Functional Capacity Evaluation - reference values of patients with chronic non-specific low back pain without Waddell signs

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Validität der EFL

Hebefähigkeit

Handkraft und -koordination

Fortbewegung

Total 28 physische Tests

Arbeitshaltungen
Evaluation der funktionellen Leistungsfähigkeit

Beobachtungskriterien für das Ausmass der physischen Anstrengung
(Isernhagen 1992)

Maximum  Leicht  Schwer
Zweifel an der Validität der EFL als rein physischer Test

• Performance during FCE is associated with pain intensity, perceived disability, and functional self efficacy.

• FCE should be considered as behavioural tests, influenced by multiple factors including physical ability, and psychosocial factors (Gross et al. 2005).
  – Some important determinants of physical performance must not have been measured
  – unable to explain large amounts of the variation in FCE performance
What Is the Role of “Nonorganic Somatic Components” in Functional Capacity Evaluations in Patients With Chronic Nonspecific Low Back Pain Undergoing Fitness for Work Evaluation?

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## Nonorganic physical signs

| **Tenderness** | 1. **Superficial**: The skin is tender to light pinch over a wide lumbar area. A localised band in a posterior primary ramus distribution may be caused by nerve irritation and should be discounted.  
2. **Deep**: Tenderness is felt over a wide area. It is not localised to one structure, and often extends to the thoracic spine, sacrum, or pelvis. |
| **Simulation Tests** | 3. **Axial Loading**: Low-back pain is reported on vertical loading over the standing subject’s skull by the examiner’s hands. Neck pain is common and should be discounted.  
4. **Rotation**: Back pain is reported when shoulders and pelvis are passively rotated in the same plane as the subject stands relaxed with the feet together. In the presence of root irritation, leg pain my be produced and should be discounted. |
| **Distraction Test** | 5. **Straight Leg Raising**: Straight leg raising is the most useful distraction test. The subject whose back pain has a nonorganic component shows marked improvement in straight leg raising on distraction as compared with formal testing. |
| **Regional disturbances** | 6. **Sensory**: Sensory disturbances include diminished sensation to light touch, pinprick, and sometimes other modalities fitting a “stocking” rather than a dermatomal pattern.  
7. **Weakness**: Weakness is demonstrated on formal testing by a partial cogwheel “giving way” of many muscle groups that cannot be explained on a localised neurological basis. |
| **Overreaction** | 8. **Overreaction** during examination may take the form of disproportionate verbalisation, facial expressions, muscle tension and tremor, collapsing, or sweating. Judgements should, however, be made with caution, minimising the examiner’s own emotional reaction; there are considerable cultural variations, and it is very easy to introduce observer bias or to provoke this type of response unconsciously. |
Cross sectional study performed in three rehabilitation clinics in Switzerland.

STUDY METHOD AND SETTING

Ethical approval: Was obtained from the three regional ethics committees (EKSG 08/029/2B; SPUK N°. 784, EKAG 08/058) where the rehabilitation clinics are located.
Patients

Inclusion criteria

• Chronic non-specific low back pain primary complaint
• 20 to 60 years of age
• Referred for fitness-for-work evaluation
• Sufficient understanding of German, French or Italian to follow the instructions during FCE were included.

Exclusion criteria

• Specific LBP
  (nerve root compression, vertebral fracture, tumor, infection, inflammatory diseases, spondylolisthesis, spinal stenosis and definite instability)
• Relevant comorbidity
  (cardio-respiratory, psychiatric or other musculoskeletal problems)
Dependent variables

Functional Capacity Evaluation

- Lifting from floor to waist
- Grip strength
- Forward bend standing
- Six-minute-walk test
Independent variables

Physical and psychosocial factors

• **Physical factors**
  - Age
  - Gender

• **Psychosocial factors**
  - Nonorganic-somatic components
  - Salary in the previous job
  - Days off work
  - Pain intensity
  - Fear avoidance beliefs
  - Perceived functional ability

Assessors

MD
Check In- und Exclusion criteria

Assessor 1
Waddell signs

Assessor 2
Functional Capacity Evaluation
## Influences on Functional Capacity Evaluation

<table>
<thead>
<tr>
<th>FCE tests</th>
<th>Adj. R2</th>
<th>Final model</th>
<th>Unstd. Coeff.</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting from floor to waist (kg)</td>
<td>0.54</td>
<td>Perceived functional ability</td>
<td>0.11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gender (male)</td>
<td>4.73</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘NOSC’</td>
<td>-0.95</td>
<td>0.009</td>
</tr>
<tr>
<td>Forward bend standing (sec)</td>
<td>0.42</td>
<td>Perceived functional ability</td>
<td>0.31</td>
<td>*0.065</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘NOSC’</td>
<td>-0.20</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Days off work</td>
<td>-0.03</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Grip strength dominant hand (kg)</td>
<td>0.58</td>
<td>Gender (male)</td>
<td>15.97</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Perceived functional ability</td>
<td>0.11</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>‘NOSC’</td>
<td>-1.53</td>
<td>0.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-0.25</td>
<td>0.005</td>
</tr>
<tr>
<td>Six minute walking distance (m)</td>
<td>0.52</td>
<td>‘NOSC’</td>
<td>-27.13</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Salary previous job</td>
<td>0.01</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pain intensity</td>
<td>-11.65</td>
<td>0.018</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FAB work activities</td>
<td>-2.50</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age</td>
<td>-1.90</td>
<td>0.025</td>
</tr>
</tbody>
</table>

* Not significant, but a confounder
Summary

• ‘Nonorganic-somatic-signs’ are consistent independent predictors for FCE performance

• Tests without any specific load on the spine (grip strength, walking) are also influenced by ‘nonorganic-somatic-components’

• Inclusion of ‘nonorganic-somatic-components’ has led to substantially higher amounts of explained variation in lifting performance (54%) than previously found (31%)

• Physical factors age and/or gender are strongly associated with grip strength and lifting, less with walking distance and not with forward bend standing.
FUNCTIONAL CAPACITY EVALUATION – PERFORMANCE OF PATIENTS WITH CHRONIC NON-SPECIFIC LOW BACK PAIN WITHOUT WADDELL SIGNS

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Waddell Signs
Objectives of this study

1. to evaluate the effect of Waddell Signs during a standardized one day protocol in patients with CNSLBP undergoing fitness for work evaluation.

2. to report performance of patients with negative Waddell Signs during a standardized one day FCE protocol.
Patients and assessors

Patients
- 318 patients with low back pain
  - 40 suffered from specific back pain
  - 28 relevant comorbidity affecting work ability
  - 11 excluded because of language problems
  - 21 subjects did not give informed consent
  - 4 older than 60
  - 16 were missed for inclusion
- 198 patients with chronic NSLBP

Assessors
- 1\textsuperscript{st} ass: 11 PT mean professional experience 12.1y (SD 6.9)
- 2\textsuperscript{nd} ass: 17 PT mean FCE last 2 years = 36.5 (SD 10.0)
Weight Capacity in patients with negative and positive Waddell signs

Lifting
Floor - Waist

Lifting
Waist - Crown

Lifting
Horizontal

Lifting
One handed
Weight Capacity in patients with negative and positive Waddell signs

For Female:
- Waddell Negative: p<0.005
- Waddell Positive: p<0.001

For Male:
- Waddell Negative: p<0.001
- Waddell Positive: p<0.001

Note: The charts show the comparison of weight capacity for different lifting and carrying tasks, with error bars indicating 95% CI.
Hand Capacity in patients with negative and positive Waddell signs

Hand Capacity

p<0.05

p<0.001
Ambulation in patients with negative and positive Waddell signs

\[ p < 0.005 \]

\[ p < 0.001 \]
Work postures in patients with negative and positive Waddell signs

Elevated work

Forward bending

Kneeling

Sitting
Work postures in patients with negative and positive Waddell signs

Elevated work
Forward bending
Kneeling
Sitting
### Manual handling performance, hand capacity and ambulation in patients without WS

<table>
<thead>
<tr>
<th>FCE Test</th>
<th>20 – 45 years of age</th>
<th>45 – 60 years of age</th>
<th>Diff.</th>
<th>20 – 45 years of age</th>
<th>45 – 60 years of age</th>
<th>Diff.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female (n= 23)</td>
<td>Male (n= 46)</td>
<td></td>
<td>Female (n= 18)</td>
<td>Male (n= 45)</td>
<td></td>
</tr>
<tr>
<td>Lifting floor to waist (kg)</td>
<td>15.4 (7.2)</td>
<td>25.3 (10.7)</td>
<td>&lt;0.001</td>
<td>13.1 (4.2)</td>
<td>23.0 (9.7)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lifting waist to crown (kg)</td>
<td>11.1 (5.0)</td>
<td>18.7 (6.1)</td>
<td>&lt;0.001</td>
<td>10.7 (1.9)</td>
<td>16.7 (6.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lifting horizontal (kg)</td>
<td>17.9 (8.2)</td>
<td>30.9 (11.5)</td>
<td>&lt;0.001</td>
<td>17.6 (5.0)</td>
<td>26.7 (9.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Carrying right (kg)</td>
<td>14.6 (6.0)</td>
<td>22.0 (8.0)</td>
<td>&lt;0.001</td>
<td>13.3 (3.3)</td>
<td>20.1 (7.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Carrying left (kg)</td>
<td>14.3 (6.2)</td>
<td>21.0 (7.1)</td>
<td>&lt;0.001</td>
<td>11.9 (2.4)</td>
<td>19.7 (6.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Grip Strength non dom. (kp)</td>
<td>22.7 (9.0)</td>
<td>45.3 (9.4)</td>
<td>&lt;0.001</td>
<td>22.1 (8.4)</td>
<td>39.1 (11.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Grip Strength dom. (kp)</td>
<td>23.6 (10.0)</td>
<td>47.0 (11.2)</td>
<td>&lt;0.001</td>
<td>21.3 (8.4)</td>
<td>39.3 (12.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Stair climb (sec)</td>
<td>145 (57)</td>
<td>137 (48)</td>
<td>ns</td>
<td>184 (59)</td>
<td>154 (59)</td>
<td>ns</td>
</tr>
<tr>
<td>Six Minute walk (m)</td>
<td>520 (104)</td>
<td>553 (96)</td>
<td>ns</td>
<td>462 (94)</td>
<td>523 (97)</td>
<td>&lt; 0.05</td>
</tr>
</tbody>
</table>
### Proportion of patients without WS reaching the criterion in static work postures

<table>
<thead>
<tr>
<th>Posture</th>
<th>Female 20-45 y (n=23)</th>
<th>Female 46-60 y (n=18)</th>
<th>Male 20-45 y (n=46)</th>
<th>Male 46-60 y (n=45)</th>
<th>Sign.†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elevated work</td>
<td>70%</td>
<td>67%</td>
<td>72%</td>
<td>61%</td>
<td>ns.</td>
</tr>
<tr>
<td>Forward bend</td>
<td>57%</td>
<td>61%</td>
<td>61%</td>
<td>49%</td>
<td>ns.</td>
</tr>
<tr>
<td>Kneeling</td>
<td>87%</td>
<td>78%</td>
<td>83%</td>
<td>76%</td>
<td>ns.</td>
</tr>
<tr>
<td>Sitting,</td>
<td>87%</td>
<td>94%</td>
<td>89%</td>
<td>98%</td>
<td>ns.</td>
</tr>
</tbody>
</table>
Zusammenfassung und Diskussion I

• Positive Waddell-Zeichen sind konsistent mit einer signifikant geringeren Leistung assoziiert
  – EFL Tests reflektieren bei diesen Patienten nicht die tatsächliche körperliche Leistungsfähigkeit.

• Patienten mit negativen Waddell-Zeichen verfügen trotz langdauernder Arbeitsunfähigkeit über eine relevante arbeitsbezogene körperliche Belastbarkeit
  – Frage 1: Wurde in den vorgängigen medizinischen Beurteilungen diese körperlichen Leistungsfähigkeit nicht erkannt?
  – Frage 2: Was kann getan werden um diesen Klienten eine frühzeitige Rückkehr zur Arbeit zu ermöglichen?
Zusammenfassung und Diskussion II

• Genügt die Anwendung der Waddell-Zeichen zur Validerung der EFL?

Nein!
Umfassende Beurteilung des Schmerz- und Leistungsverhaltens ist nötig