

# Screening of Early Dementia

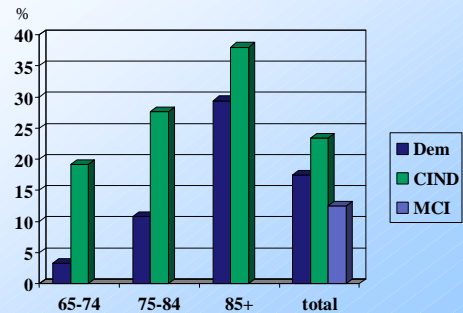
9th Nordic Meeting of Neuropsychology

Göteborg, Sweden

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## Prevalence of dementia and mild cognitive impairment by different age groups (above 65)



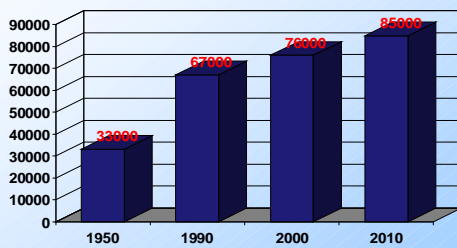
Unverzagt, Gao et al. Neurology 2001;57:1655-1662. & Viramo P, Sulkava R. 2001

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## Number of patients with moderate to severe dementia in Finland



- if milder forms are included, there are 130.000 people suffering from dementia in 2010
- >30% people over 65 suffer from memory lapses, that is 300.000 people

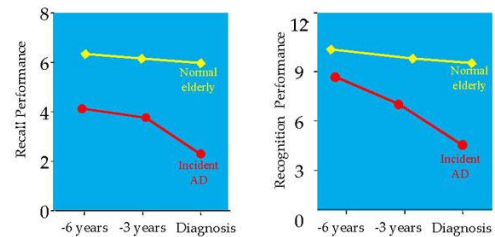
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## Memory performance in persons that will develop AD in the general population: results from the Kungsholmen Project

Bäckman et al, Brain 2002



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## Tests predicting dementia

### • Memory:

- Word list learning: immediate or delayed recall (Flicker ym.-91, Masur ym.-94, Jacobs ym.-95, Hänninen ym.-95, Albert ym.-96, Tierney ym.-96, Chen ym.-00)
- Object Memory, Logical Memory, Visual Reproduction, MMSE memory task, Associative Learning (Jacobs ym.-95, Linn ym.-95, Elias ym.-00, Albert ym.-96, Small ym.-00)

### • Executive functions and attention:

- Verbal fluency, Mental Control, Trail-Making, Digit Symbol (Linn ym.-95, Tierney ym.-96, Albert ym.-96 ja 2001)

### • Verbal functions:

- Boston Naming, Similarities (Jacobs ym.-95, Elias ym.-00)

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## Topics today

- Laura Hokkanen: THE CERAD EXPERIENCE SHARED: NORMS ACROSS COUNTRIES AND CULTURES
- Tuomo Hänninen: A NORMATIVE STUDY OF THE CERAD NEUROPSYCHOLOGICAL ASSESSMENT BATTERY IN A FINNISH ELDERLY POPULATION
- Mona Sotaniemi: CERAD -TEST BATTERY IN THE PREDICTION OF DEMENTIA IN MCI PATIENTS
- Andreas Monsch: IN SEARCH OF PRESYMPTOMATIC COGNITIVE MARKERS OF ALZHEIMER'S DISEASE

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## THE CERAD EXPERIENCE SHARED: NORMS ACROSS COUNTRIES AND CULTURES

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### CERAD = The Consortium to Establish a Registry for Alzheimer's Disease

- Started in USA in 1986 to standardize procedures for evaluation and diagnosis of AD
  - Neuropsychological, Neuropathological, Neuroimaging and Neuropsychiatric tools
  - <http://cerad.mc.duke.edu/>
- Finnish version of the CERAD Neuropsychological Battery
  - Publication in 1999 (Pulliainen, Hokkanen, Salo, Hänninen) by Finnish Alzheimer's Disease Research Society
  - also available in Swedish
  - Estonian version under preparation

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### CERAD - Battery in use or translated

- |                  |               |
|------------------|---------------|
| n Australia      | n Ireland     |
| n Austria        | n Israel      |
| n Bulgaria       | n Italy       |
| n Canada         | n Japan       |
| n China          | n Jamaica     |
| n Czech Republic | n Korea       |
| n England        | n Netherlands |
| n Finland        | n Portugal    |
| n France         | n Spain       |
| n Germany        | n Switzerland |

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### CERAD Assessment Battery

- Verbal Fluency: Animal category
- Naming
- Mini-Mental State Examination
- Word List Memory
- Constructional Praxis
- Word List Recall
- Word List Recognition
- Constructional Praxis - Recall
- Clock Drawing  
(copy)

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### Verbal Fluency

- Name all the animals you can in one minute
- 'Frontal' executive functions, fluency and control
- Semantic memory
- Verbal production
- Finnish cut point < 15 correct words
- Qualitative features in dementia: perseveration, intrusions

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### Subset of Boston Naming Test

- 15 line drawings: 5 high frequency, 5 medium, 5 low frequency items
- bed, toothbrush, scissors, mushroom, clothespin, violin, rhinoceros, hut, canoe, pyramid, penguin, stilts, sphinx, beaver, pelican (Finnish)
- tree, bed, whistle, flower, house, canoe, toothbrush, volcano, mask, camel, harmonica, tongs, hammock, funnel, dominoes (USA)
- tree, bed, whistle, flower, house, boat, toothbrush, volcano, mask, camel, harmonica, tongs, hammock, funnel, dominoes (Brazilian)
- No semantic or phonetic cuing
- Relatively easy task in normal aging
- Finnish cut point < 11
- Language ability, education affects

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### Mini-Mental State Examination (MMSE)

- n 'Consensus version' in Finland
- n Folstein et al 1975
- n Emphasis on orientation (one third of the total score)
- n only 1/10 of the total score from delayed memory
- n Still an important tool in screening
- n Finnish cut point < 25

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### World List Memory, Learning

- n List from ADAS-Cog -test
- n 10 printed words read by the subject
- n 3 learning trials, immediate recall
- n Episodic, verbal memory
- n Flat learning curves in dementia
- n Flat learning curves also in depression
- n No Finnish cut point given thus far, work in progress

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### Word List Recall and Recognition

- n Delayed recall after approx. 5 mins
- n In normal aging and depression delayed recall and recognition unimpaired
- n Most valuable in screening for Alzheimer's disease
- n Savings % used in delayed recall; relative to 3rd learning trial
- n Both correct hits and correct rejections counted in recognition
- n Finnish cut point < 80%

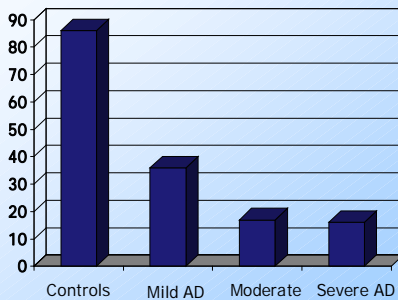
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### Word List Recall (Savings %)

Welsh et al Arch Neurol 1991



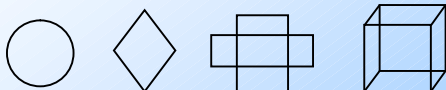
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### Constructional Praxis and Recall

- n Figures from ADAS-Cog -test:



- n Cut point for recall < 60% (relative to copy)
- n Recall important in detecting dementia, copying in differential diagnosis and follow-up

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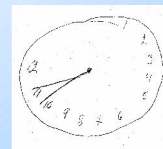


### Clock Drawing Test

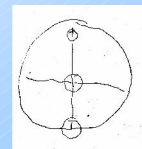
- n 'Draw a clock with all the numbers inside and clock hands at 11.10'
- n Visuo-spatial organization and planning
- n Easy in normal aging, impaired in dementia
- n Cut point < 5 (max 6)
- n Copy as an additional task, differentiate between aetiologies?



MMSE=24



MMSE=22



MMSE=9

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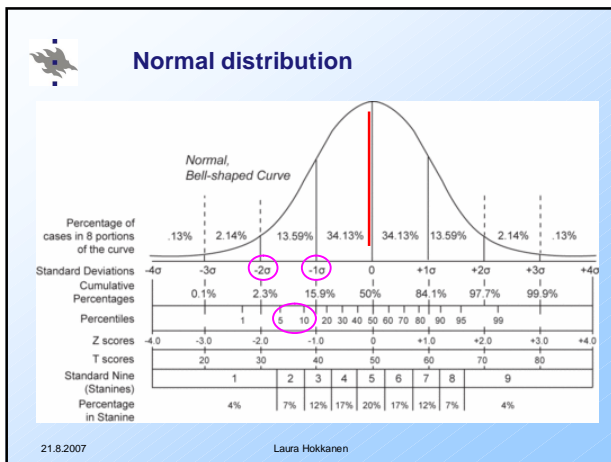
	Memory	Exec.	Verbal	Visual organization
Verbal Fluency		X	X	
Naming			X	
MMSE	X	(x)	(x)	(x)
Word List Memory	X			
Constructional Praxis				X
Word List Recall	X			
Word List Recognition	X			
Constructional Praxis, Recall	X			
Clock Drawing		X		X
Clock Copy				X

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### Ways to define cut-off points for impairment

- mean - 1.5 SD of the normal population
- mean - 2.0 SD of the normal population
- lowest 5th percentile of the normal population
- lowest 10th percentile of the normal population
- Receiver Operating Characteristic (ROC) curve, sensitivity / specificity for cases vs non-cases

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### Normative studies across the world

	n / %male	age mean	range	educ mean	range	
1 Morris	278 / 29	68.1 ± 7.7	51-88	14.2 ± 2.9	6-12	original
2 Ganguli	1350 / 45	73.1 ± 6.0	65-90		>6	caucasian
3 Unverzagt	83 / 29	74.6 ± 7.1	65-92	10.2 ± 4.2	0-18	african am.
4 Beeri	196 / 44	89.0 ± 3.2	85-101	14.9 ± 3.2	5-20	oldest old
5 Lee	618 / 34	72.0 ± 6.3	60-90	5.9 ± 4.8	0-13+	Korean
6 Collie	243 / 32	63.1 ± 9.0	>44		cp 12	Australian
7 Bertolucci	85 / 48	75.1 ± 6.2	>65	7.9 ± 4.8	cp 8	Brazilian
8 Aebi	614 / 70	70.2 ± 7.6	53-92	12.8 ± 3.1	8-20	Swiss

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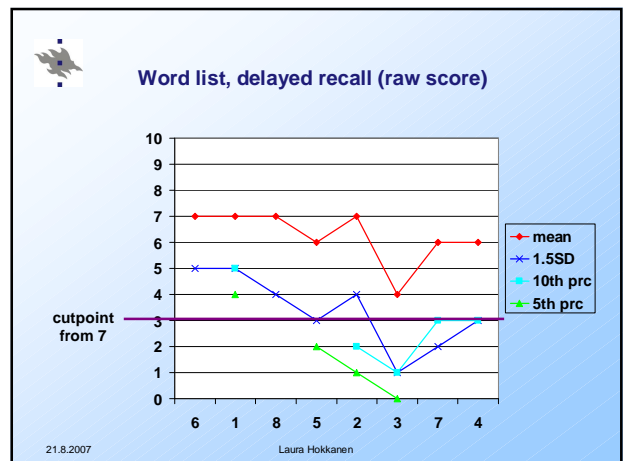
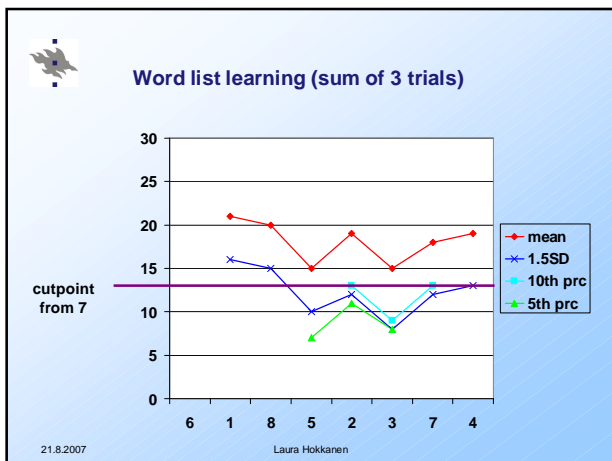
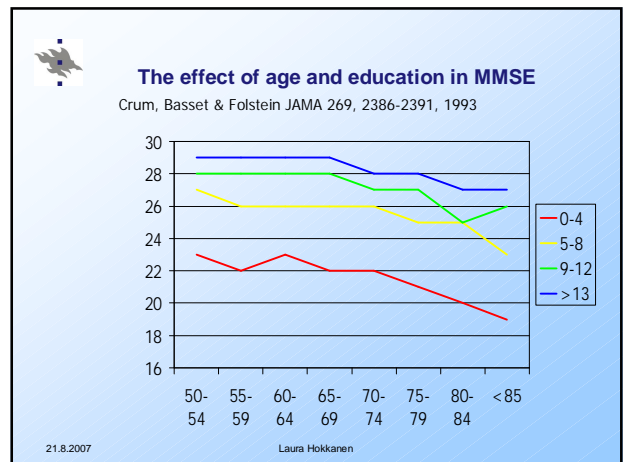
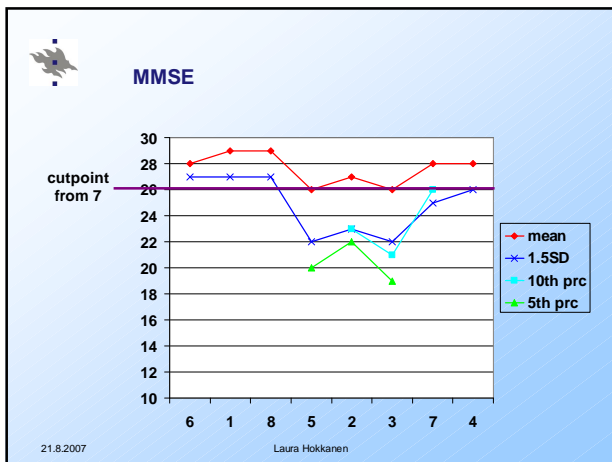
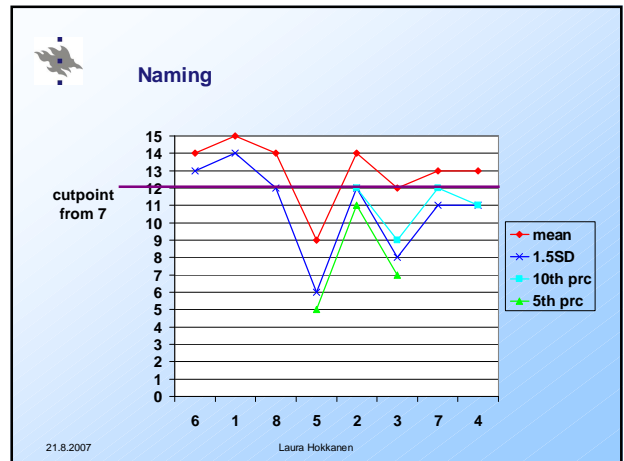
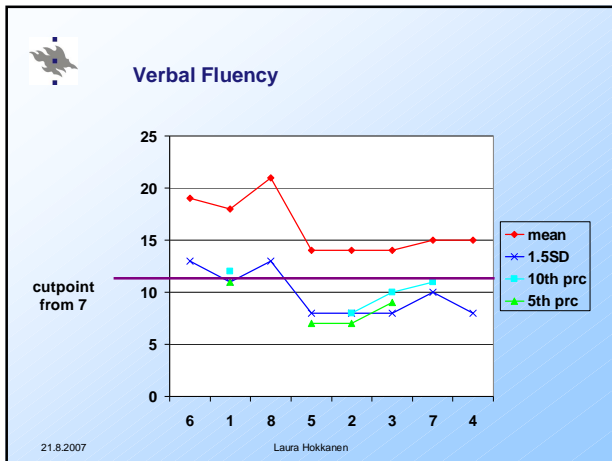
### The percentage of the variance explained (R2%)

	Age (mean)	Age (mean)	Educ (mean)	Educ (mean)	Gender (MF)	Gender (MF)
	Korean	Afro-am	Korean	Afro-am	Korean	Afro-am
	72.0	74.6	5.9	10.2	209/409	24/59
Verbal Fluency	4.8	-	8.8	29.0	-	-
Naming	3.0	-	20.3	30.0	3.7	-
MMSE	9.4	-	29.9	36.0	2.2	-
WL Learning	8.0	8.0	2.5	36.0	1.0	4.0
WL del. recall Raw	8.7	10.0	1.0	22.0	-	-
Saving%		5.0				
WL Recognition	5.7	4.0	-	18.0	-	-
Praxis	7.9	-	34.2	14.0	0.6	-

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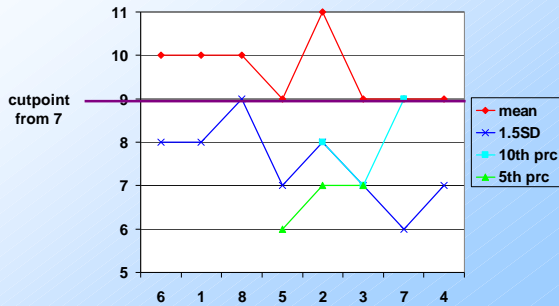
	Cut off	sensitivity	specificity	Area under the ROC curve
Brazilian study				
Verbal Fluency	11	73.8	87.1	.877
Naming (15)	12	61.9	69.4	.699
MMSE (30)	26	97.6	75.3	.942
WL Learning (30)	13	85.7	87.1	.905
WL del. Recall (10)	3	74.2	82.4	.858
WL Recognition (10)	7	76.2	87.1	.875
Praxis (11)	9	81.0	51.8	.729
Praxis recall (11)	4	87.1	67.1	.857

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## Praxis



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## Conclusions

- CERAD neuropsychological battery widely used worldwide
- search for cut-off points for impairment continues
- the effects of age and especially education need to be taken into consideration
  - very low levels of formal education?
- cultural differences beyond educational differences?

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## References

1. Morris JC, Heyman A, Mohs RC ym. The Consortium to Establish a Registry for Alzheimer's Disease (CERAD). Part I. Clinical and neuropsychological assessment of Alzheimer's disease. *Neurology* 1989;39:1159-65.
2. Ganguli M, Ratcliff G, Huff FJ ym. Effects of age, gender, and education on cognitive tests in a rural elderly community sample: norms from the Monongahela Valley Independent Elders Survey. *Neuroepidemiology* 1991;10:42-52.
3. Unverzagt FW, Hall KS, Torke AM ym. Effects of age, education and gender on CERAD neuropsychological test performance in an african american sample. *Clin Neuropsychol* 1996;10:180-90.
4. Beeri MS, Schmeidler J, Sano M ym. Age, gender, and education norms on the CERAD neuropsychological battery in the oldest old. *Neurology* 2006;67:1006-10.

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## References cont

5. Lee DY, Lee KU, Lee JH ym. A normative study of the CERAD neuropsychological assessment battery in the Korean elderly. *J Int Neuropsychol Soc* 2004;10:72-81.
6. Collie A, Shafiq-Antonacci R, Maruff P, Tyler P, Currie J. Norms and the effects of demographic variables on a neuropsychological battery for use in healthy ageing Australian populations. *Aust N Z J Psychiatry* 1999;33:568-75.
7. Bertolucci P, Okamoto I, Brucki S ym: Applicability of the CERAD neuropsychological battery to Brazilian elderly. *Arq Neuropsiquiatr* 2001; 59:532-536.
8. Aebi C. Validierung der neuropsychologischen Testbatterie CERAD-NP. Eine multi-center studie. Dissertation. Basel 2002.

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