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Nonlinear Z-score Modeling Minimizes Ceiling and Floor Effects of the Uniform Data Set Neuropsychological Measures for Frontotemporal Lobar Degeneration (FTLD)-Spectrum Disorders

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State of the art: Neuropsychological impairments in FTLD spectrum disorders are typically determined by comparing the performance of patients to normative samples adjusting for demographic characteristics. Typical linear corrections can under or overestimate impairments for FTLD, especially in younger individuals. We have previously shown that nonlinear demographic adjustments of Uniform Data Set (UDS) neuropsychological tests improve demographic corrections for FTLD. Despite these improvements, many tests further suffer from ceiling and/or floor effects when test items are too easy or too challenging for participants, which can lead to biased results if not adequately addressed.

Methodology:
Clinically normal participants (n=8,030) from the National Alzheimer's Coordinating Center who completed the UDS neuropsychological tests were used to develop shape constrained additive censored (SCAC) models that appropriately account for ceiling and/or floor effects using the method of modified maximum likelihood. SCAC model fits were generated with nonlinear monotonic correction for age, education, sex, race/ethnicity, and interactions between each of the predictors and age. Furthermore, another additive model was fitted to estimate nonlinear variation in standard deviations with respect to age and race/ethnicity.

Results: Scores on most neurocognitive tests exhibited clear nonlinear relationships with age that differed by education, sex, and race/ethnicity. Heterogenous variance was observed with respect to age and across racial/ethnic groups. Results generated from the new models accounting for floor and ceiling effects provided an improved fit to the normative data.

Conclusion: Adjusting Z-scores using SCAC models provides improved correction for age, education, sex, race/ethnicity, and ceiling/floor effects in correction tables.

Conflicts of interest

No.