SPECIALIST POLICE AND THEIR MEASURES OF STRENGTH

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Police Requirements

• General Requirements\textsuperscript{[1,2]}
  • Physical
  • Diverse
  • Unpredictable

• Specialist Requirements\textsuperscript{[3,4,5]}
  • High risk scenarios
  • Special weaponry & body armor
  • Physiological requirements
  • Musculoskeletal strength
Current Studies (A & B)

Study A
- Profiling the absolute and relative strength of a special operations police unit
  • Aim: To profile the absolute and relative strength of a special operations unit and to see if this profile was consistent over time (18 months)

Study B
- Strength measures and specialist police task performance
  • Aim: To identify any correlations between relative and absolute strength in specialist police personnel and performance
Study A - Methods

Population
• n = 47♂

Measurement Units
• Absolute Strength
• Relative Strength

Recruitment
• Written explanatory statement provided
• Oral briefing
• Voluntary participation

Outcome measures
• 1RM Protocol
  • Bench Press
  • Squat
  • Deadlift
  • Pull-up

Ethics approved under Bond University Research Ethics Committee Protocol Number: RO1585
Study A: Strength Profiling

Design

• Longitudinal cohort study

18 Month Timeline

- June 2011
- September 2011
- January 2012
- July 2012
- December 2012

Statistical Analysis

• Shapiro-Wilk test for normality
• Repeated Measures ANOVA with Bonferroni Correction
• Friedman and Wilcoxon signed-rank tests
## Results

Table 1. Bodyweight and Strength Data and Overall Change (Mean ± SD) for Five Time Points (TPs) over 18 Months

<table>
<thead>
<tr>
<th></th>
<th>TP 1</th>
<th>TP 5</th>
<th>Overall ∆ (TP1 → TP5)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bodyweight (kg)</strong></td>
<td>88.8 ± 8.3</td>
<td>89.5 ± 8.7</td>
<td>↑ 0.68 ± 1.70</td>
</tr>
<tr>
<td><strong>Absolute Bench Press (kg)</strong></td>
<td>109.7 ± 19.8&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>118 ± 19</td>
<td>↑ 8.33 ± 5.58&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Relative Bench Press (ratio&lt;sup&gt;†&lt;/sup&gt;)</strong></td>
<td>1.23 ± 0.20&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>1.32 ± 0.19</td>
<td>↑ 0.09 ± 0.07&lt;sup&gt;*&lt;/sup&gt;</td>
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<tr>
<td><strong>Absolute Squat (kg)</strong></td>
<td>125.8 ± 24.5&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>136.7 ± 25.1</td>
<td>↑ 10.91 ± 7.84&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Relative Squat (ratio&lt;sup&gt;†&lt;/sup&gt;)</strong></td>
<td>1.42 ± 0.25&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>1.53 ± 0.26</td>
<td>↑ 0.11 ± 0.10&lt;sup&gt;*&lt;/sup&gt;</td>
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<tr>
<td><strong>Absolute Deadlift (kg)</strong></td>
<td>151.6 ± 26.3&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>162.6 ± 29</td>
<td>↑ 10.96 ± 8.99&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Relative Deadlift (ratio&lt;sup&gt;†&lt;/sup&gt;)</strong></td>
<td>1.71 ± 0.25&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>1.82 ± 0.28</td>
<td>↑ 0.11 ± 0.10&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Absolute Pull-up (kg)</strong></td>
<td>121.4 ± 14.9&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>126.7 ± 15.6</td>
<td>↑ 5.23 ± 5.41&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Relative Pull-up (ratio&lt;sup&gt;†&lt;/sup&gt;)</strong></td>
<td>1.37 ± 0.15&lt;sup&gt;a,b,c,d&lt;/sup&gt;</td>
<td>1.42 ± 0.14</td>
<td>↑ 0.05 ± 0.05&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>†</sup>Relative values calculated by absolute strength value / officer bodyweight

<sup>a</sup>Significant difference from TP 2 (p < 0.05), <sup>b</sup>Significant difference from TP 3 (p < 0.05), <sup>c</sup>Significant difference from TP 4 (p < 0.05), <sup>d</sup>Significant difference from TP 5 (p < 0.05).

*Significant change between TP 1 and TP 5 (p < 0.05).
Absolute & Relative Strength

*significance between TP 1 & TP 5 (p < 0.05)
Discussion

• TP 1 → TP5: Significant Δ in all outcome measures
• TP 3 → TP 4: Smallest Δ seen across the board
• Compare to other values
  • Elite Athlete vs Tactical Athlete[^6]
• Benefits of profiling over time
• Limitations
• Future Research
Study B - Methods

Population
- n = 42♂

Measurement Units
- Absolute Strength
- Relative Strength

Recruitment
- Written explanatory statement provided
- Oral briefing
- Voluntary participation

Outcome measures
- 1RM Protocol
  - Bench Press
  - Squat
  - Deadlift
  - Pull-up

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Study B: Strength & Task Performance

Design

- Retrospective Cohort Study

Tasks Performed

- Victim Drag (85kg)
- Loaded Pack March (5km)

Statistical Analysis

- 95% Confidence Interval
- Pearson's Correlations of absolute and relative strength and task performance respectively
Results – Victim Drag

1a. Absolute Bench Press (Kg) vs. Victim Drag Scores (m)

- Absolute Bench Press
- Linear (Absolute Bench Press)
- Relative Bench Press
- Linear (Relative Bench Press)

- $R^2 = 0.5061$

- $R^2 = 0.2788$
Results – Victim Drag

![Graph showing the relationship between Victim Drag Scores (m) and Absolute and Relative Deadlifts. The graph includes two linear regressions: one for Absolute Deadlift with an R² of 0.5573, and one for Relative Deadlift with an R² of 0.323. The x-axis represents Victim Drag Scores in meters (85-120), and the y-axis represents Absolute Deadlift (100-240 kg) on the left and Relative Deadlift (0.80-2.60 kg/mass) on the right.]

1c. Absolute Deadlift (kg) vs. Relative Deadlift (kg/mass) for Victim Drag Scores (m)
Results – Pack March

2b. Absolute Squat (kg)

Relative Squat (kg/mass)

Pack March Scores (min)

R² = 0.1124

R² = 0.1562

Absolute Squat

Relative Squat

Linear (Absolute Squat)

Linear (Relative Squat)
Results – Pack March

Relative Pull-Up

Absolute Pull-Up

Linear (Absolute Pull-Up)

Linear (Relative Pull-Up)

R² = 0.1268

R² = 0.2169

Absolute Pull-Up (kg)

Relative Pull-Up (kg/mass)

Pack March Scores (min)

90

100

110

120

130

140

150

160

1.00

1.10

1.20

1.30

1.40

1.50

1.60

1.70

1.80

37

39

41

43

45

47

2d.
Discussion

• Significant correlations between both absolute and relative strength for Victim Drag performance

• Relative strength has greater correlation to Pack March performance than absolute strength

• Specialist Police Officers vs Military[7]

• Limitations

• Future Research
Conclusion

• These are the first studies which have reported on the absolute and relative strength of an elite specialist law enforcement group over time

• Practical Applications
  • Absolute & relative strength should be measured over time
  • Max Strength is a positive influence on occupational performance
  • Victim Drag training should include absolute & relative strength
  • Pack March training should focus on relative strength
References


Questions

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