

A normative study of the  
CERAD neuropsychological  
assessment battery in a Finnish  
elderly population

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# CERAD

- **CERAD** = The **C**onsortium to **E**stablish a **R**egistry for **A**lzheimer's **D**isease was established in 1986 to standardize procedures for the evaluation and diagnosis of patients with Alzheimer's disease (AD).
- A procedure to obtain information on the natural history of AD, its clinical, neuropsychological, and neuropathological correlations; its family history; and behavioral and associated personality changes
- The neuropsychological assessment
  - verbal fluency,
  - confrontational naming,
  - the Mini-Mental State examination,
  - measures of verbal learning, recall and recognition,
  - and constructional praxis performance and recall.

# CERAD

## neuropsychological assessment in Finland

- A national network of specialists working with memory disorders → Finnish Alzheimer Research Society
- Recommendation for the use of the CERAD neuropsychological assessment battery in screening of memory disorders in Finland
  - Hänninen et al. Suomen Lääkärilehti 1999;54:1967-1975.
- CERAD cognitive assessment battery. Manual and test material.
  - Pulliainen et al. (eds,). 1999, Finnish Alzheimer Research Society. New unchanged edition 2005
  - <http://www.neuro.fi/cerad.htm>
  - Pulliainen et al. Suomen Lääkärilehti 2007;12:1235 – 1241.

Progressive memory problems, age 55 or over

CERAD battery performed in a primary care unit

Scores for all subtests normal: a disease resulting in dementia is not propable

Scores for memory tests normal, minor problems in other tests: a follow-up in primary care

Scores for memory tests or several other below cut-off: a referral to diagnostic evaluation

Diagnostic evaluation and beginning of treatment in a special health care unit

Further follow-up in a primary health care unit

# CERAD neuropsychological assessment battery

1. Verbal Fluency
2. Modified Boston Naming Test
3. Mini-mental State Examination
4. Word List Memory
5. Constructional Praxis (Copying)
6. Word List Recall
7. Word List Recognition
8. Recall of Constr. Praxis (Copying)
9. Clock Drawing (not included in the original CERAD protocol)

Table 1. Demographic characteristics of the sample and the age- and education-specific subgroups (mean  $\pm$  SD)

	<b>Women</b> n = 211	<b>Men</b> n = 110	<b>All</b> n = 321
<b>Age, years</b>	70,6 (4,0)	70,7 (4,4)	70,6 (4,1)
63–70	67,5 (2,1)	67,2 (1,9)	67,4 (2,1)
71–79	73,6 (2,5)	74,8 (2,3)	73,9 (2,6)
<b>Education, years</b>	9,6 (3,3)	9,8 (3,8)	9,7 (3,5)
4–8	6,9 (1,1)	6,8 (1,2)	6,9 (1,1)
9–21	11,9 (2,8)	12,7 (3,1)	12,2 (2,9)

# The effect of age, gender and education

- Age had the effect on 3 / 9, gender 5 / 9 and education 7 / 9 variables
- Age explained 4.4% of variance in Wordlist sum of 3 trials
- Gender explained 7.6% in Wordlist sum,
- Education explained between 10.8-11.5% in MMSE, Naming and Copying

# Mean, SD and percentiles of the subtests of CERAD neuropsychological battery

Subtest	n	Mean (SD)	Percentile 5, 10, 25
Verbal Fluency	315	20,6 (5,7)	12, 14, 16
Naming	319	12,9 (1,9)	9, 10, 12
MMSE	321	27,5 (1,7)	24, 25, 26
Wordlist, sum of 3 trials	321	19,8 (3,6)	14, 15, 17
Wordlist delayed, savings %	321	83,2 (16,0)	50, 61, 71
Wordlist delayed, recognition %	321	95,4 (6,2)	80, 86, 95



# Mean, SD and percentiles of the subtests of CERAD neuropsychological battery

Subtest		Mean (SD)	Percentile 5, 10, 25
Copying	<b>312</b>	<b>9,8 (1,5)</b>	<b>7, 7, 8</b>
Copying, delayed %	<b>311</b>	<b>73,9 (28,8)</b>	<b>0, 25, 60</b>
Clock Drawing	<b>314</b>	<b>5,2 (1,1)</b>	<b>3, 4, 5</b>

# Presently used cut-off scores and 5 and 10 percentile scores in the study

CERAD subtest	cut-off	5th p	10th p
Verbal fluency	<15	12	14
Naming	<11	9	10
MMSE	< 25	24	25
Wordlist sum	-	14	15
Wordlist savings %	<80	50	61
Wordlist recognition %	<80	80	90
Copying	-	7	7
Copy savings %	<60	0	25
Clock Drawing	<5	3	4

# Conclusions

- The study provides population based normative data that can be used for both clinical and research purposes.
- Demographic factors had quite minor effect on test performance in this sample
- Limitations for the use in different populations need to be considered.
  - Limited range of age and education
- Cut-off points for some subtests need adjustment, but the sensitivity and specificity values must be considered in patient groups.