LOAD CARRIAGE EXERCISES WITH TWO DIFFERENT LOADS AND THEIR EFFECTS ON SOLDIERS PHYSIOLOGY

Terho A¹, Vaara J¹, Kyröläinen H¹,²

¹National Defence University, Finland; ²University of Jyväskylä, Finland
Agenda

• Introduction
• Methods
• Results
• Discussion
• Conversation
Introduction

Fig. 1. Loads carried on the march by various history.7-11 JRTC, Joint Readiness Training Center (Polished data).

<table>
<thead>
<tr>
<th>Duty position</th>
<th>Fighting load (kg)</th>
<th>Approach march load (kg)</th>
<th>Emergency approach march load (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rifleman</td>
<td>29</td>
<td>43</td>
<td>58</td>
</tr>
<tr>
<td>M203 grenadier</td>
<td>32</td>
<td>48</td>
<td>62</td>
</tr>
<tr>
<td>Automatic rifleman</td>
<td>36</td>
<td>50</td>
<td>64</td>
</tr>
<tr>
<td>Anti tank specialist</td>
<td>31</td>
<td>45</td>
<td>59</td>
</tr>
<tr>
<td>Rifle team leader</td>
<td>29</td>
<td>43</td>
<td>59</td>
</tr>
<tr>
<td>Rifle squad leader</td>
<td>28</td>
<td>43</td>
<td>58</td>
</tr>
<tr>
<td>Forward observer</td>
<td>26</td>
<td>41</td>
<td>58</td>
</tr>
<tr>
<td>Forward observer radio/telephone operator</td>
<td>27</td>
<td>39</td>
<td>54</td>
</tr>
<tr>
<td>Weapons squad leader</td>
<td>28</td>
<td>45</td>
<td>60</td>
</tr>
<tr>
<td>M2-40 machine gunner</td>
<td>37</td>
<td>51</td>
<td>60</td>
</tr>
<tr>
<td>M2-40B assistant gunner</td>
<td>32</td>
<td>55</td>
<td>67</td>
</tr>
<tr>
<td>M2-40B ammunition bearer</td>
<td>31</td>
<td>53</td>
<td>65</td>
</tr>
<tr>
<td>Rifle platoon sergeant</td>
<td>28</td>
<td>41</td>
<td>54</td>
</tr>
<tr>
<td>Rifle platoon leader</td>
<td>28</td>
<td>42</td>
<td>53</td>
</tr>
<tr>
<td>Platoon medic</td>
<td>25</td>
<td>42</td>
<td>54</td>
</tr>
<tr>
<td>Radio/telephone operator</td>
<td>29</td>
<td>45</td>
<td>No data</td>
</tr>
<tr>
<td>Mortar section leader</td>
<td>26</td>
<td>50</td>
<td>68</td>
</tr>
<tr>
<td>Mortar squad leader</td>
<td>28</td>
<td>58</td>
<td>65</td>
</tr>
<tr>
<td>60-mm mortar gunner</td>
<td>29</td>
<td>49</td>
<td>61</td>
</tr>
<tr>
<td>60-mm mortar assistant gunner</td>
<td>25</td>
<td>55</td>
<td>No data</td>
</tr>
<tr>
<td>60-mm mortar ammunition bearer</td>
<td>24</td>
<td>46</td>
<td>No data</td>
</tr>
<tr>
<td>Rifle company communication chief</td>
<td>31</td>
<td>50</td>
<td>No data</td>
</tr>
<tr>
<td>Fire support officer</td>
<td>25</td>
<td>42</td>
<td>No data</td>
</tr>
<tr>
<td>Fire support non-commissioned officer</td>
<td>24</td>
<td>41</td>
<td>65</td>
</tr>
<tr>
<td>Sapper engineer</td>
<td>27</td>
<td>43</td>
<td>60</td>
</tr>
<tr>
<td>Company executive officer</td>
<td>27</td>
<td>42</td>
<td>No data</td>
</tr>
<tr>
<td>Company first sergeant</td>
<td>29</td>
<td>41</td>
<td>57</td>
</tr>
<tr>
<td>Company radio/telephone operator</td>
<td>29</td>
<td>44</td>
<td>59</td>
</tr>
<tr>
<td>Rifle company commander</td>
<td>30</td>
<td>44</td>
<td>50</td>
</tr>
<tr>
<td>Average</td>
<td>29</td>
<td>46</td>
<td>60</td>
</tr>
</tbody>
</table>
# Methods

## TABLE 1. Test Subjects n=8)

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height (cm)</td>
<td>180</td>
<td>10</td>
<td>168</td>
<td>196</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>77,9</td>
<td>12,3</td>
<td>55,3</td>
<td>90,9</td>
</tr>
<tr>
<td>Bodyfat (%)</td>
<td>12,5</td>
<td>3,3</td>
<td>8,6</td>
<td>16,7</td>
</tr>
<tr>
<td>BMI</td>
<td>23,9</td>
<td>2,4</td>
<td>19,6</td>
<td>26,7</td>
</tr>
<tr>
<td>VO₂max (ml·min⁻¹·kg⁻¹)</td>
<td>51,8</td>
<td>4,2</td>
<td>46,1</td>
<td>56,7</td>
</tr>
<tr>
<td>Legpress (N)</td>
<td>3881</td>
<td>940</td>
<td>2490</td>
<td>5510</td>
</tr>
<tr>
<td>Penchpress (N)</td>
<td>950</td>
<td>163</td>
<td>760</td>
<td>1310</td>
</tr>
<tr>
<td>Standing long jump (m)</td>
<td>2,30</td>
<td>0,20</td>
<td>2,20</td>
<td>2,60</td>
</tr>
<tr>
<td>Pushup (rep/min)</td>
<td>45</td>
<td>18</td>
<td>28</td>
<td>79</td>
</tr>
<tr>
<td>Situp (rep/min)</td>
<td>53</td>
<td>5</td>
<td>43</td>
<td>60</td>
</tr>
<tr>
<td>End time 29kg (min:s)</td>
<td>52:28</td>
<td>01:11</td>
<td>51:00</td>
<td>54:02</td>
</tr>
<tr>
<td>End time 45kg (min:s)</td>
<td>50:80</td>
<td>0:59</td>
<td>49:27</td>
<td>52:28</td>
</tr>
<tr>
<td></td>
<td>29kg</td>
<td>45kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>------</td>
<td>------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Height (cm)</td>
<td>r=0,46</td>
<td>r=0,61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>r=0,50</td>
<td>r=0,72*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bodyfat (%)</td>
<td>r=-0,15</td>
<td>r=0,05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lean body mass (kg)</td>
<td>r=0,55</td>
<td>r=0,74*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fat mass (kg)</td>
<td>r=0,10</td>
<td>r=0,32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>r=0,37</td>
<td>r=0,56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VO$_{2\text{max}}$ (ml·min$^{-1}$)</td>
<td>r=0,80*</td>
<td>r=0,92**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VO$_{2\text{max}}$ (ml·min$^{-1}$·kg$^{-1}$)</td>
<td>r=0,50</td>
<td>r=0,33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legpress (N)</td>
<td>r=0,52</td>
<td>r=0,33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Penchpress (N)</td>
<td>r=0,75*</td>
<td>r=0,81*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standing long jumps (cm)</td>
<td>r=0,80*</td>
<td>r=0,68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pushup (rep/min)</td>
<td>r=0,20</td>
<td>r=0,07</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Situp (rep/min)</td>
<td>r=0,02</td>
<td>r=-0,08</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0,05, **p<0,01
Discussion

• Upper body strength and aerobic endurance are infantry soldiers vital characteristics
• Maximal aerobic capacity is also vital, but..
• Body composition might be a factor but..
• Practical applications
  – Specific training methods for specific occupational tasks
  – More focus on strength training education
  – VO2max values should not be used to estimate soldiers abilities in load carriage tasks
Conversation

• Thank you..