Effects of a Firefighter Training Academy on Lower-Body Strength

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BACKGROUND

- Firefighting is a physically demanding profession requiring lower-body strength to safely perform critical and essential job tasks.[1,2]
- Fatigue-related incidents such as slips, trips, and falls are one of the most common causes of fireground injuries.[3]
- Despite the importance of lower-body strength, limited research has tracked barbell strength progression in firefighter recruits across multiple academy timepoints.

PURPOSE:

The purpose of this study was to examine lower-body strength progression across a 32-week firefighter training academy.

METHODS

Data

- Demographic data was analyzed for 38 firefighter recruits
  - Females = 7; Age = 26 ± 4 yrs;
  - Body Mass = 86.0 ± 17.7 kg; BMI = 27.2 ± 4.1 kg/m²

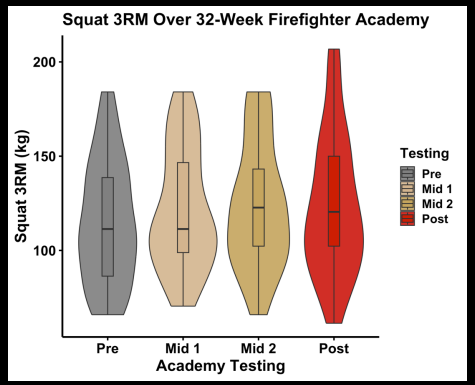
Timeline & Testing Procedures

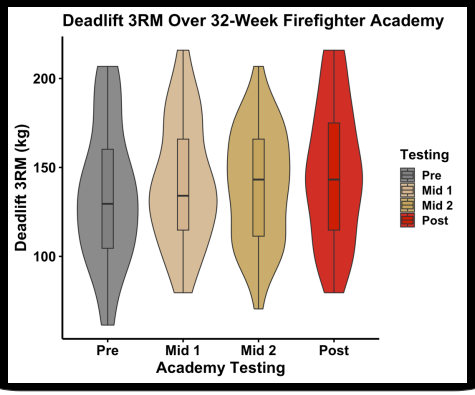
- 32-week firefighting training academy with 120 days of structed physical training.
- Strength testing occurred at four equally distributed timepoints:
  - Pre, Mid 1, Mid 2, Post
- Strength was assessed using barbell back squat and deadlift 3RM protocols.

Statistical Analysis

- Statistical analysis was completed using R.
- Linear mixed-effects models with random intercepts were selected to assess changes in squat and deadlift performance over time.
- Tukey's post hoc comparisons were used to identify significant pairwise differences between timepoints.

Recruits displayed *meaningful strength changes* during a 32-week fire academy.





RESULTS

Table 1. Changes in Squat and Deadlift 3RM Across a 32-Week Firefighter Academy

Testing	Squat 3RM (kg) *	Deadlift 3RM (kg) *
Pre	114.70 ± 32.30	134.40 ± 38.40
Mid 1	+6.64^	+6.70^
Mid 2	+8.55^	+5.14~
Post	+8.85^	+12.56^

Pre data are presented as mean ± standard deviation. Statistical significance determined via linear mixed-effects models with Tukey's post hoc comparisons. kg: kilograms, 3RM: three repetition max.
* $p < 0.05$; ^ Significant difference from Pre; ~ Significant difference from Mid 2 to Post.

CONCLUSION

- Fire academy resistance training led to significant strength improvements in both squat and deadlift performance.
- These results highlight the critical role of progressive resistance training in firefighter training academies.

PRACTICAL APPLICATIONS

This study demonstrates that progressive, barbell-based resistance training can significantly improve lower-body strength in firefighter recruits. Strength development during the academy may help prepare recruits for job-specific demands and reduce injury risk, supporting the integration of consistent resistance training across fire academies and fire departments.

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