ALZselftest™

Research has shown that the ALZselftest™ detects deficits in numerous cognitive domains with a high degree of accuracy.

OVERVIEW

- The **ALZselftest** is a new online test designed to assess cognitive functions for signs of impairment or Alzheimer's Disease (AD).
- The **ALZselftest** evaluates orientation, visuo-spatial abilities, verbal fluency, memory, attention, and executive processing.
- The **ALZselftest** is easily self-administered with basic computer skills, or can be administered by a caregiver, family member or primary care physician in the home or office.

BACKGROUND

- As many as 5 million Americans are living with Alzheimer's Disease (AD) and by 2050,10 million 'Baby Boomers' will develop AD.
- 60% of the patients with early indicators of AD may go undiagnosed in the primary care setting.
- Domain Specific Cognitive Patterns (DSCP) offer promise in discriminating between Normal, MCI and stages of AD.
- Tracking several cognitive domains (DSCP) over time may prove superior to tracking a single specific domain alone (e.g. memory or attention).

METHODS

- This study consisted of 101 total subjects (54 female; 47 male) with a mean age of 74.76.
- We compared AD and Control (C) groups as well as diagnostic categories within the AD group; Mild Cognitive Impairment (MCI); Early AD; Mild to Moderate AD; Moderate to Severe AD.
- The AD patients met all criteria set forth by the NINCDS/ADRDA and DSM - IV. All patients completed the **ALZselftest** prior to routine neurocognitive procedures, including Mini Mental State Examination (MMSE), Test of Executive Functions (EF), Verbal Fluency (VF) and the Geriatric Depression Scale (GDS).
- For comparisons between groups we utilized the Kruskal-Wallis test. We employed Discriminant Analysis (DA) to determine the efficacy of the **ALZselftest** and MMSE in classification of the five experimental groups.
- The **ALZselftest** is scored on a scale of 30 possible points.
- **FIGURE 1**, **FIGURE 2** and **FIGURE 3** show actual screens from the **ALZselftest**

- Screens for the **ALZselftest**

FIGURE 1
Clock Number Interface

FIGURE 2
Animal Naming Interface

FIGURE 3
Animal Naming and Memory for words interface

RESULTS

- **TABLE 1** shows the scoring scale and data range from this study. From left to right are the group, the range, standard deviation, mean and 95% confidence intervals.
- **FIGURE 4** shows significant differences between AD and Control for all routine neurocognitive measures administered to patients presenting to the memory disorder clinic.
- **FIGURE 5** shows the significant differences between AD and Control for domains within the **ALZselftest**.
- **FIGURE 6** shows significant differences between AD and Control for domains within the MMSE .
- The total score for the **ALZselftest** correlates with the total score for the MMSE at significant levels r (.668)†.

† = SIGNIFICANT < .01

- Scoring Scale and Data Range of Study

DIAGNOSTIC GROUP	RANGE	SD	MEAN	95% CI
0 = NORMAL	27.00–30.00	1.20	29.03	26.60–29.50
1 = MCI	26.00–30.00	.998	27.61	27.18–28.03
2 = EARLY AD	24.00–26.00	.852	25.00	24.46–25.54
3 = MILD TO MODERATE	22.00–25.00	.997	23.07	22.50–23.65
4 = MODERATE TO SEVERE	11.00–22.00	2.66	18.70	17.45–19.94

TABLE 1
Scoring scale and data range from this study for standardization. In the table from left to right are the group, the range, standard deviation, mean and 95% confidence intervals.

- **FIGURE 7** and **FIGURE 8** show the results of DA using the **ALZselftest** and MMSE for the same random sample. **FIGURE 9** shows the results of DA for the **ALZselftest** for the entire sample. **FIGURE 10** shows the plotted Chi-Square values for each diagnostic group compared to (C), illustrating the domain specific cognitive patterns (DSCP) for each group.
- Logistic regression procedures indicate both **ALZselftest** (97%) and MMSE (83%) detect cognitive deficits with significant accuracy; however, the **ALZselftest** classifies groups more accurately. Moreover, the **ALZselftest** discriminates between Control, MCI and subtypes of AD with 93% accuracy while the MMSE shows only 67% accuracy in this respect.

- Comparisons between AD and Control Groups

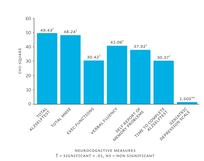

FIGURE 4
Routine neurocognitive procedural measurements administered to patients presenting to the memory disorders clinic, Significant Differences between AD and Control groups
The AD group shows significant deficits in almost all neurocognitive measures except the GDS. The AD group scores lower on **ALZselftest** and MMSE total scores, test of executive functions, and verbal fluency. The AD group self-reports memory problems higher than controls and took more time to complete the **ALZselftest** than controls.

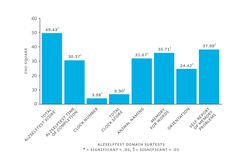

FIGURE 5
Significant Differences for ALZselftest domain subtests between AD and Control groups
The AD group shows significant deficits in numerous cognitive domains as measured by **ALZselftest**, including, verbal fluency, visuo-spatial construction, memory, processing speed, orientation, executive functions and the total score. The AD group self-reports memory problems significantly higher than controls.

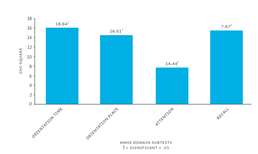

FIGURE 6
Significant Differences for MMSE domain subtests between AD and Control groups
The AD group shows significant deficits in orientation to time and place, attention and recall. The listed domains show the only significant differences between groups.

- Discriminant Analysis **ALZselftest** / MMSE

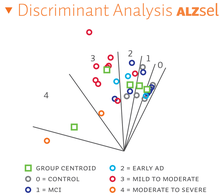

FIGURE 7
MMSE: Classification of groups (random sample) with 67% accuracy
Results of discriminant analysis on random sample of 42 subjects (20 AD and 22 controls). The first two functions account for 90.6% of the variance with Eigenvalues of (3.298) and (1.121) and Wilks' Lambda .073, p = .000 and .314, p = .025. The MMSE classifies 67% of the groups accurately.

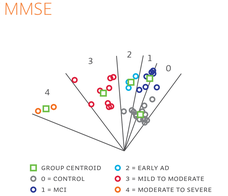

FIGURE 8
ALZselftest: Classification of groups (random sample) with 95% accuracy
Results of discriminant analysis on random sample of 42 subjects (20 AD and 22 controls). The first two functions account for 91.5% of the variance with Eigenvalues of (11.905) and (3.883) and Wilks' Lambda .006, p = .000 and .076, p = .000. The **ALZselftest** classifies 95% of the groups accurately.

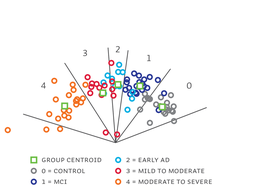

FIGURE 9
ALZselftest: Classification of AD/MCI groups with 93% accuracy
Results of Discriminant analysis for the entire sample for **ALZselftest**. The first two of four discriminant functions are shown. These functions account for 97.3% of the variance with Eigenvalues of (9.306) and (.675) and Wilks' Lambda of .045, p = .000 and .460, p = .002. These functions accurately classify 93.1 percent of the groups.

RESULTS (CONTINUED)

- Domain Specific Cognitive Patterns (DSCP)

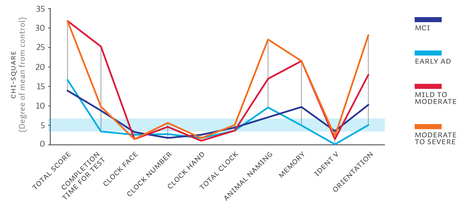

FIGURE 10
Domain Specific Cognitive Patterns associated with Alzheimer's Disease and Mild Cognitive Impairment
Results of comparison between stages of AD, MCI and controls for **ALZselftest** domain subtests. Plotting the degree of each groups' difference from the mean of the control group illustrates Domain Specific Cognitive Patterns associated with MCI and each stage of AD.

CONCLUSIONS

- The **ALZselftest** and MMSE both exhibit sensitivity to cognitive deficits. The **ALZselftest** appears more sensitive to deficits in numerous cognitive domains within MCI and diagnostic categories of AD as compared to MMSE. These domain specific cognitive patterns offer the possibility to detect AD or MCI earlier and more efficiently.
- The **ALZselftest** shows superior ability to discriminate between the normal and AD groups in addition to the AD/MCI groups as compared to MMSE.
- The **ALZselftest**, unlike the MMSE and other assessment instruments does not require professional administration, allowing for continuous monitoring by self, caregiver, family member or primary care physician.
- The **ALZselftest** may also prove important in differentiating between AD and other types of dementias, including vascular dementia, diffuse Lewy body disease, and dementia associated with Parkinson's disease.
- The **ALZselftest** is easily accessible via the Internet and offers an objective, standardized, rapid and reliable assessment of verbal fluency, memory, attention, orientation, executive functions and visuo-spatial construction without a high demand on motor functions (i.e. writing and drawing).
- Further research is planned to confirm and expand on the results of this study.

SOURCE

All research data from The Computer Self Test (CST): A Computerized Internet Accessible Cognitive Screening Test for Dementia study conducted at the University of Tennessee Medical Center.

Study conducted by Dr. John Dougherty, Jr., Rex Cannon, Andrew Dougherty, Lorin Hall, Jennifer Janowitz and Felicia Hare

ONGOING

Further research is continuing to be carried out on the **ALZselftest**. If you are interested in becoming a research partner, please contact us through our website.

For more information, visit:

WWW.ALZSELFTEST.COM

ALZselftest™

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