Educational Effects on the MMSE and TYM Test
Consequences for Early Detection of Dementia

Elizabeth van de Zande, M.Sc.,
Dr. Garmt Dijksterhuis,
Prof. Dr. Ir. Ger Rijkers,
Dr. Gerda Andringa
“Maintaining Health”

- Cognition
- Digestion
- Immune System
Geography

Province of Zeeland, the Netherlands

- Aging population
- Relatively low education
- ‘Rural’
Goal

Finding practical tools for the early detection of dementia
Goal

Finding **practical** tools for the **early** detection of dementia

• Fast
• Inexpensive
• Readily available
• Easy to use
• Non-invasive
Mini-Mental State Examination (MMSE)

- Interview style
- Maximum of 30 points
- Commonly (mis)used
- Low sensitivity
- Education effects

---

Test Your Memory (TYM)

- Relatively new test
- Maximum of 50 points
- Translated in Dutch
- Validated in memory clinic
- Education effects unknown

The Test Your Memory (TYM) Test outperforms the MMSE in the Detection of MCI and Dementia

Elizabeth van de Zande\textsuperscript{a,*}, Joseph Cornelis Maria van de Nes\textsuperscript{b}, Ingeborg Jansen\textsuperscript{a}, Margje Nouelle van den Berg\textsuperscript{a}, Anne Floor Zwart\textsuperscript{a}, Daniel Bimmel\textsuperscript{a}, Gerrit Tjalling Rijkers\textsuperscript{a}, Gerda Andringa\textsuperscript{a}

\textsuperscript{a}Department of Science, University College Roosevelt, Middelburg, The Netherlands; \textsuperscript{b}Department of Neurology, ZorgSaam Zeeuws-Vlaanderen, Terneuzen, The Netherlands

\textbf{Abstract}: The aim of this study was to evaluate the diagnostic accuracy and clinical usability of a Dutch translation of the Test Your Memory (TYM) test in patients with mild cognitive impairment (MCI) and dementia as compared to the Mini-Mental State Examination (MMSE), within the setting of the memory clinic of a general hospital. For this, forty-two participants referred to the memory clinic with memory problems and forty-two healthy controls were assessed using the TYM and the MMSE. We evaluated the sensitivity, specificity and diagnostic accuracy of the TYM and MMSE. Both instruments were tested against recently established clinical diagnostic criteria of MCI, Alzheimer’s disease (AD) and vascular dementia (VD). The TYM demonstrated to be more sensitive in detecting dementia than the MMSE. The TYM also was better at discriminating between healthy controls and patients with MCI than the MMSE. Our data suggest that the TYM is more suitable as a practical tool for the early detection of dementia than the MMSE.

\textbf{Keywords}: Test Your Memory test; Mini-Mental State Examination; early detection; dementia; Alzheimer’s disease; mild cognitive impairment.

1. INTRODUCTION

Dementia is an overarching term to describe diseases and conditions characterized by a decline in memory and other cognitive skills that affect the ability to perform everyday activities. The underlying neuronal damage can be caused by a number of degenerative disorders; the most

However, the single most important feature of a diagnostic test remains its diagnostic robustness – high sensitivity and specificity, along with a high positive predictive value in a population with cognitive impairment [3]. Previous research has shown that cognitive tests may be as sensitive
Study set-up

• Study population
  – Community dwelling individuals
  – ≥ 50 years of age
  – Living in Zeeland
  – No formal diagnosis

• Two groups
  – Memory group
  – Control group
Study goals

• Validity of test
• Usability of test
• Influence of different factors on cognition
Study goals

• Validity of test
• Usability of test
• Influence of different factors on cognition
## Results

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Memory group</th>
<th>Control group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>325</td>
<td>173</td>
<td>152</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td>223♀/101♂</td>
<td>120♀/53♂</td>
<td>103♀/48♂</td>
</tr>
<tr>
<td><strong>Mean age in years (± S.D.)</strong></td>
<td>80 (±11.2)</td>
<td>82 (±9.2)*</td>
<td>77 (±12,5)*</td>
</tr>
<tr>
<td><strong>Mean total score MMSE (± S.D.)</strong></td>
<td>26.1 (±3.8)</td>
<td>24.5 (±4.2)*</td>
<td>28.0 (±2.0)*</td>
</tr>
<tr>
<td><strong>Mean total score TYM (± S.D.)</strong></td>
<td>36.3 (±9.2)</td>
<td>32.4 (±9.4)*</td>
<td>40.7 (±6.6)*</td>
</tr>
</tbody>
</table>

*Significant difference between memory and control group (p < 0.05)
Results MMSE

- Cut-off score = ≤ 23 points
• Cut-off score = ≤ 39 points
Education

• Highest completed education
• Three categories:
  – Low (<8 years of education)
  – Middle (8-12 years of education)
  – High (>12 years of education)

<table>
<thead>
<tr>
<th>Educational level</th>
<th>Study population</th>
<th>Zeeland</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Low</td>
<td>109</td>
<td>35%</td>
</tr>
<tr>
<td>Middle</td>
<td>158</td>
<td>51%</td>
</tr>
<tr>
<td>High</td>
<td>45</td>
<td>14%</td>
</tr>
</tbody>
</table>
MMSE

Control group

Memory group
Conclusions

• MMSE is less sensitive to memory complaints than the TYM
  – Unsuitable as a detection tool

• Test scores should never be taken at face value
Much more to discuss!

- Educational effects on sub scores
- Adjustment of cut-off scores
- Cognitive reserve
  - Low education as a risk factor for dementia, or as an influence on cognitive tests, or both?
- Validity of subjective memory complaints
- Predictive value of TYM test
For more information...

• Ask questions now
• Approach me after this session
• Email: n.zande@ucr.nl

Thank you for your attention!