Differences in physical characteristics and performance measures of PT and FT tactical personnel: A critical narrative review

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Differences in physical characteristics and performance measures of PT and FT tactical personnel: A critical narrative review

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Background

- Tactical personnel (i.e. military, law enforcement and fire and rescue personnel) routinely perform physically strenuous occupational tasks, requiring muscular strength, endurance and cardiovascular fitness.
Background

• These services are comprised of both PT and FT personnel, with both groups expected to perform similar occupational tasks, at equivalent levels

(Lindberg, 2014; Williams, 2005)
Background

- PT personnel on-the-job physical training typically continues to be at a lower frequency than that of FT personnel (Pickup, 2009; Williams & Evans, 2007; Williams; 2005)

- PT personnel often have to balance other occupations and work demands with their tactical role, and so frequently have to be responsible for their own physical training sessions (Pickup, 2009; Williams & Evans, 2007)
Aim of the Review

• ...to critically appraise and discuss the findings of existing research that has compared the physical characteristics and physical performance capacities of PT and FT tactical personnel

*This research was supported by a grant from the Defence Health Foundation*
Methods

1. Literature databases searched: PubMed, CINAHL, EBSCO, and Web of Science were searched using key search terms.

<table>
<thead>
<tr>
<th>PubMed</th>
<th>(“full-time” OR “part-time” OR “reserve”) AND (“home guard” OR “army” OR “defence” OR “defense” OR “police” OR “military” OR “soldiers” OR “firefighters” OR “first responder”)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CINAHL</td>
<td>(“full-time” OR “part-time” OR “reserve”) AND (“home guard” OR “army” OR “defence” OR “defense” OR “police” OR “military” OR “soldiers” OR “firefighters” OR “first responder”)</td>
</tr>
</tbody>
</table>
Methods

2. Reference lists of included articles were manually searched, and

3. Colleagues with expertise in the topic area were asked to identify any additional articles of relevance.
Methods

• The inclusion criteria were:
  – (a) the study was published in the English language;
  – (b) the study involved human participants;
  – (c) the study was published in 1994 or later;
  – (d) the study involved participants from tactical populations
  – (e) the study included both part-time and full-time participants

• The exclusion criterion was any study that did not examine anthropometric or physical performance measure(s)
Methods

• Included articles were critically appraised using the Downs and Black checklist (Downs & Black, 1998)

• Cohen’s Kappa Analysis of all raw scores (28 item scores per paper)

• Graded according to Kennelly (Kennelly, 2011)
Results

• Six articles
  – Downs and Black scores ranged from 57% to 61%
  – *fair quality*
  – The kappa statistic for inter-rater agreement indicated an ‘*almost perfect*’ agreement (k=0.923)
Results

- Participants included
  - Male only personnel
    (Dawes et al., 2013; Williams & Evans, 2007; Williams, 2005)
  - Male and female personnel
    (Lindberg, Malm et al., 2014; Wynn & Hawdon, 2012)
  - Male tactical personnel and both male and female civilians
    (Lindberg, Oska et al., 2014)
Results

- The tactical personnel investigated in the studies were:
  - military (Williams & Evans, 2007; Williams, 2005)
  - law enforcement (SWAT) (Dawes et al., 2013)
  - firefighter (Lindberg, Malm et al., 2014; Lindberg, Oska et al., 2014; Wynn & Hawdon, 2012)
Results

• Physical characteristics were measured using:
  – Anthropometry or body composition (Dawes et al., 2013; Williams & Evans, 2007; Williams, 2005)
Results

• Physical performance capacity was measured in terms of:
  – muscular endurance (Dawes et al., 2013)
  – lower-body power (Dawes et al., 2013)
  – anaerobic endurance (Dawes et al., 2013)
  – aerobic fitness (Lindberg, Malm et al., 2014; Wynn & Hawdon, 2012; Williams & Evans, 2007; Williams, 2005)
  – physical work capacity or work levels (Lindberg, Oska et al., 2014; Williams & Evans, 2007)
Results – Body Composition

• PT
  – mean BMI ranged from 23.5 ± 4.4 to 30.1 ± 3.2 kg/m²
  – mean BF% ranged from 14.0 ± 4.4 to 20.4 ± 3.5%

• FT
  – mean BMI ranged from 22.0 ± 2.1 to 26.3 ± 2.3 kg/m²
  – mean BF% ranged from 10.7 ± 2.6 to 18.9 ± 4.0%

(Dawes et al., 2013; Williams & Evans, 2007; Williams, 2005)
Results – Cardiovascular Fitness

• PT
  – mean VO_{2\text{max}} ranged from 40.9 \pm 6.1 to 47.69 \pm 7.64 \text{mL/kg/min}

• FT
  – mean VO_{2\text{max}} ranged from 44.8 \pm 4.9 to 50.10 \pm 7.05 \text{mL/kg/min}

(Lindberg, Malm et al., 2014; Wynn & Hawdon, 2012; Williams & Evans, 2007; Williams, 2005)
Results – Cardiovascular Fitness

• Of note:
  – part-time firefighters and home guard personnel found to have an estimated VO2max of 50.1 and 53.0 mL/kg/min (Aandstad et al., 2014; von Heimburg et al., 2006)
Results – Musculoskeletal Fitness

• PT SWAT:
  – VJ 55.40 ± 6.65 cm, Sit Ups 56.52 ± 12.89, Push Ups 64.52 ± 14.05

• FT SWAT:
  – VJ 68.94 ± 9.55 cm, Sit Ups 82.70 ± 8.52, Push Ups 89.46 ± 12.95

(Dawes et al., 2013)
Results – Task Performance

• Williams & Evans, 2007: No statistically significant differences between PT & FT soldiers for any variables assessed inc: Lift and Carry tasks.

• Lindberg, Oska et al., 2014: No overall statistically significant differences observed between PT & FT firefighters - Seven simulated firefighting work tasks  
  – However found sig differences in task effort ratings (Lindberg, Malm et al., 2014)
Conclusions

• The available evidence re: PT & FT is of moderate methodological quality
Conclusions

• Generally, the research indicates that PT personnel exhibit higher BMI and BF% and lower levels of aerobic capacity and strength than FT personnel

• However, findings were variable and may reflect variation across populations in different PT & FT personnel - regular work frequencies and intensities, and individually and institutionally-arranged physical training regimes
Acknowledgement

- The Defence Health Foundation
References

• Aandstad A, Hageberg R, Holme IM and Anderssen SA. Anthropometrics, body composition and aerobic fitness in Norwegian Home Guard personnel. JSCR. 2014. 28; 11: 3206–3214
• Dawes JJE, Craig; Hough, Lindsey; Melrose, Don R.; Stierli, Michael. Description of selected physical performance measures and anthropometric characteristics of part and full time Special Weapons and tactics Teams. Journal of Australian Strength & Conditioning. 2013; 21-52.
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• Lindberg AS, Oksa J and Malm C. Laboratory or field tests for evaluating firefighters' work capacity? PloS one. 2014; 9: e91215.
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