

Clinical relevance of demographically adjusted nonlinear Z-scores for cognitive testing of patients with FTLD-spectrum disorders

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State of the art: Precise normative adjustments are essential to optimize use of neuropsychological tests in clinical practice for detecting cognitive impairment and decline. Raw neuropsychological test scores are typically transformed to Z-scores for detecting cognitive decline using linear corrections for age, sex, and education. However, for FTLD spectrum disorders, linear adjustments are problematic because linearity of effects does not extend to younger ages and consequently Z-scores for younger subjects are inflated, leading to over-diagnosis.

Methodology: Linear correction of Z-scores for demographic predictors has been extended to an approach that can capture non-linear effects for tests that potentially include floor or/and ceiling effects on the scores. The models also allow differential nonlinear corrections with respect to race and ethnicity as proxies for social disadvantage with the goal being to improve interpretation of test results in minority populations. Z-scores generated using linear, nonlinear, as well as previously published normative data approaches were compared for different neuropsychological tests across a range of demographic predictor combinations. The different Z-scores were tabulated and clinically interpreted to determine under which conditions each test proved most informative.

Results: Z-scores of neurocognitive scores based on nonlinear correction were more consistent with clinical expert interpretation of test results for predicting cognitive impairment associated with FTLD symptoms compared to linear and traditional approaches.

Conclusion: Demographically adjusted Z-scores using nonlinear models improve clinical interpretation of cognitive performance and have the potential to improve detection of cognitive impairment in FTD (and other dementias) and potentially inform with respect to differential diagnosis.

Conflicts of interest

N/A