Practice Effects in Digital Semantic Verbal Fluency Assessments Improve Detection of Cognitive Impairments in an Older-Age Memory Clinic Population

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Introduction

Practice effects are improvements in cognitive task performance that occur as a person becomes familiar with the task through repetition and can hold valuable diagnostic potential, especially in contexts like Alzheimer's disease and related dementias, where they may be reduced due to compromised learning abilities **(1)**. Reduced or absent practice effects can thus indicate cognitive impairment and help distinguish healthy aging from pathological decline. Research has shown that individuals with cognitive impairment (CI) often show limited or no practice effects in standard neuropsychological tests such as the semantic verbal fluency task (SVF) **(2)**. In the SVF participants are instructed to name as many different items belonging to a certain semantic category (e.g. animals) typically within 60 seconds. If changes in practice effects are detectable even over short re-assessment intervals indicative of cognitive status, they could offer a rapid and easy means of monitoring cognitive health. We present data on repeated SVF administrations and analyze how performance improvements—i.e. practice effects—can help separate cognitively intact from cognitively impaired older-age participants.

Methods

We use data from a US ongoing memory clinic study, collecting data from the SVF performed as part of a digital cognitive assessment (DCA) protocol. Two administrations of the SVF were performed with the exact same instruction and category stimulus (animals). In between SVF tests, participants were administered other cognitive tasks. Evaluation was based on data from 96 participants (58 female) with an average age of 70 years (± 10 years); 24 are diagnosed with a cognitive impairment such as MCI or dementia and both groups did not differ in years of education.

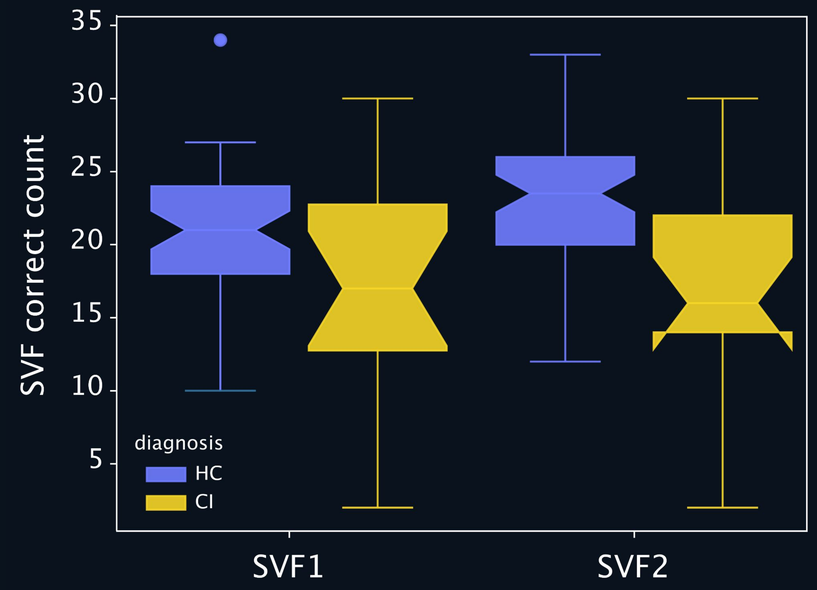

Figure: Boxplot showing group comparisons between healthy control group (HC) in blue and cognitively impaired group (CI) including MCI and dementia in orange. Trial 1 and trial 2 represent the repeated consecutive administration of the SVF. Groups are compared based on their word count in the consecutive SVF performances.

Cognitive impairment (CI) was determined through a standard memory clinic evaluation by a neuropsychologist and neurologist. From the SVF task, the word count of each test was calculated by counting the number of semantically correct responses subtracting the repetitions. We compared both groups' SVF performance across both repeated SVF trials with a significant trial-to-trial improvement in SVF word count considered to represent a practice effect. For group comparisons we calculate non-parametric Kruskal Wallis tests and for within-group tests of repeated assessments we use Wilcoxon signed rank tests.

Results

Results show that both groups differ significantly in word count in both the first (x2=6.12, p<.05, d=.50) as well as the second SVF trial (x2=12.54, p<.001, d=.77) with the second trial showing a more pronounced difference between both groups. Investigating the difference in trial performance within both groups, we see a significant improvement of SVF performance in the cognitively intact participants group but not in the CI group; compare also Figure 1. These results indicate that only those not cognitively impaired benefit from the repeated administration of the SVF and show practice effects and that this leads to a more visible spread in the performance of both groups during the second trial.

Conclusion

Overall, we present evidence showing that a repeated administration of a widely adopted neuropsychological assessment such as the SVF might be beneficial for distinguishing those with and without cognitive impairment. Given that only cognitively intact participants improved their performance, practice effects could be a valuable and efficient measure derived from such standard widely adopted cognitive assessments. Semantic verbal fluency tasks are straightforward to administer, making them a practical tool for identifying individuals in early stages of dementia who may warrant further cognitive evaluation or dementia diagnostics. Those results could have implications for screening and cognitive assessments not only in clinical trials but also in general healthcare.

Disclosure

JT, LS, NL and AK are employed by the speech biomarker company ki:elements. JT and NL hold shares in the speech biomarker company ki:elements. The other authors have nothing to disclose.

References

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