Age-related differences in upper-body muscular endurance amongst male Law Enforcement Officers: a comparison to civilian population norms

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Background

- Police officers are required to perform tasks that can include dynamic movements

(Blacker et al., 2013; Carlton et al., 2013)
Background

- The push up is commonly employed in tactical populations as a physical conditioning tool (Knapik et al., 2005) and as an outcome measure to determine if a new or modified physical conditioning program is effective (Heinrich, Spencer, Fehl, & Poston, 2012).
Background

• When used as a health measure standards are often based on age norms / historical contexts of reductions in performance associated with aging.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Male (Reps)</th>
<th>Female (Reps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 and under</td>
<td>40</td>
<td>21</td>
</tr>
<tr>
<td>26-30</td>
<td>35</td>
<td>18</td>
</tr>
<tr>
<td>31-35</td>
<td>30</td>
<td>15</td>
</tr>
<tr>
<td>36-40</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>41-45</td>
<td>20</td>
<td>7</td>
</tr>
<tr>
<td>46-50</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>51 and over</td>
<td>6</td>
<td>3</td>
</tr>
</tbody>
</table>

Australian Army Basic Fitness Assessment
Push up pass standards
Aims

- Aim:
  - To investigate age-related differences in push-up performance in a physically-active, male law enforcement population and determine whether they mirrored general population norms.
Participants

- $N=518 \, \text{♂} \, \text{LEO (2 Different LEO US agencies)}$
  - mean age $= 38.99 \pm 7.50\text{yrs}$ / mean weight $= 91.36 \pm 13.89 \text{kg}$ / mean body fat percentage $= 21.74 \pm 6.0\%$
- Grouped according to age
  - Group 1: 20-29 yrs [$n=66$];
  - Group 2: 30-39 yrs [$n=177$];
  - Group 3: 40-49 yrs [$n=234$];
  - Group 4: 50-59 yrs [$n=41$].
Methods

• Measures:
  – Body weight (lbs) converted to kg
  – Body Composition (Bioelectric impedance)
  – Push ups in 1 minute

• Statistical analysis
  – Pearson’s product-moment correlation
  – Forward stepwise linear regression analysis
  – Comparison to published norms (Ratamess, 2012)
  – Alpha set at 0.05 a priori
Methods

• Ethical approval
  – University of Colorado Colorado Springs Institutional Review Board for human subjects
  – Bond University Human Research Ethics Committee
## Results

<table>
<thead>
<tr>
<th>Age Group</th>
<th>All mean±SD</th>
<th>20-29 mean±SD</th>
<th>30-39 mean±SD</th>
<th>40-49 mean±SD</th>
<th>50-59 mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE (yrs)</td>
<td>38.99±7.51</td>
<td>26.59±1.79</td>
<td>34.66±2.90</td>
<td>43.36±2.55</td>
<td>52.76±2.39</td>
</tr>
<tr>
<td>WEIGHT (kg)</td>
<td>91.45±13.9</td>
<td>87.9±12.86</td>
<td>91.27±14.56</td>
<td>93.15±15.26</td>
<td>88.26±11.09</td>
</tr>
<tr>
<td>BF (%)</td>
<td>21.78±6.01</td>
<td>17.94±5.94</td>
<td>20.99±6.15</td>
<td>23.32±5.39</td>
<td>24.42±4.42</td>
</tr>
<tr>
<td>Push-ups (reps)</td>
<td>44.48±15.47</td>
<td>46.47±14.62</td>
<td>44.66±15.57</td>
<td>43.92±15.74</td>
<td>43.71±15.09</td>
</tr>
</tbody>
</table>
Results

![Chart showing results of push-ups by age band](chart.jpg)
Results

Final predictive model for push-up performance derived from the forward stepwise linear regression analysis entering %BF, age and body weight.

<table>
<thead>
<tr>
<th></th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>95.0% Confidence Interval for B</th>
<th>Correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td>t</td>
</tr>
<tr>
<td>(Constant)</td>
<td>66.64</td>
<td>3.46</td>
<td></td>
<td>19.23</td>
</tr>
<tr>
<td>%BF</td>
<td>-1.45</td>
<td>.11</td>
<td>-.57</td>
<td>-13.66</td>
</tr>
<tr>
<td>Age</td>
<td>.23</td>
<td>.09</td>
<td>.11</td>
<td>2.72</td>
</tr>
</tbody>
</table>
Discussion

• Contrary to normative data push up performance did not decrease with age in this population of LEO
Discussion

- When compared to general population norms, male LEO in each age category demonstrate substantially better push-up performance and do not demonstrate the decline in push up performance with age observed in the general population.
Conclusion / Take Home Message

• Upper-body muscular endurance does not have to decrease with age, within the current age range, if the population is physically active and regularly performs upper body strength exercises.

• Population based normative data may not be a suitable comparative sample for tactical populations like law enforcement (rehab/RTW protocols as an e.g.)
References


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