Assessing the impact of English language skills and education level on PubMed searches by Dutch-speaking users

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Original brief: supply the pharmacology unit of Ghent University with a Dutch version of the MeSH list
Terminology project

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- **Instead**: development of a full scale English & Dutch termbase (i.e. also synonyms, grammatical & spelling information, pronunciation etc.)
**Terminology project**

- **Original brief**: supply the pharmacology unit of Ghent University with a Dutch version of the MeSH list
- **Instead**: development of a full scale English & Dutch termbase (i.e. also synonyms, grammatical & spelling information, pronunciation etc.)
- Translations made by students as a **master thesis**:
  - 35-50 MeSH terms
  - students team up with medical informants
  - terminological records
Is it really useful to translate the Medical Subject Headings (MeSH)?
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Do Dutch-speaking users of PubMed have problems with searching PubMed in English?
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Do Dutch-speaking users of PubMed have problems with searching PubMed in English?

Do they have other problems when using PubMed?
Advantage of English as lingua franca of science: **terminological continuity**

**BUT:**

- difficult medical terminology
- Lankamp (1989): basic level of English knowledge including linguistic items other than domain-specific terminology is needed to select relevant information
- Mouillet (1999): several **sublanguages** needed for IR: informatics, documentation science, biomedical sciences
Vendel (1982): **Medical knowledge** plays crucial role in understanding of English medical literature
⇒ extra dimension: Bachelor vs. Master students of Nursing
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⇒ extra dimension: Bachelor vs. Master students of Nursing

- Nursing Department at University College Ghent (n=31) + Department of Nursing and Midwifery at University of Antwerp (n=40)
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- **Gender** of real population of nursing students is reflected in sample (75%-80% female and 20%-25% male students)
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- Master students attended an **additional programme on scientific research** (literature searching, systematic view)
5 parts:

- **questionnaire**: computer skills, familiarity with PubMed, English language skills
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Test

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- **satisfaction survey**
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- **satisfaction survey**
- **language test**: DIALANG
2 **types** of evaluation:
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- **precision, recall and F-score**: list of selected articles - gold standard ("gold standard query" + "union of outputs" principle (Miller 1971))
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- **qualitative analysis**: Morae: program to analyse user-computer interaction.
  
  * **tasks** (e.g. reading, searching, validation)
  * **markers** (e.g. search term formulation, MeSH term selection, PubMed search, article selection)
Search process

Marker scores:

- 0 = bad
  e.g. kinesitherapi
- 1 = medium
  e.g. resiential care, resident
- 2 = good
  e.g. elderly, nursing home
Language test

⇒ freely available language test: DIALANG (based on Common European Framework of Reference) ⇒ vocabulary and reading test

- compare language skills of Bachelor - Master students
- relationship language skills - performance on the search task
Language test

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⇒ hypothesis: at least B2 or C1 level for reading and vocabulary

- **reading:**
  - B2: understand articles about contemporary issues;
  - C1: understand factual texts in specialized language.

- **vocabulary:**
  - B2: write reports and essays;
  - C1: write reports in specialized language.
### Precision, recall, F-score

<table>
<thead>
<tr>
<th></th>
<th>avg prec</th>
<th>avg recall</th>
<th>avg F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor</td>
<td>37.6%</td>
<td>2.7%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Master</td>
<td>30%</td>
<td>4.4%</td>
<td>7.2%</td>
</tr>
</tbody>
</table>

Table: Results in both test groups

- partly due to limited time
- No significant differences between both test groups
### Language skills

<table>
<thead>
<tr>
<th></th>
<th>Bachelor Count N%</th>
<th>Bachelor N%</th>
<th>Master Count N%</th>
<th>Master N%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Score reading test</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>3.2%</td>
<td>2.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>9.7%</td>
<td>12.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>35.5%</td>
<td>12.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>38.7%</td>
<td>50.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>9.7%</td>
<td>15.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>3.2%</td>
<td>7.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Score vocabulary test</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1</td>
<td>0%</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A2</td>
<td>3.2%</td>
<td>10.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B1</td>
<td>12.9%</td>
<td>7.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B2</td>
<td>67.7%</td>
<td>57.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1</td>
<td>9.7%</td>
<td>25.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C2</td>
<td>6.5%</td>
<td>0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

⇒ no significant relation between language skills and education level!
Language skills

⇒ positive correlation between
  - vocabulary test and F-score ($r_s=0.258; n=71; p=0.0298$)
  - reading test and F-score ($r_s=0.261; n=71; p=0.028$)
Education level

- no significant correlation with precision, recall, F-score
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- pre-test survey:
  - 100% of master students vs. 45% of bachelor students use **medical databases** to search for medical information
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- pre-test survey:
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  - Master students use PubMed more often than bachelor students (“because they received a more elaborate introduction into the use of PubMed?”)
no significant correlation with precision, recall, F-score

pre-test survey:

- 100% of master students vs. 45% of bachelor students use **medical databases** to search for medical information
- Master students use PubMed more often than bachelor students (“because they received a more elaborate introduction into the use of PubMed?”)
- Master students search for medical information in English more frequently than bachelor students
Education level

- Bachelor students found searching for medical info in English more difficult than master students.
Bachelor students found searching for medical info in **English more difficult** than master students.

- Positive correlation between **maximum time between inputs** and level of education:
Search process

- Negative correlation between number of bad search terms and level of education
Search process

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- However, no effect on search performance.
  ⇒ Students were asked to search with MeSH terms (controlled vocabulary)
Search process

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- However, no effect on search performance.
  ⇒ Students were asked to search with **MeSH terms** (controlled vocabulary)
- Number of **bad MeSH terms** has impact on F-scores
Conclusions

- **English language skills** have an impact on results of the search task
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- **No significant difference** between bachelor and master students in language skills and performance on the search task.
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- Master students are **more familiar** with the search system (PubMed) → reflected in the max. time between inputs.
Conclusions

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- **No significant difference** between bachelor and master students in language skills and performance on the search task

- Master students are **more familiar** with the search system (PubMed) → reflected in the max. time between inputs

- Bachelor students tend to formulate **more bad search terms**, but no impact because of use of MeSH terms ⇒ MeSH terms = language aid
Future work

- **Expert** in biomedical information retrieval + expert in field of accidental falls in elderly: perform search task
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- **Same test** in UK ⇒ control group
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- **Expert** in biomedical information retrieval + expert in field of accidental falls in elderly: perform search task
- **Same test** in UK ⇒ control group
- Incorporation of **translated MeSH terms** in search system
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