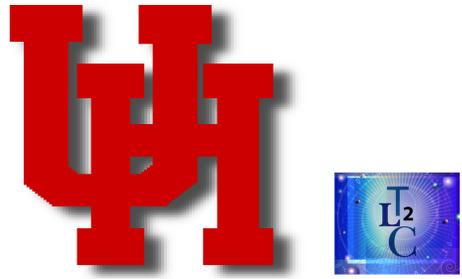


# Cognitive Reserve as a Moderator for the Relationship between Depression and Cognitive Functioning in Alzheimer's Disease



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## Introduction

- Depression is one of the most prevalent non-cognitive correlates of AD, with prevalence estimates most commonly 30-50%.
- The effect of depression on cognition in AD has not been consistently demonstrated; however, evidence suggests reduced performance on measures of processing speed and attention in depressed patients with AD.
- Cognitive reserve is thought to delay the onset and slow the progression of cognitive impairments in AD. By the same reasoning, cognitive reserve may protect against the effects of depression on cognition in patients with AD.
- Educational and occupational attainment, as well as higher scores on mental ability tests, are correlated with cognitive reserve. These same variables are significantly related to better functioning and coping after brain injury or disease.
- The present study aimed to examine the effects of cognitive reserve on the relationship between depressive symptoms and performance on neuropsychological tests in patients with probable AD.
- Hypothesis: Cognitive reserve moderates the relationship between depressive symptoms and performance on neuropsychological tests in patients with probable AD.

## Participants

- Prospectively collected longitudinal data was obtained from the Baylor College of Medicine Alzheimer's Disease and Memory Disorders Center.
- Inclusion criteria included meeting NINCDS-ADRDA criteria for probable AD and MMSE score > 14 so as to only include patients who could adequately report their depressive symptoms on the GDS (n = 520).
- The final sample was 67% female and the mean age was 74.63 years (SD = 7.97).

## Method

- Correlations were calculated between scores on all selected tests administered (see Table 1).
- An ordinary least squares regression model was used to predict performance on neuropsychological tests from GDS scores and AMNART estimated IQ scores.
- Further regression analyses were conducted on patients with mild AD (MMSE ≥ 20) to determine whether AMNART scores moderated the relationship between depressive symptoms and processing speed in this subset of the sample.

Table 1. Tests Administered and Descriptions of Cognitive Functions Measured

TESTS ADMINISTERED	COGNITIVE FUNCTION MEASURED
American National Adult Reading Test (AMNART)	Cognitive Reserve
Geriatric Depression Scale (GDS)	Depressive symptoms
Mini Mental State Examination (MMSE)	Global mental status
Alzheimer's Disease Assessment Scale (ADAS)	Cognitive dysfunction in AD
Wechsler Memory Scale-Revised (Logical Memory I and Visual Reproduction I subtests)	Episodic memory (Verbal and Visual)
Controlled Oral Word Association Test (COWA; letters FAS)	Phonemic Fluency
Animals	Semantic Fluency
Verbal Series Attention Test (VSAT; total time and errors)	Attention and psychomotor speed

## Results

- Cognitive reserve was significantly related to performance on all of the neuropsychological measures administered. Depressive symptoms were significantly related to processing speed and phonemic fluency.
- Cognitive reserve demonstrated incremental validity, over and above depressive symptoms, in predicting cognitive test performance.
- Cognitive reserve accounted for significant variance over and above depressive symptoms for processing speed (12%), verbal episodic memory (7%), visual episodic memory (5%), phonemic fluency (20%), and semantic fluency (5%); but not for overall level of cognitive dysfunction (ADAS).
- In multiple regression analyses, the interaction between GDS and AMNART scores approached significance in predicting performance on VSAT time. Thus, additional analyses on this variable were conducted after grouping the subjects by AD severity.
- Regression analyses conducted on patients with mild AD showed a significant interaction between GDS and AMNART scores when predicting VSAT time ( $p < .05$ ). This suggests that cognitive reserve moderates the relationship between depressive symptoms and processing speed in these patients (Figure 1 & 2).

Figure 1. Effect of Cognitive Reserve and Depressive Symptoms on VSAT Time (Attention/Psychomotor Speed—Lower Values Better, N = 299).

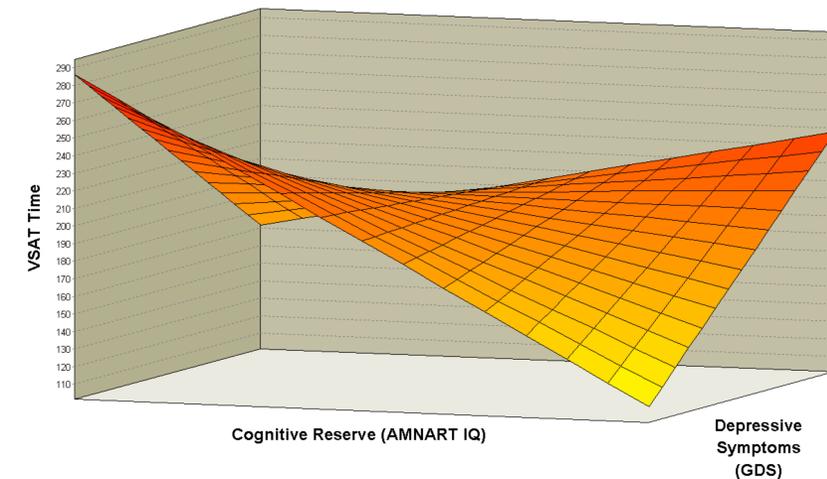
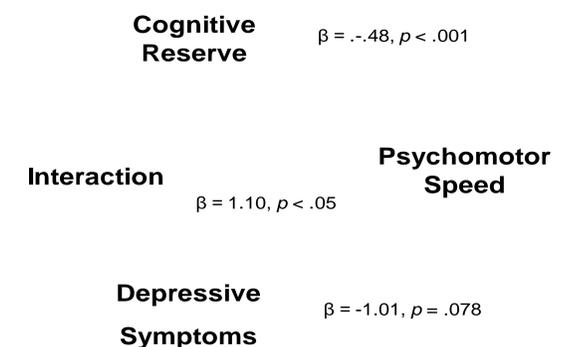


Figure 2. Standardized Regression Coefficients for the Effect of Cognitive Reserve, Depressive Symptoms, and the Interaction in Predicting Psychomotor Speed (N = 299)



## Conclusions

- Results from this study showed that depressive symptomatology is not a reliable predictor of performance on neuropsychological testing in patients with AD.
- However, cognitive reserve (either independently or by association with educational and occupational achievement) consistently predicts and accounts for significant variance in cognitive ability.
- Cognitive reserve moderated the relationship between depressive symptoms and psychomotor speed in patients with mild AD. Patients with high cognitive reserve and fewest depressive symptoms performed best on a speeded task. The attention/psychomotor speed of AD patients with high cognitive reserve was more negatively affected by depressive symptoms than that of patients with lower cognitive reserve.