MCI performance classification improves with a brief vocabulary test

Scores on cognitive tests in the bottom 7% of normative distributions are consistent with the possible diagnosis of mild cognitive impairment (MCI). The identification of patients with MCI is improved by correcting for the influence of demographic factors such as Age, Education, and Gender (AEG), on performance. Here, we evaluated whether estimates of premorbid verbal IQ derived from a brief vocabulary test would further improve classification accuracy.

METHODS. We obtained vocabulary scores from 441 healthy adults (mean age = 65.1 ±14.4) using the 4-min vocabulary subtest of the California Cognitive Assessment Battery (CCAB). The vocabulary subtest included 24 multiple choice items that adapted in difficulty based on the examinee responses using a 2:1 staircase with adjustable step sizes (Figure 1). Tests were telemedically administered in participants' homes by an experienced proctor who monitored performance via a web-based interface.

RESULTS. Unlike cognitive measures of fluid intelligence, vocabulary scores improved significantly with Age ($r = 0.25$, $p < 0.001$, Figure 2). Scores were also higher for participants with more education and female gender. Vocabulary z-scores were therefore calculated after correcting for the influence of Age, Education, and Gender. Vocabulary z-scores correlated significantly with total recall scores on the Bay Area Verbal Learning Test (BAVLT, $n = 398$ participants, $r = 0.35$, $p < 0.001$) and significantly improved model fit when added to AEG regressors ($z = 2.1$, $p< 0.02$ one tailed)L the AEG model accounted for 25.6% of BAVLT score variance, whereas the AEG+vocabulary (AEG+V) model accounted for 34.7% of variance. AEG and AEG+V models classified different participants in the MCI performance range: 44% of participants in the lowest 7% of scores in the AEG+V model fell within the normal range in the AEG model, while 32% of participants classified as MCI in the AEG model fell within the normal range on the AEG+V model (Figure 3).

DISCUSSION: The current results suggest that a brief vocabulary test improves MCI classification accuracy among older participants.

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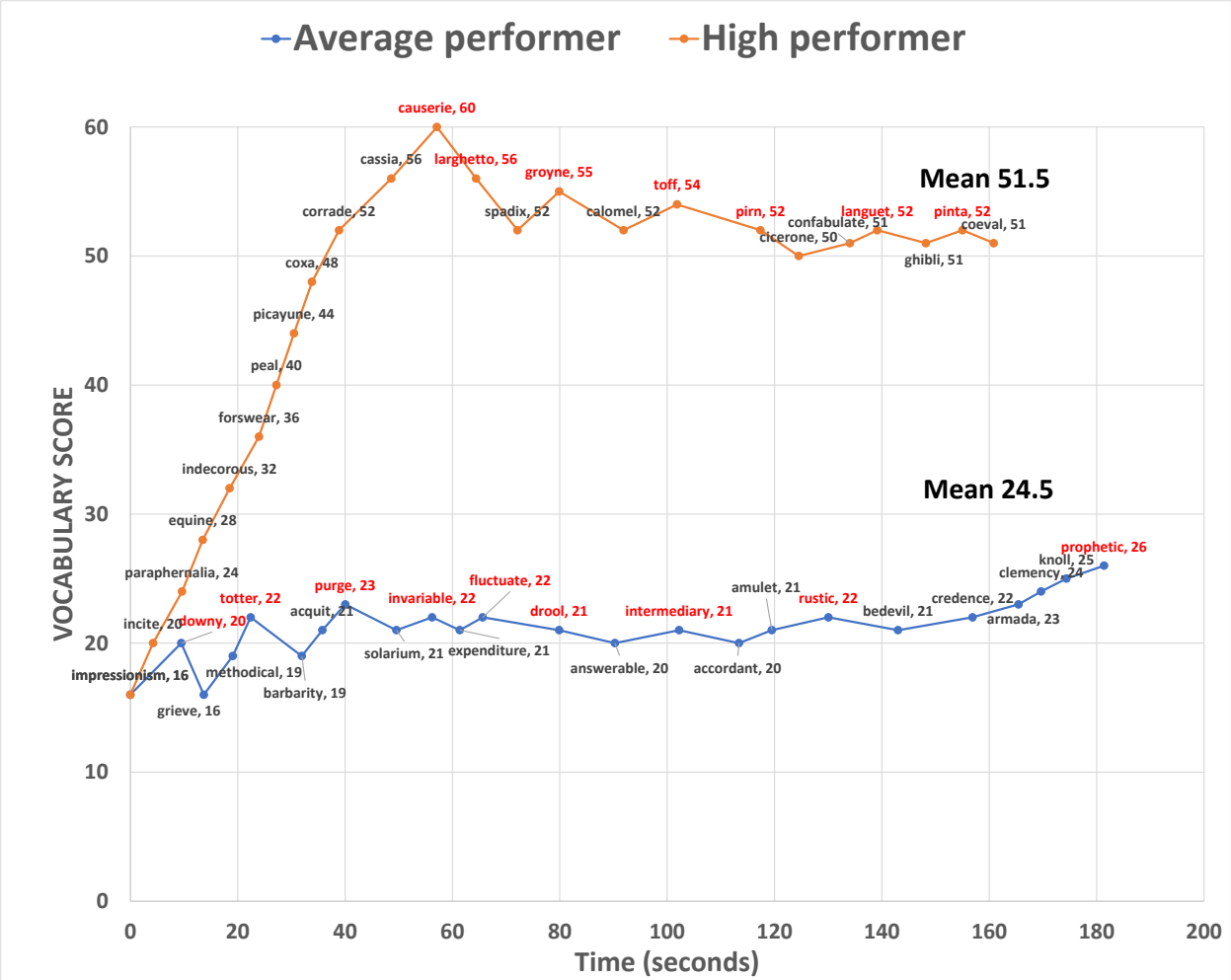

Figure 1. The adaptive CCAB vocabulary test. Participants were presented with 24 multiple choice trials. Difficulty was adapted over 60 levels beginning with large step sizes which were reduced following reversals. The data from two participants are shown along with the words presented, level, and accuracy (black = correct, red = error).

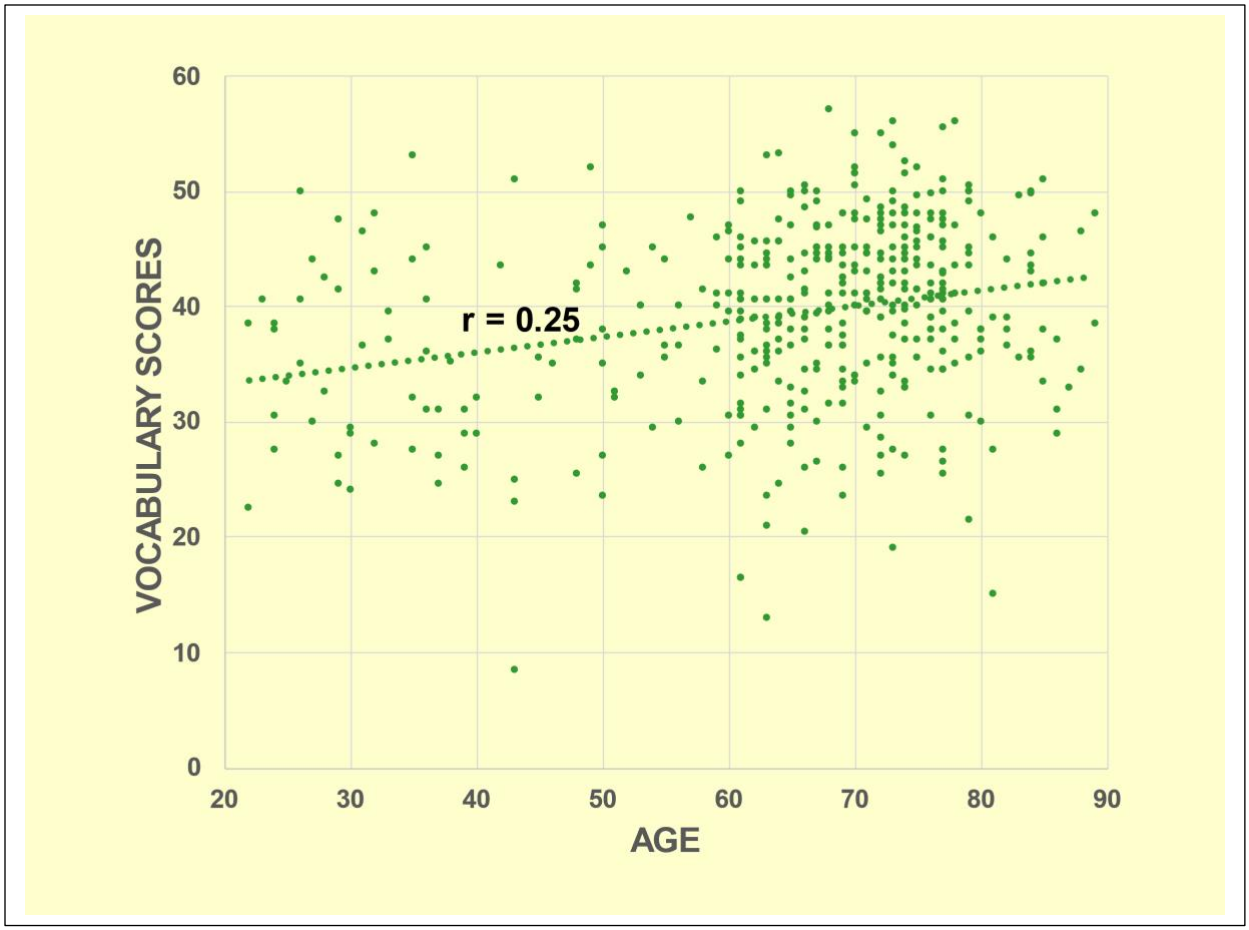

Figure 2. Vocabulary scores as a function of participant age.

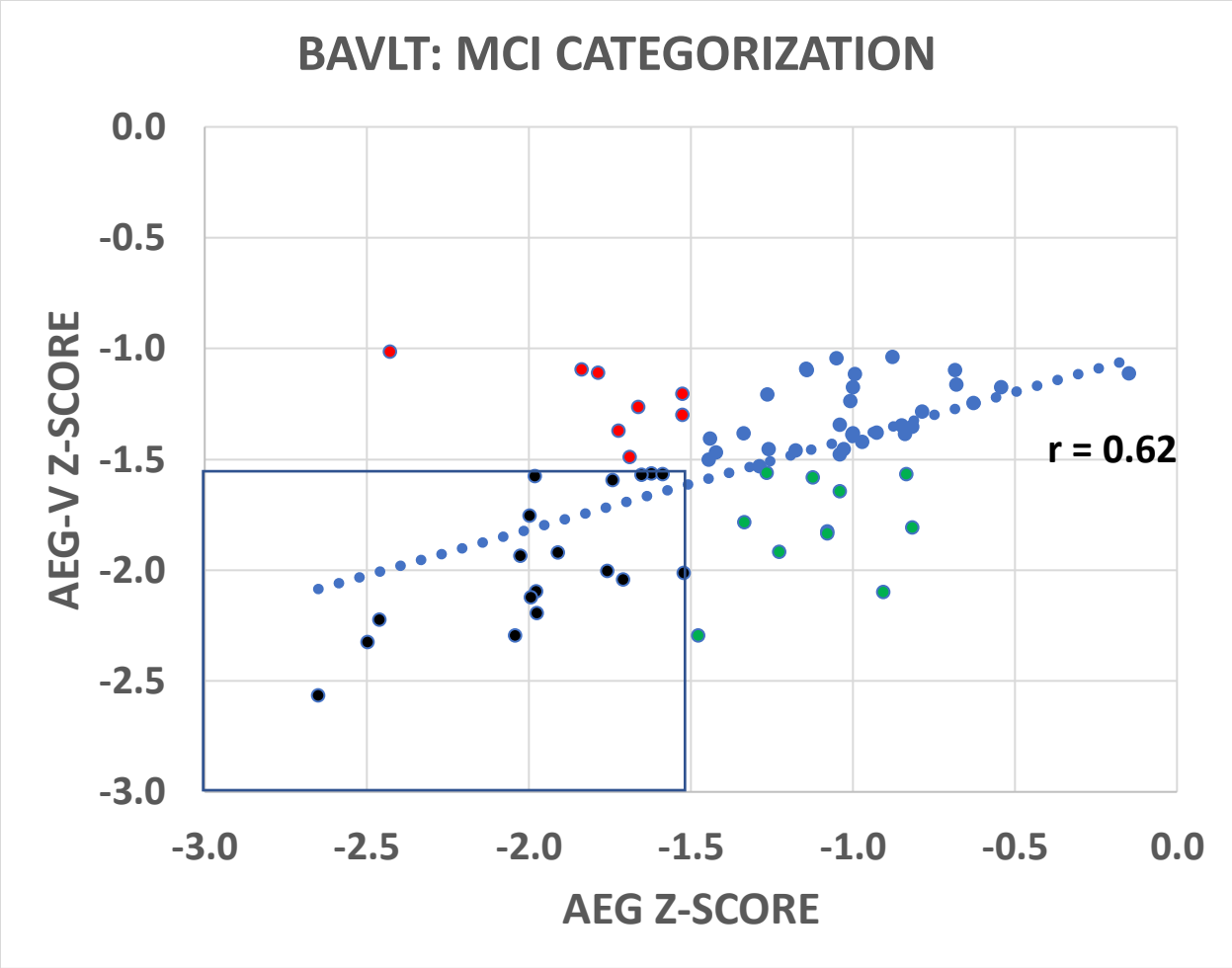

Figure 3. MCI-level performance with and without vocabulary z-score regression. The black box in the lower left shows the z-scores of participants (black dots) falling within the bottom 7% of AEG+V and AEG z-score distributions. Participants above the box (red dots) had abnormal AEG z-scores but were within the normal range for AEG+V scores. Participants on the right of the box (green dots) had abnormal AEG+V scores but fell within the normal range on AEG scores. The correlation of AEG and AEG+V z-scores over the range of participants with MCI-level performance on either measure was r = 0.62.