted to attempt each test for a total of 3 times with the highest score being retained. Scores ranged from a 0-3 for each of the 7 movement screens with a maximum composite score of 21. Upon completing the screenings, test scores were reviewed and a detailed report was provided to each firefighter through the FMS™PRO APP. Additionally, each participant received an auto-generated corrective exercise program from the FMS™PRO APP with exercise figures, descriptions, and videos to be performed prior to routine conditioning programs. Participants followed up an average (mean) of 262 days later (range 132 days) for a re-assessment of their FMS™ score. RESULTS: Mean composite scores improved from 11.2/21 to 15.6/21. A Wilcoxon Signed Ranks test indicated significant improvements in composite scores (p = .003) with a large effect size (r = 0.6). Individualized item scores on the 7 movement screens indicated significant improvements in the deep overhead squat, hurdle, shoulder mobility, and rotary stability (p ≤ .046) with effect size ranges from medium to large (r = 0.3-0.8). Significant changes were not present for the inline lunge, active straight leg raise, and trunk stability push-up (p ≥ .083) with effect sizes of r ≤ 0.3. CONCLUSIONS: An auto-generated corrective exercise program combined with a detailed explanation of baseline performance was effective in improving overall movement literacy, based on a standardized movement assessment tool. The composite score change exceeded the threshold of error based on a previously established minimal detectable change of 2.5/21, indicating true change occurred. The absence of a comparison group is a study limitation. PRACTICAL APPLICATIONS: The efficiency of using an auto-generated program provides value to both the movement system/exercise professionals responsible for exercise programming as well as firefighters with movement impairments. Software programs that have the ability to target individualized impairments may be an efficient and potentially proficient tool to improve movement literacy among firefighters and subsequently reduce injury risk profiles.

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Figure: Functional Movement System™

INTRODUCTION AND PURPOSE

Firefighter injury rates are among the highest of all occupations with approximately 50% occurring at the musculoskeletal system.¹ Research suggests that poor movement quality increases one's risk of a job-related injury and that corrective exercises with integrated movements may reduce overall injuries.^{2,5} Moreover, evidence suggests that exercise routines based on a standardized movement assessment tool have the potential to improve movement literacy, reduce lost time due to injury, as well as reduce the incidence of injuries.³⁻⁵ Thus, exercise prescription based on standardized movement assessment tool scores may be an effective strategy to improve movement literacy. Thus, the purpose of this study was to Investigate the effectiveness of auto-generated corrective exercise programming on movement literacy scores among firefighters with lower baseline performance scores on the Functional Movement System (FMS™).⁶

METHODS

Eleven male firefighters (mean age 44) with baseline FMS™ scores less than 14/21 were recruited from October 2021 through September 2022. Baseline FMS™ assessments using the most current procedures included detailed explanations of the 7 movement screens as well as 5 clearing procedures (see Figure) and scoring criteria. The certified FMS™ professional performed each test first, prior to scoring, to demonstrate what was expected and firefighters were permitted to attempt each test for a total of 3 times with the highest score being retained. Scores ranged from a 0-3 for each of the 7 movement screens with a maximum composite score of 21. Upon completing the screenings, test scores were reviewed, and a detailed report was provided to each firefighter through the FMS™PRO APP. Additionally, each participant received an auto-generated corrective exercise program from the FMS™PRO APP with exercise figures, descriptions, and videos to be performed prior to routine conditioning programs. Participants followed up an average (mean) of 262 days later (range 132 days) for a re-assessment of their FMS™ score.

RESULTS

Mean composite scores improved from 11.2/21 to 15.6/21. A Wilcoxon Signed Ranks test indicated significant improvements in composite scores (p = .003) with a large effect size (r = 0.6). Individualized item scores on the 7 movement screens indicated significant improvements in the deep overhead squat, hurdle, shoulder mobility, and rotary stability (p ≤ .046) with effect size ranges from medium to large (r = 0.3-0.8). Significant changes were not present for the inline lunge, active straight leg raise, and trunk stability push-up (p ≥ .083) with effect sizes of r ≤ 0.3.

CONCLUSION

An auto-generated corrective exercise program combined with a detailed explanation of baseline performance was effective in improving overall movement literacy, based on a the FMS™. The composite score change exceeded the threshold of error based on a previously established minimal detectable change of 2.5/21, indicating true change occurred.⁷ The absence of a comparison group is a study limitation.

PRACTICAL APPLICATIONS

The efficiency of an auto-generated program provides value to both the movement system/exercise professionals responsible for exercise programming as well as firefighters with movement impairments. Programs targeting individualized impairments may be an efficient & potentially proficient tool to improve movement literacy among firefighters and subsequently reduce risk profiles.

REFERENCES

1.Campbell R, Hall S. Firefighter Injuries in the United States. National Fire Protection Association. December 2022.
2. Bonazza NA, Smuin D, Onks CA, Silvis ML, Dhawan A. Reliability, Validity, and Injury Predictive Value of the Functional Movement Screen: A Systematic Review and Meta-analysis. Am J Sports Med. 2017;45(3):725-732.
3. Suzuki K, et al. Effects of functional movement screen training in high-school baseball players: A randomized controlled clinical trial. Medicine .2021;100(14):e25423.
4. Stanek JM, Dodd DJ, Kelly AR, Wolfe AM, Swenson RA. Active duty firefighters can improve Functional Movement Screen (FMS) scores following an 8-week individualized client workout program. Work. 2017;56(2):213-220.
5. Griffin SC, Regan TL, Harber P, et al. Evaluation of a fitness intervention for new firefighters: injury reduction and economic benefits. Inj Prev. 2016;22(3):181-188.
6. Functional Movement Screen Available at www.functionalmovement.com
7. Teyhen DS, Shaffer SW, Lorenson CL, et al. The Functional Movement Screen: a reliability study. J Orthop Sports Phys Ther. 2012;42(6):530-540.