The perceived effect of load carriage on marksmanship in the tactical athlete.

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The perceived effect of load carriage on marksmanship in tactical athletes

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2 NSW Police Force
Introduction

- Tactical operators required to carry heavy loads (Carbone et al., 2014)
- Mobility & marksmanship must not be negatively affected
- Inconsistent reports on impacts of load carriage on marksmanship accuracy (Knapik et al., 1991; Rice et al., 1999; Carbone et al., 2014)
- Australian Army soldiers perceive negative impacts (Orr et al., 2013)
- How do SWAT perceive the impacts? Are they accurate?
Methods

• Six men – Police Tactical Operations Unit (SWAT)
• Fatigues Only (FO)
• Tactically Loaded (TL)
• Short move & mobility task with Primary & Secondary weapon
Methods

• Distance to centre of target
  – DCOT

• Horizontal shot spread
  – X-Dispersion

• Vertical shot spread
  – Y-Dispersion

Image Source: Carbone et al., 2014
Methods:

- Visual Analogue Scale (VAS)
- Scaled & measured
Methods

• Statistics
  – Paired-samples $t$-tests
  – Pearson’s correlation coefficients
  – Alpha levels set at 0.05

• Ethics approval – BUHREC RO1585B
Results

• No significant difference when TL
Results

- Perceived significant improvement in marksmanship when TL
  - Primary – VAS +3.00 ± 2.53 ($p = 0.016$)
  - Secondary – VAS +2.83 ± 2.93, ($p = 0.039$)

- Did not perceive either weapon affected by TL differently
Results

- Moderate negative correlation (negative = improved performance)
  - VAS Primary – MobP-XDisp ($p = 0.247$)

Table 4. Correlation between variables for tactically loaded primary weapon marksmanship

<table>
<thead>
<tr>
<th>Variable</th>
<th>VAS Primary</th>
<th>ShP-DCOT</th>
<th>MoP-DCOT</th>
<th>ShP-XDisp</th>
<th>MoP-XDisp</th>
<th>ShP-YDisp</th>
<th>MoP-YDisp</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAS Primary</td>
<td>1.000</td>
<td>-0.347</td>
<td>-0.401</td>
<td>-0.288</td>
<td>-0.561</td>
<td>0.190</td>
<td>-0.294</td>
</tr>
<tr>
<td>ShP-DCOT</td>
<td>-0.347</td>
<td>1.000</td>
<td>-0.483</td>
<td>0.874*</td>
<td>-0.457</td>
<td>0.394</td>
<td>-0.570</td>
</tr>
<tr>
<td>MoP-DCOT</td>
<td>-0.401</td>
<td>-0.483</td>
<td>1.000</td>
<td>-0.210</td>
<td>0.960**</td>
<td>-0.925**</td>
<td>0.817*</td>
</tr>
<tr>
<td>ShP-XDisp</td>
<td>-0.288</td>
<td>0.874*</td>
<td>-0.210</td>
<td>1.000</td>
<td>-0.242</td>
<td>0.002</td>
<td>-0.410</td>
</tr>
<tr>
<td>MoP-XDisp</td>
<td>-0.561*</td>
<td>-0.457</td>
<td>0.960**</td>
<td>-0.242</td>
<td>1.000</td>
<td>-0.806</td>
<td>0.866*</td>
</tr>
<tr>
<td>ShP-YDisp</td>
<td>0.190</td>
<td>0.394</td>
<td>-0.925**</td>
<td>0.002</td>
<td>-0.806</td>
<td>1.000</td>
<td>-0.636*</td>
</tr>
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<td>MoP-YDisp</td>
<td>-0.294</td>
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<td>-0.410</td>
<td>0.866*</td>
<td>-0.636*</td>
<td>1.000</td>
</tr>
</tbody>
</table>

ShP-DCOT = Short move primary weapon DCOT; MoP-DCOT = Mobility task primary weapon DCOT; ShP-XDisp = Short move primary weapon X-dispersion; MoP-XDisp = Mobility task primary weapon X-dispersion; ShP-YDisp = Short move primary weapon Y-dispersion; MoP-YDisp = Mobility task primary weapon Y-dispersion

* Correlations significant at $p < 0.05$
** Correlations significant at $p < 0.01$
Moderate negative correlations
- VAS Secondary – ShS-DCOT ($p = 0.179$)
- VAS Secondary – ShS-XDisp ($p = 0.275$)

High negative correlation
- VAS Secondary – ShS-YDisp ($p = 0.082$)
Table 5. Correlation between variables for tactically loaded secondary weapon marksmanship

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>VAS Secondary</td>
<td>1.000</td>
<td>0.631</td>
<td>-0.306</td>
<td>-0.534</td>
<td>-0.472</td>
<td>-0.756</td>
<td>-0.301</td>
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<tr>
<td>ShS-DCOT</td>
<td><strong>-0.631</strong></td>
<td>1.000</td>
<td>0.238</td>
<td>0.666</td>
<td>0.640</td>
<td>0.524</td>
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<td>MoS-DCOT</td>
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<td>0.238</td>
<td>1.000</td>
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<td>0.604</td>
<td>-0.196</td>
<td>-0.615</td>
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<td>ShS-XDisp</td>
<td><strong>-0.534</strong></td>
<td>0.666</td>
<td>-0.483</td>
<td>1.000</td>
<td>0.135</td>
<td>0.804</td>
<td>0.587</td>
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<tr>
<td>MoS-XDisp</td>
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<td>0.640</td>
<td>0.604</td>
<td>0.135</td>
<td>1.000</td>
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<tr>
<td>ShS-YDisp</td>
<td><strong>-0.756</strong></td>
<td>0.524</td>
<td>-0.196</td>
<td>0.804</td>
<td>0.427</td>
<td>1.000</td>
<td>0.778</td>
</tr>
<tr>
<td>MoS-YDisp</td>
<td>-0.301</td>
<td>-0.014</td>
<td>-0.615</td>
<td>0.587</td>
<td>0.032</td>
<td>0.778</td>
<td>1.000</td>
</tr>
</tbody>
</table>

ShS-DCOT = Short move secondary weapon DCOT; MoS-DCOT = Mobility task secondary weapon DCOT; ShS-XDisp = Short move secondary weapon X-dispersion; MoS-XDisp = Mobility task secondary weapon X-dispersion; ShS-YDisp = Short move secondary weapon Y-dispersion; MoS-YDisp = Mobility task secondary weapon Y-dispersion
Discussion

• Tactical police perceive improvement in marksmanship when TL
  – In contrast to Orr et al. (2013)
  – ARA soldiers carry heavier loads over greater distances
  – Familiarity & operational requirement increases positive perception

• X-dispersion decreased during TL short move
  – Consistent with Carbone et al., 2014
  – Body armour splint torso & generate low-level muscle activity at shoulder

• Primary weapon DCOT increased during TL mobility task
  – Rifle interaction with torso
  – Increased respiratory rate & vertical chest displacement (Carbone et al. 2014)
Conclusion

• Tactical police officers perceive marksmanship improves when TL
• Trend towards objective marksmanship measures supporting belief
• Key reason and difference to military populations is constant marksmanship while loaded
Practical Applications

• Direction for training tactical operators
  – Marksmanship training in TL condition Carbone et al. 2014

• Monitor perception of load carriage impacts
  – Prevent over-confidence
  – Provide feedback on relationship to performance
References


