Development and validation of a test instrument to assess Basic Motor Qualifications in primary school

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Symposium: Basic Motor Competencies in Physical Education
Madrid AIESEP International Conference 2015, July 10th
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1. Introduction

MOBAQ-LUX3 - Project aim

(1) Elaboration of competence-oriented test items following the approach of Basic Motor Qualifications (MOBAQ/Motorische Basisqualifikationen) in order to evaluate the elementary motor qualifications of third-graders

- Based on a consensus of the minimal requirements for third-graders to be able to participate in the culture of human motion in the sense of cultural participation
- The MOBAQ-approach fixes normatively basic motor competencies as minimal requirements for students
- They are codified in a binary way

(Kurz & Fritz, 2007; Kurz et al. 2012)

(2) Implementation of the validated test battery to establish a diagnosis for pedagogical purposes on a mandatory basis in the class level 3 in Luxembourg

- The results should help to identify students with remediation needs on school and classroom level, in order to be able to suggest specific services and offers to those students and to their parents.

1 funded by the Ministry for Education, Childhood and Youth
## 1. Introduction

### Project phases

<table>
<thead>
<tr>
<th>Project phases</th>
<th>Objectives</th>
<th>Topics</th>
<th>Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preparation</td>
<td>• How must test items be constructed according to the MOBAQ approach?</td>
<td>• 1. Expert Meeting</td>
<td>01-04/2012</td>
</tr>
<tr>
<td></td>
<td>• Which qualifications should 8 year-old children accomplish?</td>
<td>• Teacher questionnaire</td>
<td></td>
</tr>
<tr>
<td>Conception of the test instrument</td>
<td>• Development of test items</td>
<td>• 1. phase pre-tests</td>
<td>05/2012-08/2013</td>
</tr>
<tr>
<td></td>
<td>• Substantial validation by experts</td>
<td>• 2. phase pre-tests incl. feedback from teachers and students</td>
<td></td>
</tr>
<tr>
<td>Study I</td>
<td>• Scientific validation of the test instrument: <strong>Item analysis</strong></td>
<td>• Pre-test on a sample of n = 112 students</td>
<td>09/2013-03/2014</td>
</tr>
<tr>
<td>Study II</td>
<td>• Scientific validation of the test instrument: <strong>Factor analysis / Latent class analysis</strong></td>
<td>• Instruction of the teachers</td>
<td>04-09/2014</td>
</tr>
<tr>
<td></td>
<td>• Testing of the influence of control variables</td>
<td>• Supervision of the executing schools</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Advancement and optimizing of the test instrument in practical conditions</td>
<td>• Feedback by teachers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Improvement of the test instructions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Final report on Study I and II</td>
<td></td>
</tr>
<tr>
<td>Implementation on a national level</td>
<td>• Familiarization with the implementation of MOBAQ-LUX8</td>
<td>• Instruction of the teachers</td>
<td>Start</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Supervision of the executing schools</td>
<td>09/2014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Systematic study of data and feedback to schools</td>
<td></td>
</tr>
</tbody>
</table>

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1. Introduction

29 test items in 6 test dimensions, based on the curricular concept of “Movement fields” in the PE curriculum in Luxembourg

- **BAG**: Moving on equipment (5 items)
- **BIW**: Moving in water (5 items)
- **LUS**: Running and jumping (5 items)
- **RUF**: Rolling and riding (5 items)
- **SKG**: Playing with small devices (4 items)
- **SPB**: Playing with balls (5 balls)
1. Introduction

Study I: Item analysis

Realization of a pre-test to validate the MOBAQ-LUX3 test items empirically and to develop an adequate test design (including a test manual and materials for teacher training)

- Sample of $n = 112$ students in 8 classes in 4 schools
- Empirical validation (Validity / Reliability / Objectivity)
- Item selection and item revision
- Revision of test instructions
15 test items in 5 test dimensions, based on the curricular concept of “Movement fields” in the curriculum in Luxembourg

- **BAG: Moving on equipment** (3 items)
- **BIW: Moving in water** (3 items)
- **LUS: Running and jumping** (3 items)
- **RUF: Rolling and riding** (3 items)
- **SKG: Playing with small devices** (3 items)
- **SPB: Playing with balls** (3 balls)
2. Methods

Study II: Validation

Test procedure

- Test period: May-July 2014
- 24 classes in 9 schools
- 17 involved teachers
- Implementation of the test tasks in the regular teaching time in class
- Standardization: teacher training for the teachers/test instructors
- Instruction by the test instructor and several trials for the students
- 2 attempts per test item: the test is passed, when one of the two attempts was successful
2. Methods

Studie II: Sample

- $N_{\text{all}} = 399$ students
  - $N_{\text{boys}} = 193 / 50.4\%$
  - $N_{\text{girls}} = 201 / 48.4\%$
- Age: $M = 8.3$ SD: .52 Min: 7.3 Max: 10.3
- Nationality $N_{\text{LUX}} = 201 / 50.4\%$
- First language: $N_{\text{LUX}} = 139 / 34.8\%$
- BMI: $N = 287$ students
  - $N_{\text{NW}} = 230 / 80.1\%$
  - $N_{\text{OW}} = 40 / 13.9\%$
  - $N_{\text{Ob}} = 17 / 5.9\%$
2. Methods

Study II: Scaling

- Study I: Dichotomous Scaling 0 = „fail“, 1 = „pass“
- Study II: advanced 2nd level 2 = „2nd level pass“ (except RUF)

Ordinal scale level 0 – 1 – 2

- Test items „Catching and throwing“ and „Throwing in a target“:
  Number of successful attempts:
  0, 1, 2 out of 6 -> 0
  3, 4 out of 6 -> 1
  5, 6 out of 6 -> 2

- Level 2 only possible, when level 1 passed
  2 levels = 2 different test items
  10 Items: BAG2; BAG3; BIW2; BIW3; LUS2; LUS3; SPB2; SPB3; SKG2; SKG3
### 3. Results

#### Descriptive statistics: Item difficulties

<table>
<thead>
<tr>
<th></th>
<th>Persistent running</th>
<th>Coordinated running</th>
<th>Rhythmic skipping</th>
<th>Balancing</th>
<th>Rotating</th>
<th>Stabilizing</th>
<th>Throwing in a target</th>
<th>Hitting in a target</th>
</tr>
</thead>
<tbody>
<tr>
<td>N %</td>
<td>70 18.1</td>
<td>21 5.7</td>
<td>42 11.4</td>
<td>20 6.2</td>
<td>17 5.3</td>
<td>15 4.4</td>
<td>13 3.8</td>
<td>127 36.1</td>
</tr>
<tr>
<td>N %</td>
<td>71 18.4</td>
<td>130 35.5</td>
<td>48 13.0</td>
<td>55 17.0</td>
<td>45 13.9</td>
<td>53 15.7</td>
<td>71 20.6</td>
<td>90 25.6</td>
</tr>
<tr>
<td>N %</td>
<td>245 63.5</td>
<td>215 58.7</td>
<td>278 75.5</td>
<td>248 76.8</td>
<td>261 80.8</td>
<td>270 79.9</td>
<td>261 75.5</td>
<td>135 38.4</td>
</tr>
<tr>
<td>N %</td>
<td>386 100.0</td>
<td>366 100.0</td>
<td>368 100.0</td>
<td>323 100.0</td>
<td>323 100.0</td>
<td>338 100.0</td>
<td>345 100.0</td>
<td>352 100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Controlling with a stick</th>
<th>Throwing and catching</th>
<th>Bouncing</th>
<th>Dribbling</th>
<th>Gliding</th>
<th>Diving</th>
<th>Floating</th>
</tr>
</thead>
<tbody>
<tr>
<td>N %</td>
<td>52 14.9</td>
<td>42 11.2</td>
<td>30 7.9</td>
<td>49 13.0</td>
<td>44 14.5</td>
<td>38 13.1</td>
<td>37 13.2</td>
</tr>
<tr>
<td>N %</td>
<td>111 31.9</td>
<td>41 11.0</td>
<td>38 10.0</td>
<td>74 19.6</td>
<td>140 46.1</td>
<td>15 5.2</td>
<td>103 36.8</td>
</tr>
<tr>
<td>N %</td>
<td>185 53.2</td>
<td>291 77.8</td>
<td>312 82.1</td>
<td>255 67.5</td>
<td>120 39.5</td>
<td>237 81.7</td>
<td>140 50.0</td>
</tr>
<tr>
<td>N %</td>
<td>348 100.0</td>
<td>371 100.0</td>
<td>380 100.0</td>
<td>378 100.0</td>
<td>304 100.0</td>
<td>290 100.0</td>
<td>280 100.0</td>
</tr>
</tbody>
</table>
3. Results

Confirmatory factor analysis (WLSMV-estimator, FIML, standardized)

(CFI = 1.00; TLI = 1.00; RMSEA = 0.009 [.000 - .034]; WRMR = 0.64)
3. Results

Definition „Special needs“

- If at least two thirds of the tasks in a test area are passed, we assume that the student has the basic requirements for participation in the competence area.
  
  \[ \geq \frac{2}{3} \text{ passed} \rightarrow \text{minimal requirements achieved} \]

- Students who pass less than two thirds of the tasks in a test area, should practice specifically in this competence area – support is needed.
  
  \[ < \frac{2}{3} \text{ passed} \rightarrow \text{minimal requirements not achieved} \]
  
  \[-\rightarrow \text{The student needs support} \]

- If at least two thirds of the tasks in a test area are passed on level 2, we assume that the student has advanced requirements for participation in the competence area.
  
  \[ \geq \frac{2}{3} \text{ level 2 passed} \rightarrow \text{minimal requirements exceeded} \]
3. Results

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**Special needs in the competence areas**

<table>
<thead>
<tr>
<th>Frequency in %</th>
<th>Object-movement</th>
<th>Self-movement</th>
<th>Movement in water</th>
</tr>
</thead>
<tbody>
<tr>
<td>School Mamer</td>
<td>12,3</td>
<td>3,6</td>
<td>10,5</td>
</tr>
<tr>
<td>Total Study II</td>
<td>19,8</td>
<td>6,3</td>
<td>9,1</td>
</tr>
</tbody>
</table>

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3. Results

Basic Motor Qualifications
MOBAQ-LUX3

Results of the survey in 2014:
School : Elementary school XXX
Class : 3.1 A
Erin Gerlach

Self-movement: Minimal requirements exceeded
Object-movement: Minimal requirements achieved
Movement in water: Minimal requirements not achieved
MOBAQ-LUX3

- has partly similar structures as the MOBAK-instruments – self-movement & object-movement – and as existing movement skill assessments – locomotor & object control (Herrmann, Gerlach & Seelig, 2015; Burton & Miller, 1998).

- The developed test battery mostly satisfied the psychometric criteria and is a suitable instrument to identify students with support needs in PE.
5. Outlook

- **MOBAQ-LUX**
  - Development and implementation of a support framework based on support measures on school and classroom level
  - Linking to national educational monitoring in 3rd grade in mathematics and languages undertaken by LUCET (Luxembourgish Centre for Educational Testing)
  - Development of age-specific tests for the 1st grade (based on MOBAK-CH1 and connected to MOBAQ-LUX3)
  - Development of age-specific tests for the 5th grade (based on MOBAQ-LUX3)
Thank you very much!

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## MOBAQ/MOBAK Overview

<table>
<thead>
<tr>
<th>Used for what?</th>
<th>Diagnosis</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acquisition</td>
<td>Basic Motor Qualifications</td>
<td>Basic Motor Competences</td>
</tr>
<tr>
<td></td>
<td>(MOBAQ/BAMOQ)</td>
<td>(MOBAK/BAMOC)</td>
</tr>
<tr>
<td>Intern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(practice in schools)</td>
<td>Learning assessment</td>
<td>Description of learning paths</td>
</tr>
<tr>
<td></td>
<td>(MOBAQ-LUX)</td>
<td>(MOBAQ-CH)</td>
</tr>
<tr>
<td>Extern</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(research)</td>
<td>Monitoring</td>
<td>Impact research</td>
</tr>
<tr>
<td></td>
<td>(MOBAQ-NRW)</td>
<td>(MOBAK-CH)</td>
</tr>
</tbody>
</table>
3. Results

Class 1: 12.8%

Class 2: 18.1%

Class 3: 69.1%

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