Physical fitness, physical training, physical demands and injuries in Swiss Soldiers

Thomas Wyss, Nadja Beeler and Lilian Roos
Introduction

Daily military routine is physically more demanding than civilian life:

- 14 vs. 8 km/day on foot
- 18 vs. 12 MJ/day energy expenditure


Optimal selection and training are necessary to meet the increased requirements and to avoid injuries.

- **Selection**: Fitness Test Battery for the Recruitment of the Swiss Army
- **Training**: Physical training during military service
Physical Requirements

Fitness

Injuries

Military performance

Physical training and physical demands
Physical Fitness Test

- Seated shot put
- Standing long jump
- 1-leg stand
- Trunk muscle strength test
- Progressive endurance run
Job specific physical fitness standards

Training school: Reconnaissance

Proportion of recruits above fitness standard with overuse injuries [%]

Fitness standards in progressive endurance run [min]

Wyss et al., J Sports Med Phys Fitness, 2012
Prediction of injuries compared to other tests

- Sit-up test
- Trunk muscle strength test

Wunderlin et al., J Sports Med Phys Fitness, 2015
Prediction of injuries compared to other tests

- 1-leg standing test
- MFT S3 Check

Wyss et al., ECSS, 2012
Physical Fitness Test

Seated shot put
Standing long jump
1-leg stand

Trunk muscle strength test
Progressive endurance run

Physical Requirements

Fitness

Injuries

Military performance

Physical training and physical demands
Physical demands

Energy expenditure [MJ/day] during BMT

Swiss Army
US Army Support Regiment
US Army Special Forces
UK Parachute Regiment

Cycling
(Vogt et al. 2005)
Soccer
(Ebine et al. 2002)
Civilians
(Ekelund et al. 2002)
Resting energy expenditure

Wyss et al. 2014; Tharion et al. 2005; Wilkinson et al. 2008
Physical training

Swiss Army:

- **180** minutes physical training per week according to the regulations.
- **85** minutes physical training per week according to the responsible staff.
- **36** minutes activated during physical training per week according to objective sensor data.

*Hofstetter et al., J Strenght Cond Res, 2012; Wyss & Mäder, Mil Med, 2010*
Physical demands and physical training related to injury incidences

Six risk factors explain 99% of the differences in injury incidence rates between 12 training schools:

(Wyss et al., Mil Med, 2014)

- High energy expenditure (demands)
- Decreasing distances on foot per week with increasing time of BMT
- Large differences in daily physical demands within training week
- Little time spent on sports related PT
- Many activities with heavy equipment
- Little time for night rest
Federal Office of Sport FOSPO
Swiss Federal Institute of Sport Magglingen SFISM

Physical Requirements

Fitness

Injuries

Military performance

Physical training and physical demands
# Physical training intervention study

<table>
<thead>
<tr>
<th>3 study groups</th>
<th>Control</th>
<th>PT+</th>
<th>PT++</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantity</td>
<td>as usual</td>
<td>180'/week</td>
<td>180'/week</td>
</tr>
<tr>
<td>Quality</td>
<td>as usual</td>
<td>as usual</td>
<td>different content, instructed by physical education teachers</td>
</tr>
</tbody>
</table>
Physical training intervention study

45'/week: Interval endurance run – instead of long jog

Federal Office of Sport FOSPO
Swiss Federal Institute of Sport Magglingen SFISM
Physical training intervention study

30'/week circuit strength training
Physical training intervention study

30‘/week
team sports

30‘/week
balance training
## Physical training intervention study

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>PT+</th>
<th>PT++</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration per week [min]</td>
<td>70</td>
<td>140</td>
<td>145</td>
</tr>
<tr>
<td>Fitness score</td>
<td>+ 8 %</td>
<td>+ 16 %</td>
<td>+ 26 %</td>
</tr>
<tr>
<td>Aerobic fitness</td>
<td>+ 8 %</td>
<td>+ 17 %</td>
<td>+ 40 %</td>
</tr>
</tbody>
</table>

Roos et al., J Strength Cond Res, 2015
Physical training intervention study

- Motivation
- Army Commitment
- Endurance capacity
- Stress resistance
- Military Performance
- Trunk muscle strength
- Injuries
- Medical Drop Out

Roos et al., Mil Med, 2015
Physical training intervention study

What kind of injuries were prevented by the implemented interventions?

![Acute vs. overuse onset of injuries](chart.png)
Physical training intervention study

What kind of injuries were prevented by the implemented interventions?
References used in this presentation


