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### 30 Item response theory and differential item functioning of the AD8: The High School & Beyond Study

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**Objective:** The AD8 is a validated screening instrument for functional changes that may be caused by cognitive decline and dementia. It is frequently used in clinics and research studies because it is short and easy to administer, with a cut off score of 2 out of 8 items recommended to maximize sensitivity and specificity. This cutoff assumes that all 8 items provide equivalent "information" about everyday functioning. In this study, we used item response theory (IRT) to test this assumption. To determine the relevance of this measure of everyday functioning in men and women, and across race, ethnicity, and education, we conducted differential item functioning (DIF) analysis to test for item bias.

**Participants and Methods:** Data came from the 2021 follow up of the High School & Beyond cohort (N=8,690; mean age  $57.5 \pm 1.2$ ; 55% women), a nationally representative, longitudinal study of Americans who were first surveyed in 1980 when they were in the 10th or 12th grade. Participants were asked AD8 questions about their own functioning via phone or internet survey. First, we estimated a one-parameter (i.e., differing difficulty, equal discrimination across items) and two-parameter IRT model (i.e., differing difficulty and differing discrimination across items). We compared model fit using a likelihood-ratio test. Second, we tested for uniform and non-uniform DIF on AD8 items by sex, race and ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic), education level (high school or less, some college, BA degree or more), and survey mode

(phone or internet). We examined DIF salience by comparing the difference between original and DIF-adjusted AD8 scores to the standard error of measurement of the original score.

**Results:** The two-parameter IRT model fit the data significantly better than the one-parameter model, indicating that some items were more strongly related to underlying everyday functional ability than others. For example, the "problems with judgment" item had higher discrimination (more information) than the "less interest in hobbies/activities" item. There were significant differences in item endorsement by race/ethnicity, education, and survey mode. We found significant uniform and non-uniform DIF on several items across each of these groups. For example, for a given level of functional decline (theta) White participants were more likely to endorse "Daily problems with thinking/memory" than Black and Hispanic participants. The DIF was salient (i.e., caused AD8 scores to change by greater than the standard error of measurement for a large portion of respondents) for those with a college degree and phone respondents.

**Conclusions:** In a population representative sample of Americans ~age 57, the items on the AD8 contributed differing levels of discrimination along the range of everyday functioning that is impacted by later life cognitive impairment. This suggests that a simple cut-off or summed score may not be appropriate since some items yield more information about the underlying construct than others. Furthermore, we observed significant and salient DIF on several items by education and survey mode, AD8 scores should not be compared across education groups and assessment modes without adjustment for this measurement bias.

**Categories:** Dementia (Alzheimer's Disease)

**Keyword 1:** cross-cultural issues

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