**INTRODUCTION**

**Current Situation in Belgium**

Legislation of 1971: necessity of good physical condition, and prescription of medical follow-up and physical tests
code of good practice, not binding, not uniformly applicable

Test ordered by Belgian Ministry of Internal Affairs: development of specific physical tests for fire fighters and providing of criteria

**Aim of the Study**

Current physical fitness/ strength: test standards (recruitment and periodic evaluation)
Relation physical fitness/ strength with: age, career, volunteer/professional/student,
signal questions physical fitness/ strength.
Relevance: are the tests considered functional/ relevant by experienced fire fighters?

**Population and Methods**

**Test Population (149 persons were tested)**

<table>
<thead>
<tr>
<th>Fire Fighters</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volunteers/Professionals</td>
<td>Secondary school, specialisation safety professions</td>
</tr>
<tr>
<td>No selection for years in the job or rank</td>
<td>14-22 year</td>
</tr>
<tr>
<td>8 different brigades</td>
<td>3 schools</td>
</tr>
<tr>
<td>Voluntary participation</td>
<td></td>
</tr>
<tr>
<td>80 participants - 3 women</td>
<td>69 participants - 12 women</td>
</tr>
</tbody>
</table>

**Description of the Test Population**

<table>
<thead>
<tr>
<th>Total Test Population (N=149)</th>
<th>Test Population (N=80)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Mean</td>
</tr>
<tr>
<td>Height</td>
<td>171,6</td>
</tr>
<tr>
<td>Weight</td>
<td>80,1</td>
</tr>
<tr>
<td>BMI</td>
<td>25,6</td>
</tr>
</tbody>
</table>

**Physical Tests**

“Resting heart rate”
- Weight vest of 5 kg
- Heart rate before and after every exercise
- Each time: exercise for 1’ and recover for 1’
- Briefing during each recovery minute
- After the tests: heart rate after 5’ of recuperation

1. Pull up:
   - 1’ as much as possible
   - promotion

2. Clamber over a beam:
   - as fast as possible; max. 1
   - beam on 1’60m; go and return

3. Balance on a beam
   - as fast as possible; max. 1
   - 3m to go, and return

4. Squat run
   - 3m to go and return; as fast as possible; max. 1
   - knees in an angle of <90°

5. Push up
   - during 1’; as many times as possible
   - arms: from straightened to 90°

6. Dragging a rag
   - a rag with a load of 80 kg
   - 15m to go and return; as fast as possible; max. 1

7. Dragging a hose
   - flat hose Ø 70mm/length 20m
   - 15m distance; as fast as possible; max. 1

8. Collecting a hose
   - in a empty hose; Ø 45mm/length 30m
   - as fast as possible; max. 1

9. Stair run
   - as fast as possible, max. 1; step by step
   - 8 floors, 126 steps of 100cm high
   - (in practice: steps of 17cm (15-19) till 22,6m height)

**Physical Tests - Fears**

- **Ladder test**: 30m ladder on truck, extended, free under an angle of 70°
- secured
- climb up at steady pace
- at the top wait for non verbal sign and call your name
- descended at steady pace

**Physical Tests - Circuit**

- **Tunnel test (not retained)**
  - crawl through 10m, flexible PVC tube, Ø +/- 70cm on 35cm
  - at the middle, stop and wait for a sign to go on

**Results Physical Tests - Total Test Population**

<table>
<thead>
<tr>
<th><strong>Relative Heart Rate during Tests</strong></th>
<th><strong>Relation Physical Tests-V02max</strong></th>
<th><strong>Score Relevance Physical Tests</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull up</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Climber</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Balance test</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Squat run</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Push up</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Dragging a rag</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Dragging a hose</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Stair run</td>
<td>0,0</td>
<td>0,0</td>
</tr>
<tr>
<td>Collecting a hose</td>
<td>0,0</td>
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**Conclusion**

- The examined physical tests are found relevant
- After stair run heart rate was 94% of the max. HR
- Height/ weight are positively related to better results:
  - Height - climber
  - Weight - dragging a rag/ a hose
- Age is negatively related to climber/ stair run; strength (dragging) seems no problem
- Major difference between men and women in physical tests with strength component

**Minimal required psychological fitness at selection**

- **Ladder test**: is a valid “physical” test to evaluate fear of heights
- We found no good “physical” test for claustrophobia
- **PAR-Q** (physical activity readiness questionnaire)
  - is a valid questionnaire to evaluate risks to participate in strenuous physical tests
  - is not related to the actual results on the physical tests

**Study**

Preparation:
- literature
- Belgian and European survey meeting of experts
- Organisation of field study
- voluntary participants
- PAR-Q questionnaire
- physical tests
- relevance questionnaire

- informed consent
- heart rate at rest
- recovery with heart rate monitoring

**Development and Application of a Fitness Test for Fire Fighters in Belgium**

Braeye T., Motmans R., Baukens C., Verhoogen R., Hermans V., Vandermissen L., Goddeeris L.

1 Group IDEWE, External Service for Prevention at Work, Heverlee, Belgium 2 Katholieke Universiteit Leuven, Belgium 3 Vrije Universiteit Brussel, Belgium

**Voluntary participation**

8 Different brigades
No selection for years in the job or rank
8 different brigades
3 schools
Voluntary participation
80 participants - 3 women
69 participants - 12 women

**PAR-Q (Medical Questionnaire)**

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
- Do you feel pain in your chest when you do physical activity?
- In the past month, have you had chest pain when you were not doing physical activity?
- Do you lose your balance because of dizziness or do you ever lose consciousness?
- Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?
- Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
- Do you know of any other reason why you should not do physical activity?

**Contact**
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