MS Center Amsterdam

Introducing Multiple Screener:
An unsupervised digital screening tool for cognitive deficits in MS

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BACKGROUND Cognitive deficits affect up to 70% of all patients with MS and have a significant impact on quality of life [1-3]. **Neuropsychological testing** is necessary for **timely identification** and **monitoring of cognitive decline over time.** Brief test batteries, such as the Brief International Cognitive Assessment for MS (BICAMS) [4,5], exist. However, **the paper-and-pencil based BICAMS** needs to be administered by a **test leader**, making it still too **time-consuming** to implement in standard routine clinical care.

OBJECTIVE To develop a time-efficient, unsupervised, digital, screening tool for cognitive deficits in patients with MS: **Multiple Screener.**

METHODS
Multiple Screener consists of two segments.
1. **Psychological:** well being (anxiety, depression, fatigue) is assessed.
2. **Cognitive:** neuropsychological tests are based on the BICAMS: (1) SDMT, (2) Dutch version of the CVLT-II, and (3) SPART (instead of the Brief Visuospatial Memory Test-Revised (BVMT-R), since a digital version of the BVMT-R was too difficult to score automatically).

Part 2.1. Clarity and feasibility
Qualitative evaluation of the Multiple Screener tool (questionnaire)
16 patients with MS
mean age 50.9 years (SD 9.4, range 37-68)
Part 2.2. Comparison between paper and digital assessment
Intraclass correlation coefficients (ICC)
60 healthy controls (HCs)
mean age 44.5 years (SD 14.0, range 18-67)
Part 2.3. Norm data
Step 1: Multiple linear regression – effects of age, sex, and educational level
Step 2: Regression-based correction for age-effect on the raw test scores
Step 3: If necessary, additional correction for sex or educational level (calculated per bin (men and women; high and low educational level)
236 HCs
mean age 42.8 years (SD 12.8, range 18-69)

CONCLUSION
1. The clarity and feasibility of the Multiple Screener tool was confirmed.
2. Performance on the adjusted, digital version of the BICAMS correlated well with the standard paper-and-pencil based test scores in HCs.
3. Multiple Screener is an unsupervised, digital, screening tool, with available norm scores, and together with the online assessment of confounders (anxiety, depression, fatigue [6]), it is a promising tool to **timely identify and easily monitor cognitive decline in patients with MS.**

FUTURE PERSPECTIVES
• Validate the tool (sensitivity and specificity) in patients with MS
• Determine optimal clinical cut-off scores

RESULTS

Table 1. ICCs with 95% confidence intervals (CI)
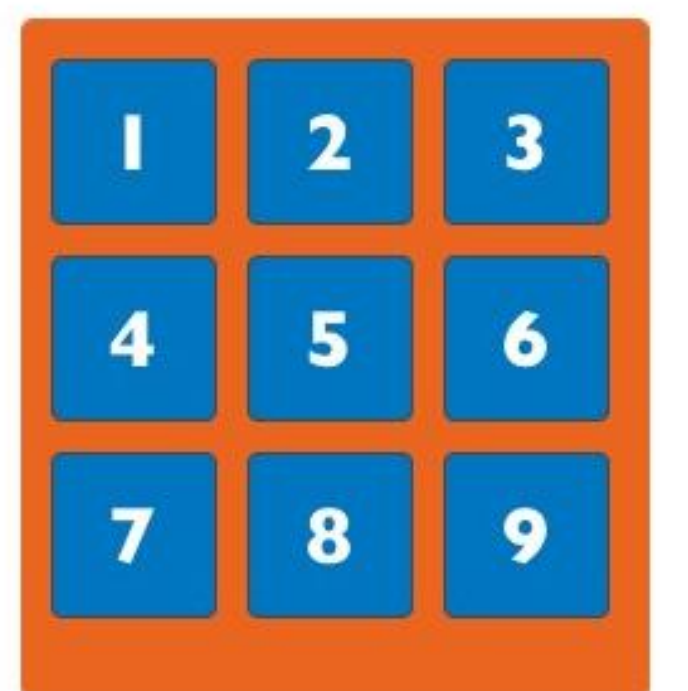
Test	ICC	CI
SDMT	0.79	0.67-0.87
CVLT-II	0.77	0.64-0.85
SPART	0.61	0.42-0.75

Two-way mixed effects model, relative agreement, single rater

1. Symbol Digit Modalities Test (SDMT) - information processing speed

2. California Verbal Learning Test (CVLT-II) - verbal memory (Dutch version)

3. Spatial Recall Test (SPART) - visuospatial memory

MULTIPLE SCREENER

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