



THE IMPACT OF RELATIVE STRENGTH ON SIMULATED FIRE-SUPPRESSION ACTIVITY PERFORMANCE TIMES

R. Kollock, WD. Hale

The University of Tulsa, Tulsa, OK



INTRODUCTION

Adequate muscular strength is an important to the performance of fire-suppression activities. However, minimal evidence exists indicating an appropriate cut-off value for relative strength in firefighters. Insight into this area would help direct strength training programs for fire and rescue personnel.

PURPOSE

The purpose of the study was to determine if relative strength (RS) influences performance on simulated fire-suppression activities (sFSA).

METHODS

28 male career firefighters were recruited. Each firefighter performed the following timed (sec) sFSA as part of their annual physical abilities test (Figure 1): HD, search, rescue, forcible entry (FE), and LRE. In a subsequent test session, participants performed the isometric mid-thigh pull (IMTP) (Figure 2). All firefighters were free of injury and not restricted for duty at the time of both testing sessions. The IMTP required participants complete 3 trials of a 5-sec isometric contraction using a custom strength testing device with an integrated load cell. The peak IMTP value was used to calculate RS (peak IMTP/body weight). Firefighters with a RS <2.0x (n=12) were assigned to the weaker group, while firefighters with a RS ≥2.0x (n=16) were assigned to the stronger group.

The inclusion criteria for each group were established based on the findings and recommendations of previous research.^{1,2} Multiple independent sample tests were used to analyze the difference between groups. As a result of violation of normality in the FE measures, a Mann-Whitney U test was used to explore group differences for that variable. A Bonferroni correction to adjust the alpha level was used to mitigate the risk of a type 1 error when performing multiple statistical tests. The adjusted alpha level was set at .01.



Figure 1. Simulated Fire-suppression Activities



Figure 2. Isometric mid-thigh pull

Results

The analyzes revealed there were no statistically significant differences between groups for HD (13.6 ± 3.1 vs 11.6 ± 2.2 , $p = .05$, $d = .784$), search (40.2 ± 8.3 vs 35.4 ± 6.3 , $p = .09$, $d = .664$), rescue (15.6 ± 3.3 vs 14.0 ± 2.4 , $p = .157$, $d = .556$), FE (2.7 ± 1 vs 2.6 ± 1 , $p = .80$, $d = .041$), and LRE (27.3 ± 2.9 vs 24.7 ± 2.3 , $p = .02$, $d = .963$).

CONCLUSION

Although, the performance times for the HD, search, rescue, and LRE were lower for the stronger group, they were not statistically significantly lower.



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Practical Application

The RS cut-off value of 2.0x a firefighter's body mass may not be an adequate criterion for judging if a firefighter possesses sufficient muscular strength to quickly perform select FSA. However, future studies with larger samples are warranted before definitive conclusion can be made.

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References

1. Dawes JJ, Lockie RG, Kornhauser CL, Holmes RJ, Orr RM. Relationships between absolute and relative strength and power in male police officers of varying strength levels. *Journal Sci Sport Exerc* 1(3): 1-8, 2019.
2. Johnson QR, Dawes JJ, Uftring M, et al. Differences in Stronger Versus Weaker Firefighters in Selected Measures of Power. *Int J Exerc Sci.* 2022;15(4):552-560.

