The predictive validity of ELA in work-related medical rehabilitation

David Bühne
Einschätzung körperlicher Leistungsfähigkeiten bei arbeitsbezogenen Aktivitäten

(Work-related Physical Functional Capacity Evaluation)

4 dimensions
- posture
- locomotion
- movement of body parts
- complex categories

24 subtests
- e.g. standing, sitting, bent posture
- e.g. walking, climbing, crawling
- e.g. reaching, handgrip strength
- e.g. lifting, carrying, pushing
Background

ELA

- in Germany widely-used within the work-related medical rehabilitation
  - MBOR - German Pension Insurance (DRV)
  - ABMR - German Social Accident Insurance (DGUV)
- purpose
  - therapy planning
  - basis for RTW-estimations
- characteristics
  - selection of tests is based on the (expected) workplace-related strain
  - possibility of requirement-related test-modifications
### ELA-procedure

**Background**

**ELA-procedure**
- Interview
- Requirement profile
- Test selection & modification
- Test implementation
- Consistency check
- Report including profile comparison
- Therapy planning
- RTW-recommendations

### Comparison of physical capabilities with occupational requirements

*The capabilities are ... than the occupational requirements*

<table>
<thead>
<tr>
<th>Activity</th>
<th>Assessment</th>
<th>much higher (++)</th>
<th>rather higher (+)</th>
<th>equal to (=)</th>
<th>rather lower (-)</th>
<th>much lower (--)</th>
<th>N/A (Ø)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitting</td>
<td></td>
<td>✗</td>
<td>O+</td>
<td>O=</td>
<td>O.</td>
<td>O_</td>
<td>OØ</td>
</tr>
<tr>
<td>Standing</td>
<td></td>
<td>O++</td>
<td>O-</td>
<td>X=</td>
<td>O.</td>
<td>O_</td>
<td>OØ</td>
</tr>
<tr>
<td>Kneeling</td>
<td></td>
<td>O++</td>
<td>X-</td>
<td>O=</td>
<td>O.</td>
<td>O_</td>
<td>OØ</td>
</tr>
<tr>
<td>Crouching</td>
<td></td>
<td>O++</td>
<td>O-</td>
<td>O=</td>
<td>O.</td>
<td>O_</td>
<td>XØ</td>
</tr>
<tr>
<td>Sitting tilted forward</td>
<td></td>
<td>O++</td>
<td>X-</td>
<td>O=</td>
<td>O.</td>
<td>O_</td>
<td>OØ</td>
</tr>
<tr>
<td><strong>Standing tilted forward</strong></td>
<td></td>
<td>O++</td>
<td>O+</td>
<td>O=</td>
<td>X</td>
<td>O_</td>
<td>OØ</td>
</tr>
<tr>
<td>Arms in front/over head</td>
<td></td>
<td>O++</td>
<td>X-</td>
<td>O=</td>
<td>O.</td>
<td>O_</td>
<td>OØ</td>
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*iqpr – D. Bühne – The predictive validity of ELA*
ELA-procedure

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**ELA-procedure**

- interview
  - requirement-profile
- test selection & modification
- test implementation
- consistency check
- report including profile comparison
- therapy planning
- RTW-recommendations

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<th>job requirement</th>
<th>standard test-design</th>
<th>modified test-design</th>
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<tbody>
<tr>
<td>Lifting floor –</td>
<td>lifting a driver-platform (12.5kg)</td>
<td>floor – work surface (100cm); object: crate; 10 lifts per set; weight is increased</td>
<td>level 1: floor</td>
</tr>
<tr>
<td>work surface</td>
<td>every 15 minutes from pallet (15cm) to</td>
<td>until the maximum weight is observed</td>
<td>level 2: 80cm</td>
</tr>
<tr>
<td></td>
<td>height of 80cm</td>
<td></td>
<td>object: crate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10 lifts per set</td>
</tr>
<tr>
<td>Standing tilted</td>
<td></td>
<td></td>
<td>target: 15kg</td>
</tr>
<tr>
<td>forward</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

...
## Background

### ELA-procedure

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<td>floor – work surface (100cm); object: crate; 10 lifts per set; weight is increased until the maximum weight is observed</td>
<td>level 1: floor level 2: 80cm object: crate 10 lifts per set target: 15kg</td>
</tr>
<tr>
<td>Standing tilted forward</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>
Background

Are ELA-results valid?

Overall and activity-related ability to cope the physical work demands

Return to Work

prediction
The predictive validity of ELA

**Key Qualifications**

- Drive
- Concentration
- Interpersonal contact
- Orderliness
- Autonomy
- Stamina
- Teamwork
- Leadership
- Responsibility
- Abstract Thinking

**Body Posture**

- Sitting
- Standing
- Lying
- Kneeling/Crouching
- Bent Over/Stooped
- Arms in Compulsory Position

**Locomotion**

- Walking/Ascending
- Climbing
- Crawling/Sliding

**Body Part Movement**

- Head/Neck Movements
- Arm Movements
- Hand/Finger Movements
- Leg/Foot Movements
- Trunk Movements

**Environmental Influences**

- Climate
- Sound/Noise
- Vibration/Shaking
- Wetness/Soiling
- Gasses/Vapours/Dusts
- Light
- Liquids/Solids

**Occupational Safety**

- Accident Hazard
- Wearing Occup. Safety Equip.

**Work Organisation**

- Working Time
- Shift Work
- Night Shift
- Piecework/Incentive Wage

- Time Sequence-Oriented Workplace
- Isolated Workplace
- Common Workplace

**IMBA**

- Drive
- Concentration
- Interpersonal contact
- Orderliness
- Autonomy
- Stamina
- Teamwork
- Leadership
- Responsibility
- Abstract Thinking

- Reading
- Arithmetic
- Writing
- Gestures/Miming
- Vision
- Hearing
- Speech
- Touching/Feeling
- Perc. Of Movem. And Pos.
- Articulation/Speech
- Smelling/Tasting
Background

Are ELA-results valid?

Overall and activity-related ability to cope the physical work demands

Return to Work

Ability to cope the physical work demands

Motivation

Availability of workplace

Environm. influences

Key qualifications

prediction
**Objective**

(1) evaluation of the ability of a short-form FCE to predict sustainable return to work (RTW)

(2) evaluation of the gain of information towards patient self-reports

**Design**

multicentric prospective cohort study (with four outpatient rehabilitation clinics in Cologne, Freiburg, Neuss & Viersen)

**Participants**

patients (N=198) with musculoskeletal disorders

**Data collection**

between September 2013 and January 2016
**FCE-Indicator**

overall FCE-rating

(ability to cope the physical work demands -
“very good” to “moderate” vs. “rather/very poor”)

**Outcome:**

sustainable RTW:

- employment at 3-month follow-up
- less than 1.5 weeks of sick leave because of musculoskeletal disorders within the follow-up period
**Patient characteristics (admission)**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>47.7 (SD=10.0)</td>
</tr>
<tr>
<td>Male gender</td>
<td>66.2%</td>
</tr>
<tr>
<td>Sick-listed</td>
<td>80.3%</td>
</tr>
<tr>
<td>ICD-10 (M40-M54)</td>
<td>52.0%</td>
</tr>
<tr>
<td>Expected RTW-duration (&gt;1 month)</td>
<td>62.6%</td>
</tr>
<tr>
<td>PHQ-2 (Score&lt;3)</td>
<td>76.8%</td>
</tr>
<tr>
<td>Health-related disability at work (heavily)</td>
<td>74.7%</td>
</tr>
<tr>
<td>Employed</td>
<td>82.3%</td>
</tr>
<tr>
<td>Days of sick-leave (&gt;=100)</td>
<td>43.4%</td>
</tr>
</tbody>
</table>
Results – sample (follow-up)

- Employed ≥3h/day: 74.7%
- Employed ≥3h/day & <1,5 weeks during follow-up: 59.1%
Results - assessors

Age
35.3 years
(SD=7.7)

Experience

FCE
1.1 years
(SD=1.9)

ELA
2.2 months
(SD=3.6)

- occupational therapists
- sports scientists
- physiotherapist

1 occupational therapists
5 sports scientists
6 physiotherapists
## Results

1) predictive validity of FCE-information at discharge

<table>
<thead>
<tr>
<th></th>
<th>$R^2_{\text{Nagelkerke}}$</th>
<th>AUC-ROC</th>
<th>CCR</th>
<th>Odds ratio (FCE)</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Crude (FCE-result positive vs. negative)</strong>*</td>
<td>0.287</td>
<td>0.737</td>
<td>73.2%</td>
<td>17.2 (6.2–57.8)</td>
<td>94.9%</td>
<td>42.0%</td>
</tr>
<tr>
<td><strong>Reference model</strong>**</td>
<td>0.291</td>
<td>0.780</td>
<td>72.2%</td>
<td>---</td>
<td>82.9%</td>
<td>56.8%</td>
</tr>
<tr>
<td><strong>Reference model + FCE (ELA)</strong>*</td>
<td>0.440</td>
<td>0.835</td>
<td>78.8%</td>
<td>14.6 (4.8–44.9)</td>
<td>90.6%</td>
<td>61.7%</td>
</tr>
</tbody>
</table>

* Adjusted for assessors
** Based on/adjusted for: age, gender, employment status, family status, vocational qualification, sick-listed at admission, sick leave 1 year preadmission, work demands, initial diagnosis & baseline

RTW=0, N-RTW=1
## Results

### 2) gain of information at admission

#### Sociodemographic data
- employment status
- vocational qualification
- gender & age
- family status

#### Health-related data
- sick-listed at admission
- initial diagnosis
- sick leave 1 year preadmission
- general health (SF-12 item)
- depression (PHQ-2)
- pain

#### Work-related data
- work demands
- expected duration till RTW
- health-related disability at work
- wish for retirement
- physical work ability (WAI-Item)
- job satisfaction
2) gain of information at admission

Sociodemographic data
- employment status
- vocational qualification

Health-related data
- sick-listed at admission

Work-related data
- work demands
- expected duration till RTW
- health-related disability at work

Reference model

\[ R^2_{\text{Nagelkerke}}: 0.458 \]

**correctly classified:** 77.8%

**AUC:** 0.863
## Results

2) gain of information at admission

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<tr>
<td>Reference model*</td>
<td>0.458</td>
<td>0.863</td>
<td>77.8</td>
<td>---</td>
<td>88.0</td>
<td>63.0</td>
</tr>
<tr>
<td>Reference model + FCE-result (ELA)</td>
<td>0.480</td>
<td>0.870</td>
<td>78.8</td>
<td>2.6 (1.1 – 6.0)</td>
<td>88.0</td>
<td>65.4</td>
</tr>
</tbody>
</table>

*Employment status, vocational qualification, sick-listed at admission, work demands, expected duration till RTW, health-related disability at work, baseline; additionally adjusted for assessors

RTW=0, NRTW=1
Limitations

- validity of test-selection questionable
- validity of physical work-demands-assessment questionable
- reliability of ELA is unknown
- influence of contextual factors (e.g. employment rate)

Conclusions

- the study confirms the predictive validity of crude and adjusted FCE-information
- the gain of information towards patient self-reports is questionable
2nd ELA-study (2018-2020)

Objective:

1. Evaluation of the ability of a short-form FCE to predict sustainable return to work after controlling for non-physical reintegration-barriers

2. Identification of limiting factors
Thank you for your attention

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