Alzheimer's disease dementia: a neuropsychological approach

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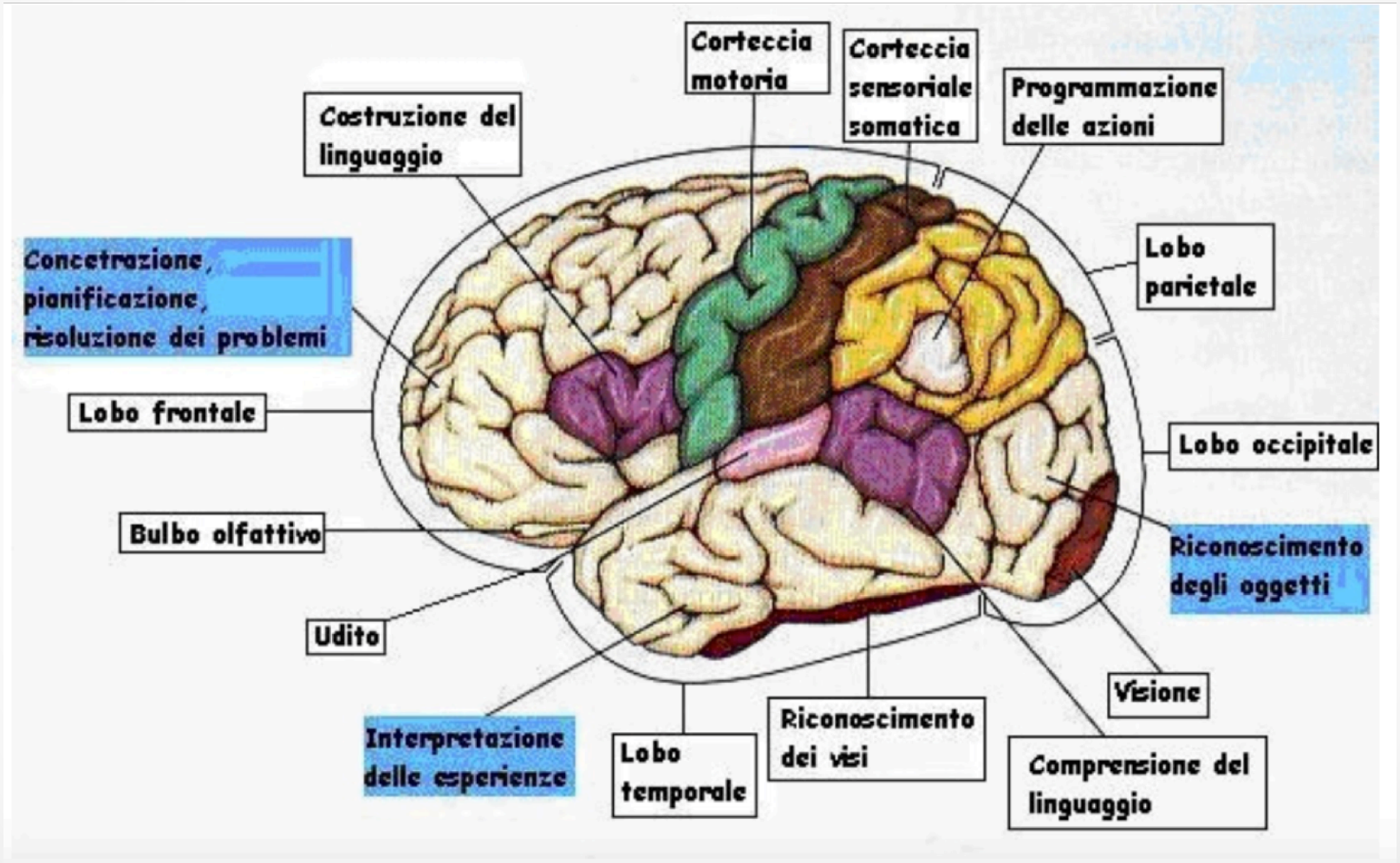
Summary

- What is the **Neuropsychology:** its aims
- How we can use **clinical neuropsychology** to assess Alzheimer's disease dementia and make differential diagnosis
- Main **cognitive instruments** to briefly assess Alzheimer's disease dementia and monitore its severity
- **Practice session**: The **Clinical Dementia Rating**

Neuropsychology studies the structure and function of the brain as they relate to specific psychological processes and behaviours.



Neuropsychological evaluation is a diagnostic process whose aim is to understand and measure individual cognitive function.

It allows to define the **presence and severity** of cognitive impairment in patients with different brain damage (ictus; dementia; eg.) throughout the use of specific instruments (clinical interview, standardized tests etc).

Principal objectives of neuropsychological evaluation:

- **Diagnostic** (to allow preclinical and differential diagnosis)
- **Prognostic** (to prospect the cognitive decline over time)
- **Rehabilitative** (to implement specific treatments)

Dementia

- Dementia is a disease marked by a gradual loss of **cognitive** functioning which can also incorporate losses of motor, emotional, and social functioning as well..
- It is a permanent and progressive disease that eventually renders people unable to care for themselves.

Table 1: Common dementia subtypes; source Prince et al, 2014

Dementia subtype	Early symptoms	Tissue damage	% of dementia cases
Alzheimer's Disease	Impaired memory, apathy and depression, gradual onset	Cortical amyloid plaques and neurofibrillary tangles	50-75%
Vascular Dementia	Similar to AD but memory less affected, mood fluctuations more prominent; physical frailty, stepwise onset	Blood supply to critical regions of brain, or more diffusely.	20-30%
Lewy Body Dementia	Marked fluctuation in cognitive ability; visual hallucinations; Parkinsonism	Cortical Lewy bodies	<5%
Fronto-temporal Dementia	Personality changes; mood changes; disihibition; language difficulties	No single pathology – damage limited to frontal and temporal lobes	5-10%

Dementia - Diagnosis

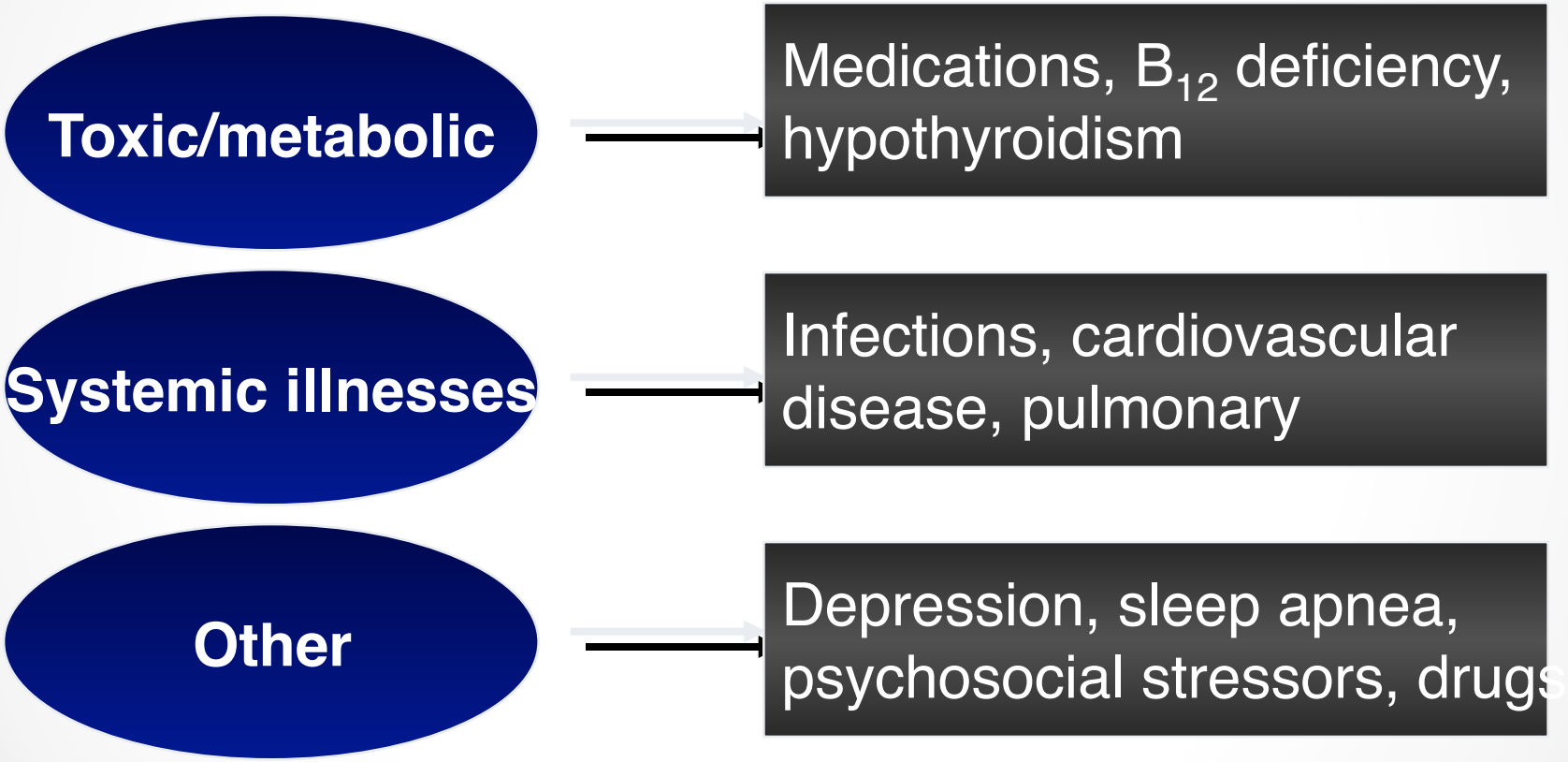
- **Medical History** - To determine risk factors, the onset of symptoms and how they've changed over time.
- **Neuropsychological Exam** - Evaluates a person's cognitive ability, e.g. orientation in time and space, memory, language skills, reasoning ability, attention, and social appropriateness.
- **Brain Imaging/Lab Tests -** CT or MRI, cerebrospinal fluid (all used to confirm a diagnosis or eliminate various possibilities).
- **Blood tests** - used to diagnosis neurosyphilis.
- **Metabolic tests** - determine treatable disorders such as a vitamin B12 deficiency
- **EEG** (electroencephalography) is used to diagnose Creutzfeldt-Jakob disease.

Dementia - Diagnosis

- Important to establish the cause of the dementia: Alzheimer's and dementia are not the same thing.
- A **differential diagnosis** compares the symptoms of two or more diseases.
- DD is important because some forms of dementia are "treatable"

Causes that Mimic Dementia

*(*but are treatable)*



Treatment may improve, but not fully reverse, symptoms

REVIEW

Lifting the veil: how to use clinical neuropsychology to assess dementia

James R Burrell,[1,2,3] Olivier Piguet[1,2,3]

Table 1 Patterns of cognitive impairment across the range of dementia syndromes

Cognitive domain	Alzheimer's disease	Behavioural variant FTD	Semantic dementia	Progressive non-fluent aphasia	Logopenic progressive aphasia	Vascular dementia	Dementia with Lewy bodies	Progressive supranuclear palsy	Corticobasal syndrome
Attention and concentration	++ to +++	–	–	–	+ to ++	+ to ++	+ to ++	–	–
Memory									
Encoding	+++	Variable	–	–	Variable	+	+ to ++	–	Variable
Retrieval	+++	Variable	–	–	Variable	+++	+ to ++	–	Variable
Recognition	+++	Variable	–	–	Variable	+	+ to ++	–	Variable
Language									
Speech	Fluent	Fluent	Fluent	Non-fluent	Non-fluent	Fluent	Fluent	Sparse and adynamic	Sometimes non-fluent
Motor speech errors	+	–	–	++ to +++	+ to ++	–	–	–	Variable
Object naming	+	–	+++	–	+ to ++	–	–	–	Variable
Word knowledge	+	–	++ to +++	–	–	–	–	–	Variable
Single word repetition	–	–	–	+ to ++	+	–	–	–	Variable
Sentence repetition	–	–	–	–	++ to +++	–	–	–	Variable
Word production									
Visuospatial									
Visuoperception deficits	Variable	–	–	–	–	–	++ to +++	–	+++
Visuoconstruction deficits	++	–	–	–	+ to ++	+	+ to ++	–	+++
Executive	+ to ++	++ to +++	–	–	–	+ to +++	+	+	Variable
Social cognition									
Behavioural disturbances	+ to ++	++ to +++	++	–	–	+ to ++	+ to ++	–	–
Emotion	+	++ to +++	+ to +++	–	–	–	–	–	+
Motor symptoms/signs	–	Variable	–	–	–	+ to ++	++ to +++	++ to +++	++ to +++
Performance on MMSE	Impaired	Preserved	Impaired	Impaired	Very impaired	Impaired	Very impaired	Preserved	Variable

FTD, frontotemporal dementia; MMSE, Mini-Mental State Examination.

Burrell JR, Piguet O. *J Neurol Neurosurg Psychiatry* 2015;**86**:1216–1224. doi:10.1136/jnnp-2013-307483

Alzheimer's Disease

Progressive disorder in which neurons deteriorate resulting in the loss of cognitive functions (memory, judgment and reasoning, movement coordination, and pattern recognition).

It occurs in two forms: familial or early onset AD (<40 ys) and late onset AD (>65 ys)

It affects particular areas of the brain which are important for learning new information (hippocampus) and goes on to affect all areas of cognitive function.

After death, changes to the structure of the brain and tissue loss for a person who had Alzheimer's can be clearly seen at autopsy

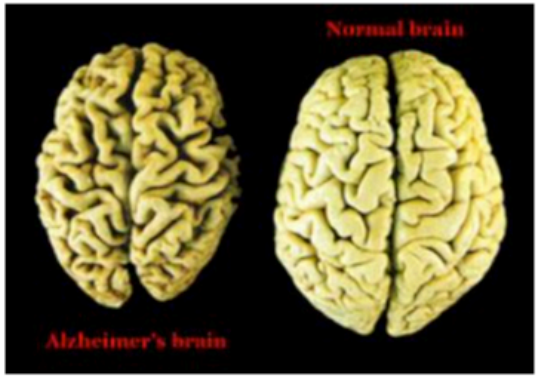


Figure 4 Tissue loss in Alzheimer's vs healthy brain

AD Prevalence

- The most recent estimates of diagnoses and undiagnosed rates find that **the prevalence of late onset dementia is 7.1%** among people of 65 or over.

- Prevalence in the population **increases with age**, from 7.1% in 65-69s up to **41.1%** in people of **95** or over.

- This shows that most people do not develop dementia–even among the very oldest people, the majority (3/5) do not develop dementia

"People are staying physically healthy longer but not mentally healthy. In the past what happened was you died at the age your body wore out. Now what happens is that your body doesn't wear out, but your brain does."

AD model

Risk Factors

Family history

AGE

Head Injury, Depression, Female, Presence of APOE E4 allele
Chronic Illness-Down's syndrome

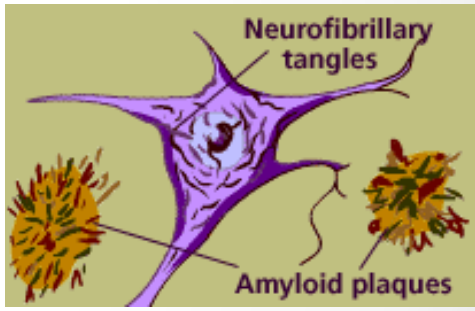
Genetic

Tissue damage

Alzheimer's pathology

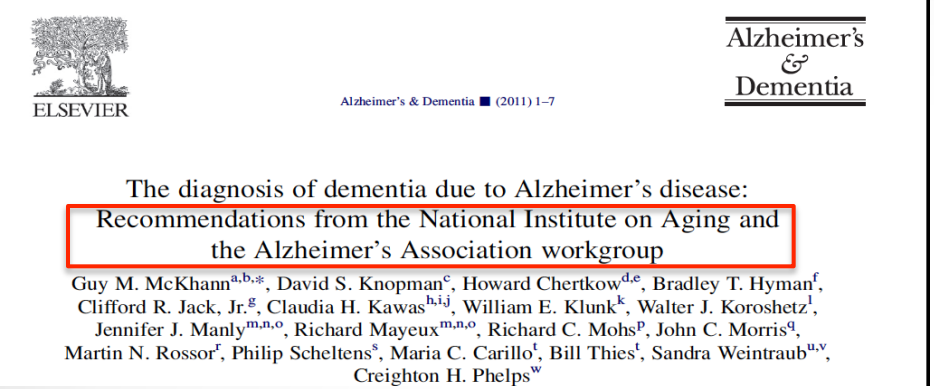
Amyloid Plaques

NFTs



Neuronal and Synaptic dysfunction

Cognitive Decline



Revised criteria from National Institute of Neurological and Communicative Disorders and Stroke and Alzheimer's Disease and Related Disorders Association Criteria **(NINCDS-ADRDA)** from 1984 consensus group

Probable Alzheimer's Disease

- ADL/IADL impaired and represent a decline from previous level of functioning.
- Dementia established by clinical and neuropsychological examination (memory deficit plus 1 in one other domain)
- Insidious onset and progressive course.
- Risk increases with age; rare onset before age 60
- Other diseases capable of producing a dementia syndrome have been ruled out (delirium and major psychiatric disorder).
- The diagnosis of dementia **should not** be applied when there is evidence of substantial cerebrovascular disease.

Cognitive deficits according to the revised criteria

C. The initial and most prominent cognitive deficits are evident on history and examination in one of the following categories.

a. Amnestic presentation: It is the most common syndromic presentation of AD dementia. The deficits should include impairment in learning and recall of recently learned information. There should also be evidence of cognitive dysfunction in at least one other cognitive domain, as defined earlier in the text.

b. Nonamnestic presentations:

- Language presentation: The most prominent deficits are in word-finding, but deficits in other cognitive domains should be present.
- Visuospatial presentation: The most prominent deficits are in spatial cognition, including object agnosia, impaired face recognition, simultanagnosia, and alexia. Deficits in other cognitive domains should be present.
- Executive dysfunction: The most prominent deficits are impaired reasoning, judgment, and problem solving. Deficits in other cognitive domains should be present.

Learning and recall of recently learned information

Word findings

Object Agnosia,
Prosopoagnosia
Alexia

Reasoning
Judgment
Problem solving

AD - Neuroanatomy

Parietal Lobe

- Interprets sensations of tactile stimulation, e.g. pain, temperature, touch, size, shape, and body part awareness.

Frontal lobe

- Voluntary movement
- Emotion
- Planning and execution of behavior
- Memory, Speech, Writing

Occipital Lobe

- Understanding visual images or the meaning of the written word.

Temporal Lobe:

- Understanding sounds;
- Understanding speech;
- Emotion; Memory

Hippocampus

Plays a crucial role in both the encoding and retrieval of information. Damage to the hippocampus produces *global retrograde amnesia*, which is the inability to retain newly learned information.

Alzheimer's Disease Top 10 Warning Signs (not early)

1. Recent memory changes affecting daily life
2. Challenges in problem solving and planning
3. Difficulty performing familiar tasks
4. Disorientation to time and/or place
5. Difficulty understanding visual images and/or spatial relationships
6. Problems with spoken and written language (eg, paraphasia, agraphia)
7. Misplacing things
8. Poor judgment
9. Withdrawal from activities (eg, social, work)
10. Changes in personality and/or mood (delusions, loss of inhibitions)

Need a Top 10 Early Warning Signs

Alzheimer's Association. 10 Signs of Alzheimer's. Available at: http://www.alz.org/alzheimers_disease_10_signs_of_alzheimers.asp. Accessed April 20, 2009.

Alzheimer's Disease Is Under-diagnosed

- Early AD is subtle, the diagnosis continues to be missed
  - It is easy for family members to avoid the problem and compensate for the patient
  - Physicians tend to miss the initial signs and symptoms
- Less than half of AD patients are diagnosed
  - Estimates are that **25%–50%** of cases remain undiagnosed
  - Diagnoses are missed at all levels of severity: mild, moderate, severe
- Undiagnosed AD patients often face avoidable social, financial, and medical problems
- Early diagnosis and appropriate intervention may lessen disease burden
  - Early treatment may substantially improve overall course
- No definitive laboratory test for diagnosing AD exists

ORIGINAL CONTRIBUTION

The Preclinical Phase of Alzheimer Disease

A 22-Year Prospective Study of the Framingham Cohort

Merrill F. Elias, PhD, MPH; Alexa Beiser, PhD; Philip A. Wolf, MD; Rhoda Au, PhD; Roberta F. White, PhD; Ralph B. D'Agostino, PhD

Objectives: To relate performance on tests of cognitive ability to the subsequent development of probable Alzheimer disease (pAD) and to identify the pattern of earliest changes in cognitive functioning associated with a diagnosis of pAD.

Design: From May 1975 to November 1979, a screening neuropsychological battery was administered to Framingham Study participants. They were followed up prospectively for 22 years and examined at least every 2 years for the development of pAD.

Setting: A community-based center for epidemiological research.

Participants: Subjects were 1076 participants of the Framingham Study aged 65 to 94 years who were free of dementia and stroke at baseline (initial) neuropsychological testing.

Main Outcome Measure: Presence or absence of pAD during a 22-year surveillance period was related to test performance at initial neuropsychological testing.

Results: Lower scores for measures of new learning, recall, retention, and abstract reasoning obtained during a dementia-free period were associated with the development of pAD. Lower scores for measures of abstract reasoning and retention predicted pAD after a dementia-free period of 10 years.

Conclusions: The "preclinical phase" of detectable lowering of cognitive functioning precedes the appearance of pAD by many years. Measures of retention of information and abstract reasoning are among the strongest predictors of pAD when the interval between initial assessment and the development of pAD is long.

Arch Neurol. 2000;57:808-813

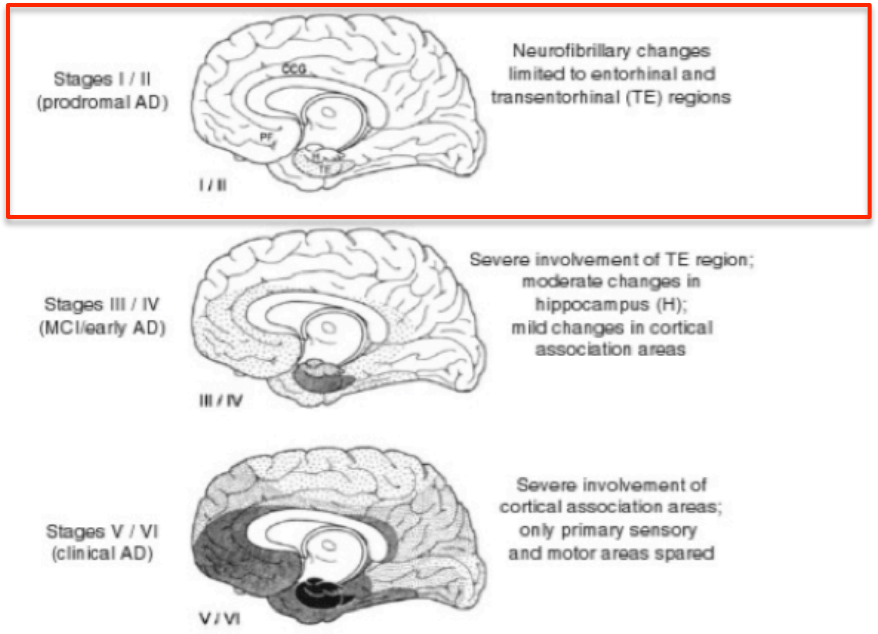
Prodromal AD Stage

- **Characteristics**
- Begins with forgetfulness
- Progresses to disorientation and confusion
- Personality changes
- Symptoms of depression/manic behaviors

Neuropsychol Rev (2008) 18:73–90
DOI 10.1007/s11065-008-9054-1

Neuropsychological Contributions to the Early Identification of Alzheimer's Disease

Mark W. Bondi · Amy J. Jak · Lisa Delano-Wood · Mark W. Jacobson · Dean C. Delis · David P. Salmon



MCI/early AD Stage

- **Characteristics**
- Need assistance with ADLs
- Unable to remember names
- Loss of short-term recall
- May display anxious, agitated, delusional, or obsessive behavior
- May be physically or verbally aggressive
- Disoriented to time and place
- Inability to carry on a conversation
- Poor personal hygiene
- Disturbed sleep
- Posture may be altered
- May ask questions repeatedly

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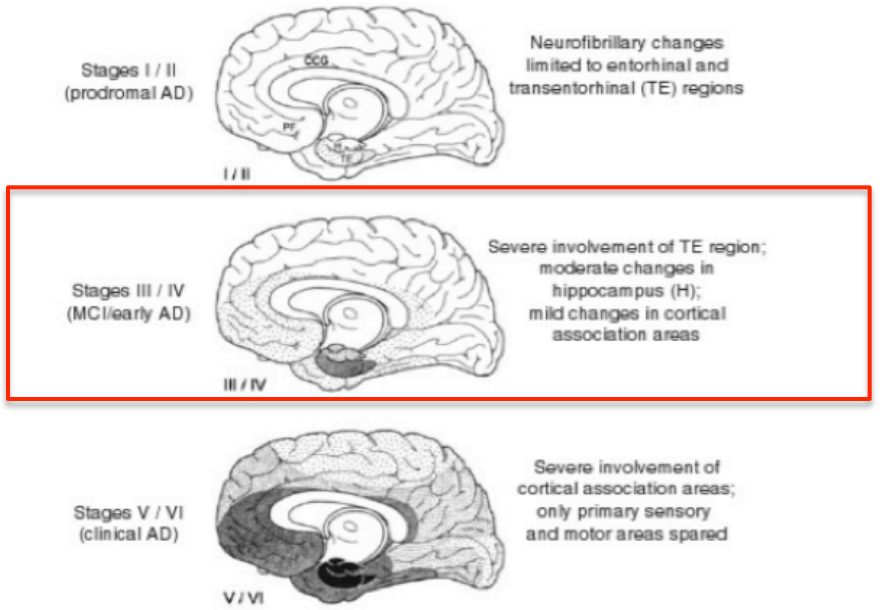

Clinical AD

- **Characteristics**
- Loss of verbal articulation
- Loss of ambulation
- Bowel and bladder incontinence
- Extended sleep patterns
- Unresponsive to most stimuli

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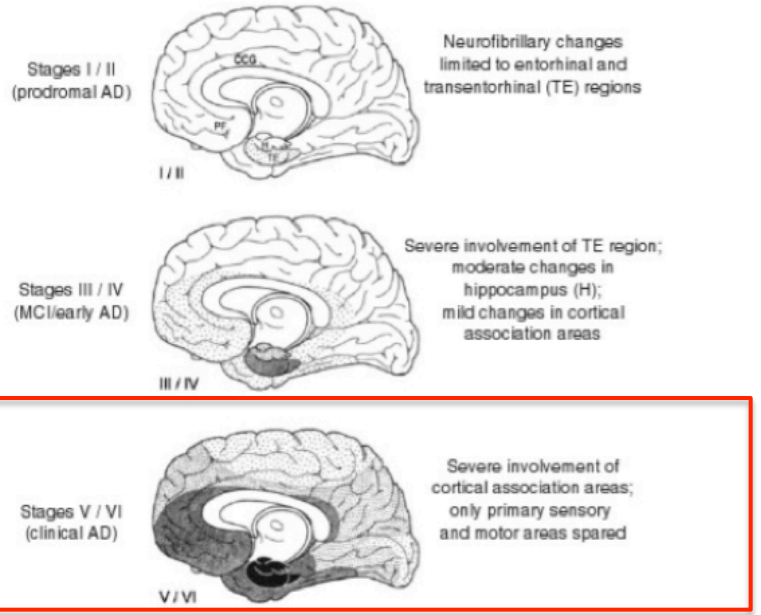


Ann Ist Super Sanità 2004;40(4):485-493

Valutazione neuropsicologica e comportamentale nel morbo di Alzheimer

Domenico ACCORRÀ, Lorenzo MAZZARINI, Paolo GIRARDI, Amedeo RUBERTO, Giorgio D. KOTZALIDIS e Roberto TATARELLI

Dipartimento di Psichiatria, Università degli Studi "La Sapienza", II Facoltà di Medicina, Ospedale Sant'Andrea, Roma

Riassunto. - Per valutare la comparsa e successiva evoluzione dei sintomi cognitivi, comportamentali e neuropsichiatrici della demenza di Alzheimer (AD) abbiamo considerato l'evoluzione clinica di questi gruppi di sintomi in 100 pazienti con AD diagnosticati secondo i criteri NINCDS-ADRDA > 65 anni dall'esordio all'*exitus* durante le fasi t0 (precoce), t1 (di stato), t2 (neurologica) e t3 (internistica). In t0 sono frequenti i disturbi mnesici, depressivi (40%), ansiosi (30%), sessuali (15%). In t1 i disturbi mnesici peggiorano in 90% dei soggetti e sono presenti disturbi dell'attenzione (46%) e difficoltà nel pensiero astratto. In t2 compaiono disturbi alimentari (80%), stereotipie (38%), deliri (23%); l'ansia e il deficit dell'attenzione (74%) peggiorano. In t3 aumentano i disturbi alimentari (95%), e i deliri (46%); le funzioni intellettive non sono più valutabili attraverso i test neuropsicologici. Questo studio ha evidenziato un deterioramento progressivo delle funzioni cognitive e comportamentali e una comparsa brusca ed evoluzione repentina dei disturbi neuropsichiatrici e internistici nel corso di AD.

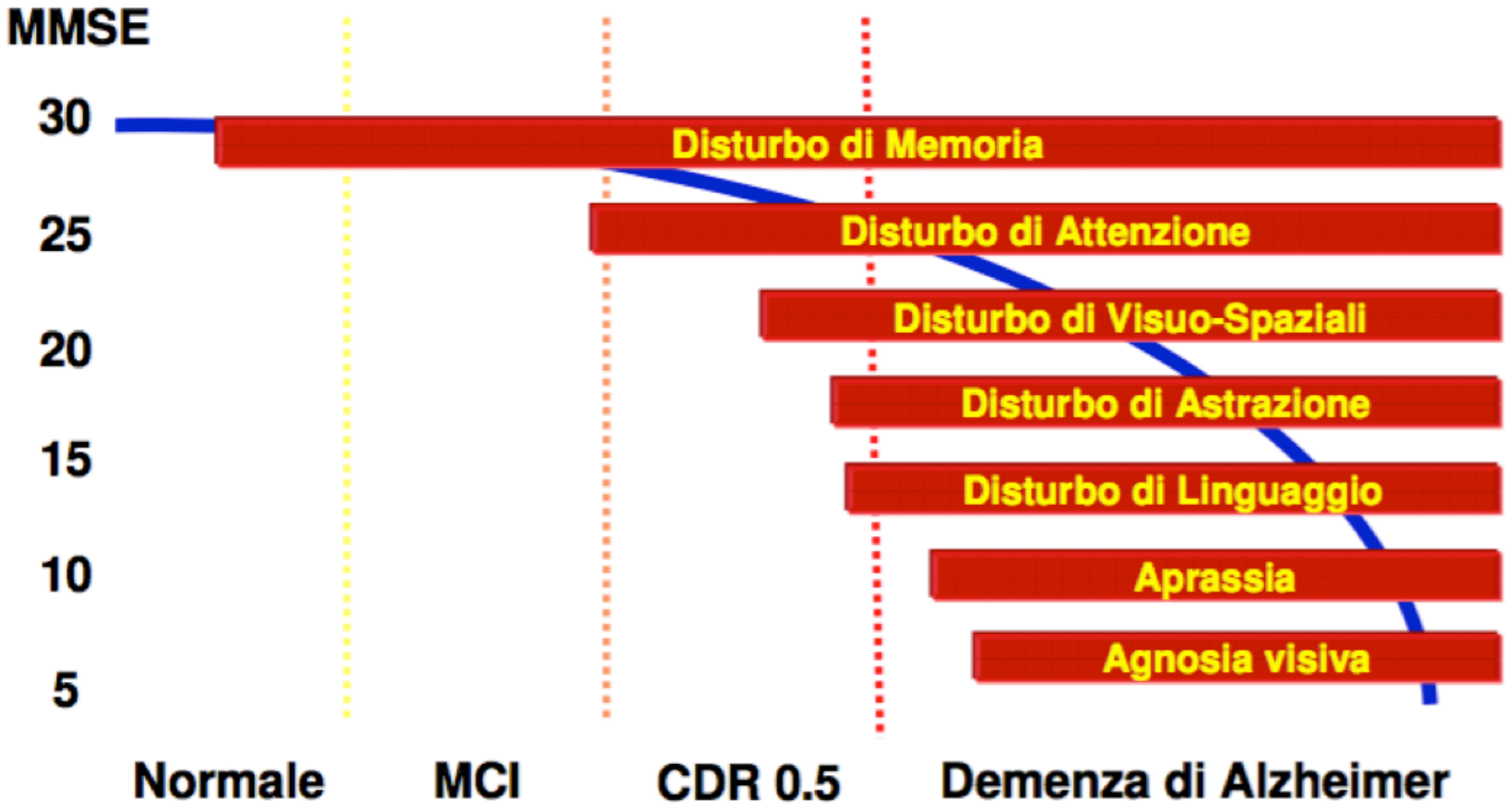
Parole chiave: morbo di Alzheimer, neuropsicologia, alterazioni comportamentali, sintomi cognitivi, decorso longitudinale, psicometria.

Sintomo/segno	t0 (%)	t1 (%)	t2 (%)	t3 (%)
Depressione	40	40	24	24
Sessualità	15	15	8	0
Alimentazione	10	10	80	96
Ansia	30	44	50	22
Allucinazioni	1	1	12	28
Deliri	1	1	22	45
Iterazioni e/o perseverazioni	0	0	38	59
Apprendimento	10	10	52	100
Memoria	75	93	100	100
Fasia recettiva	1	33	78	90
Fasia espressiva	12	62	80	90
Prassia	0	10	65	90
Orientamento	15	45	75	95
Funzioni visuo-spaziali	0	5	18	18
Agnosia	0	0	2	61
Attenzione	11	47	75	95
Pensiero astratto	0	38	12	100
Delirium	0	0	11	97
Crisi comiziali	0	1	1	1
Tremori/rigidità	0	8	12	52
Atassia/ipercinesia	1	0	10	38

Evoluzione dei sintomi e segni nel tempo (espressi in % di presenza nella popolazione osservata; n=100) in pazienti con morbo di Alzheimer

Valutazione neuropsicologica e comportamentale nel morbo di Alzheimer
Ann. Ist. Sup. Sanità 2004; 40(4):485-493

La Progressione dei Disturbi Neuropsicologici nella MA



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Neuropsychologia 46 (2008) 1732–1737

NEUROPSYCHOLOGIA

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Neuropsychological correlates of whole brain atrophy in Alzheimer's disease

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Abstract

Alzheimer's disease (AD) is associated with excess whole brain volume loss, and progressive cognitive impairment. We aimed to study the extent to which these two potential biomarkers of AD progression are correlated. Forty-six patients with sporadic AD were tested with a neuropsychometric battery including test of verbal and visual memory, vocabulary, arithmetic, naming, visuoperceptual skills and reasoning at two time-points, approximately 1 year apart; annualised rates of change for each test were calculated. Each subject also attended for up to twelve T1-weighted volumetric MRI scans at fixed intervals over a 2-year period. For each individual all possible scan-pairs were positionally registered, and whole brain atrophy rates were calculated using the brain boundary shift integral. Linear mixed models were used to investigate associations between atrophy rate and coincident change in each neuropsychometric score. Each model estimated the effect of a unit change in score, plus the additional effect of a fall to floor, after adjusting for baseline levels. 467 MRI scans were performed, permitting 2199 individual measures of change to be made. The model-derived mean atrophy rate was 2.23% per year with a between-subject *SD* of 0.99% per year. Increasing atrophy rate was significantly associated with rate of change in a number of non-memory based neuropsychological scores, with the strongest association seen with longitudinal change in matrix reasoning ($p = 0.004$). These results provide further evidence that cerebral atrophy is a clinically relevant marker of AD progression. This methodology whereby data from patients falling to floor on a given test may be included and accounted for, rather than discarded, may find broader application in clinical studies incorporating neuropsychometric outcomes.

Keywords: Alzheimer's disease; Neuropsychometry; Clinical trials; Atrophy; Correlation

2,23% of annual atrophy associated with reasoning and memory deficits.

Original Research Article

Dementia and Geriatric Cognitive Disorders

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Predicting Rapid Clinical Progression in Amnestic Mild Cognitive Impairment

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Key Words
Alzheimer's disease · Associative memory · Progression · Mild cognitive impairment

Abstract
Background/Aims: We investigated whether an initial neuropsychological assessment could predict rapid progression over 12 months, from amnestic mild cognitive impairment (aMCI) to Alzheimer's disease (AD). ***Methods:*** A longitudinal study compared the neuropsychological profiles of 27 normal controls and 18 aMCI patients at baseline and 12 months. ***Results:*** At 12 months, 24 control subjects followed up remained cognitively normal. 7 aMCI patients (6 multiple-domain aMCI and 1 single-domain aMCI) progressed to AD, and 11 were non-progressors. Prognosis was best captured by a combination of associative learning, the paired associate learning task (PAL), and global cognition, the Addenbrooke's Cognitive Examination (ACE). ***Conclusion:*** The PAL and ACE can sensitively detect meaningful differences in scores at baseline and may be used as prognostic indicators. Multiple-domain aMCI patients progressed rapidly to AD and may be more usefully labelled as early stage AD.

Introduction

Mild cognitive impairment (MCI) is the term applied to the transitional stage between normal ageing and dementia proper. The most validated subtype is amnestic MCI (aMCI), the proposed prodrome to Alzheimer's disease (AD), with an annual conversion rate from 6 to 25% [1]. Although patients with aMCI present with deficits in episodic memory, perform above accepted cut-off points (>24) on the Mini Mental State Examination (MMSE) and show preservation of basic activities of daily living in accordance with criteria [1], a range of neuropsychological studies have shown that the vast majority of aMCI have other subtle cognitive deficits, particularly involving attention and mental speed [2–6] and semantic memory [7–10]. For example, Bozoki et al. [7] reported that in a sample of 48 MCI patients, 17 had aMCI and 31 had memory plus additional cognitive impairment in attention, word retrieval, visuospatial tasks or fluency. The latter group was twice as likely as the isolated memory-impaired group to develop AD over 2–5 years. In a study from our clinic in Cambridge, we found that only 25 out of 90 patients with MCI broadly defined had pure aMCI [11], and that deficits in semantic memory and attention were typically present in the other cases.

These findings are consistent with a number of serial MRI studies showing that multiple brain structures are affected very early in the course of AD. For instance, Convit et al. [41] reported early temporal neocortex in-

Cognitive Continuum

Normal

An ideal point of intervention?

Mild Cognitive Impairment (MCI)

Dementia

Why Mild Cognitive Impairment (MCI) Screening Is Important to Consider

- Cognitive impairment is disruptive to human well-being and psychosocial function
- **Cognitive Impairment is potentially a prodromal condition to dementia and Alzheimer's disease (AD)**
- Dementia is a very costly condition to individuals and society
- With the aging of the population, there will be a progressive increase in the proportion of elderly individuals in the world
- Screening will lead to better care

Neuropsychological brief instruments to detect cognitive deficits from prodromal to clinical AD dementia

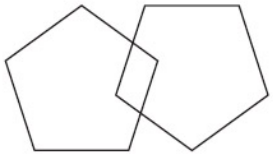
Mini-Mental State Exam (MMSE)

- MMSE (maximum score 30)
- 6 subscores
- Orientation
- Registration
- Attention and calculation
- 3 words recall
- **Language: denomination, repetition, comprehension, writing.**
- Visuo-spatial skills

The Mini-Mental State Exam

Patient_____ Examiner _____ Date_____

Maximum	Score	
		Orientation
5	( )	What is the (year) (season) (date) (day) (month)?
5	( )	Where are we (state) (country) (town) (hospital) (floor)?
		Registration
3	( )	Name 3 objects: 1 second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat them until he/she learns all 3. Count trials and record. Trials _____
		Attention and Calculation
5	( )	Serial 7's. 1 point for each correct answer. Stop after 5 answers. Alternatively spell "world" backward.
		Recall
3	( )	Ask for the 3 objects repeated above. Give 1 point for each correct answer.
		Language
2	( )	Name a pencil and watch.
1	( )	Repeat the following "No ifs, ands, or buts"
3	( )	Follow a 3-stage command: "Take a paper in your hand, fold it in half, and put it on the floor."
1	( )	Read and obey the following: CLOSE YOUR EYES
1	( )	Write a sentence.
1	( )	Copy the design shown.



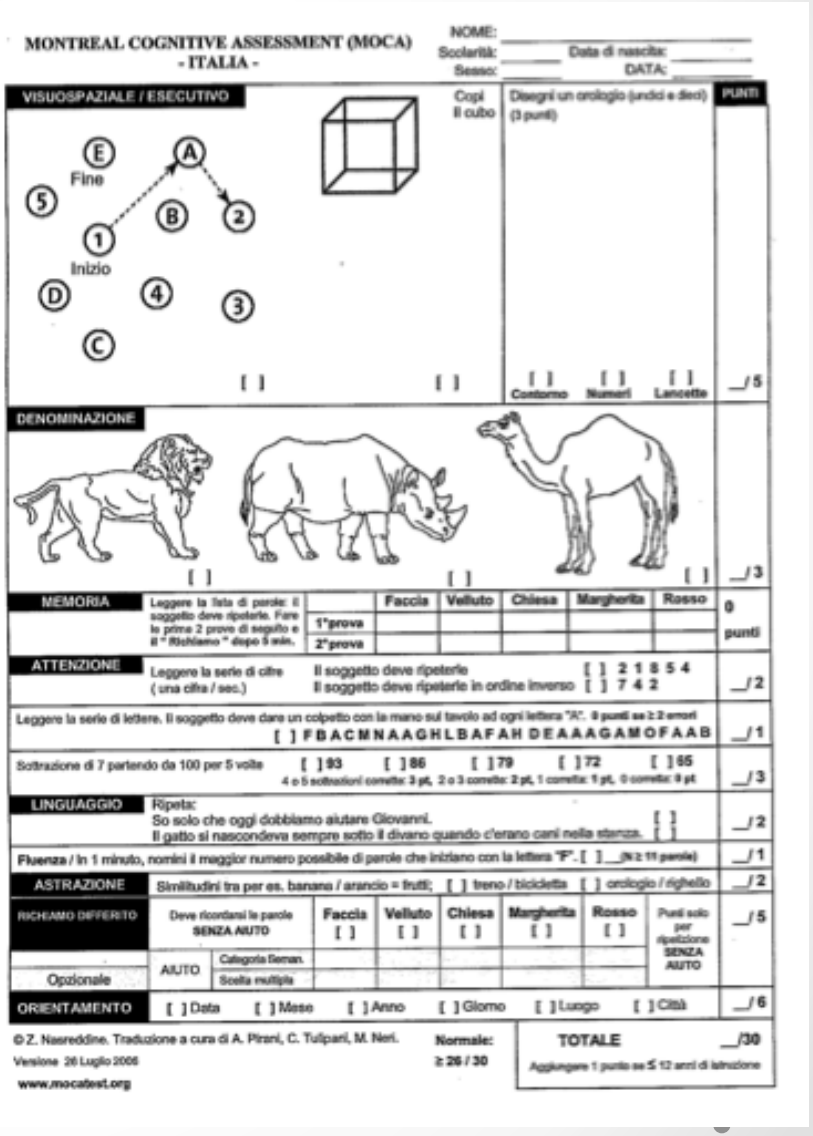
____ Total Score

ASSESS level of consciousness along a continuum _____

Alert Drowsy Stupor Coma

Montreal Cognitive Assessment (MoCA)

- MoCA (maximum score 30)
- 7 subscores:
- visuospatial/executive (5 points);
- naming (3 points);
- memory (5 points for delayed recall);
- attention (6 points);
- language (3 points);
- abstraction (2 points);
- orientation (6 points).



MONTREAL COGNITIVE ASSESSMENT (MOCA)
- ITALIA -

NOME:
Scolarità: Data di nascita:
Sesso: DATA:

VISUOSPAZIALE / ESECUTIVO — PUNTI

Copi il cubo

Disegni un orologio (undici e dieci) (3 punti)

Fine Inizio

Contorno Numeri Lancette — /5

DENOMINAZIONE — /3

MEMORIA — Leggere la lista di parole: il soggetto deve ripeterle. Fare le prima 2 prove di seguito e il " Richiamo " dopo 5 min.

	Faccia	Velluto	Chiesa	Margherita	Rosso
1°prova					
2°prova					

0 punti

ATTENZIONE — Leggere la serie di cifre (una cifra / sec.)
Il soggetto deve ripeterle [ ] 2 1 8 5 4
Il soggetto deve ripeterle in ordine inverso [ ] 7 4 2 — /2

Leggere la serie di lettere. Il soggetto deve dare un colpetto con la mano sul tavolo ad ogni lettera "A". 0 punti se ≥ 2 errori
[ ] F B A C M N A A G H L B A F A H D E A A A G A M O F A A B — /1

Sottrazione di 7 partendo da 100 per 5 volte [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65
4 o 5 sottrazioni corrette: 3 pt, 2 o 3 corrette: 2 pt, 1 corretta: 1 pt, 0 corrette: 0 pt — /3

LINGUAGGIO — Ripeta:
So solo che oggi dobbiamo aiutare Giovanni. [ ]
Il gatto si nascondeva sempre sotto il divano quando c'erano cani nella stanza. [ ] — /2

Fluenza / In 1 minuto, nomini il maggior numero possibile di parole che iniziano con la lettera "F". [ ] (N ≥ 11 parole) — /1

ASTRAZIONE — Similitudini tra per es. banana / arancio = frutti; [ ] treno / bicicletta [ ] orologio / righello — /2

RICHIAMO DIFFERITO — Deve ricordarsi le parole SENZA AIUTO

	Faccia [ ]	Velluto [ ]	Chiesa [ ]	Margherita [ ]	Rosso [ ]
Opzionale — AIUTO — Categoria Semant.					
Opzionale — AIUTO — Scelta multipla					

Punti solo per ripetizione SENZA AIUTO — /5

ORIENTAMENTO — [ ] Data [ ] Mese [ ] Anno [ ] Giorno [ ] Luogo [ ] Città — /6

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Versione 26 Luglio 2006
www.mocatest.org

Normale: ≥ 26 / 30

TOTALE /30
Aggiungere 1 punto se ≤ 12 anni di istruzione

MMSE

- Pros
  - Widely accepted and validated tool for dementia screening
  - 30-point scale well known and score is easily interpretable
  - Measures orientation, working memory, recall, language, praxis
- Cons
  - Scale developed 40 years ago, before MCI criteria and when early dementia less well understood
  - Lacks sensitivity to MCI and early dementia
  - Takes 7 min. to administer
  - Copyright issues

MoCA

- Pros
  - Much more sensitive than MMSE in detecting MCI and early dementia
  - More content tapping higher level executive functioning
  - 30-point scale similar to MMSE
  - Translations available in 35+ languages
  - Free online
- Cons
  - Takes 10-14 min. to administer
  - More complex administration and directions than MMSE

Psychiatry and Clinical Neurosciences 2008; 62: 167–173 doi:10.1111/j.1440-1819.2008.01750.x

Regular Article

Poor performance in Clock-Drawing Test associated with visual memory deficit and reduced bilateral hippocampal and left temporoparietal regional blood flows in Alzheimer's disease patients

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Aim: To investigate the associations of Clock-Drawing Test (CDT) score with neuropsychological test scores and regional cerebral blood flow.

Method: Twenty-five patients (normal aging, $n = 2$; mild cognitive impairment, $n = 7$; Alzheimer's disease [AD], $n = 16$) participated in this study. Their average age was 74.8 years.

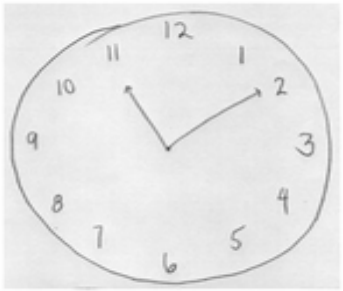
Results: CDT score correlated well with the neuropsychological test scores of Mini-Mental State Examination, Clinical Dementia Rating, immediate visual memory, delayed visual memory, and IQ evaluated by Koh's block design. CDT score also had a statistically significant correlation with the regional blood flow in the left hippocampal region as evaluated on 3-D stereotaxic region-of-interest template analysis applied to single-photon emission computed tomography images. Using a cut-off point of 8/9 in the CDT, the high-CDT group had significantly higher delayed visual memory and IQ scores than the low-CDT group. Moreover, the high-CDT group had significantly higher regional blood flows in the left parietal, left angular and bilateral hippocampal regions than the low-CDT group.

Conclusion: CDT score correlates well with regional cerebral blood flow that is decreased in the early stage of AD.

Key words: Alzheimer's disease, cerebral blood flow, Clock Drawing Test, early stage, SPECT.

Clock drawings and test: Patients are instructed to draw a clock face with all the numbers in it, and to show the time as 10 minutes past 11.

No dementia



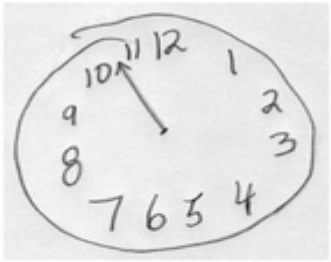
Clock-drawing test score = 15/15
(Mini-Mental State Examination score = 30/30)

Alzheimer disease

Clock-drawing test score = 11/15
(Mini-Mental State Examination score = 21/30)

- Numbers 1 to 12 incorrect (-1 point)
- Hour and minute target incorrect (-2 points)
- Numbers in incorrect position (-1 point)

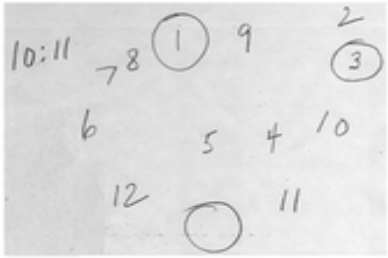
Alzheimer disease



Clock-drawing test score = 8/15
(Mini-Mental State Examination score = 25/30)

- Numbers in incorrect position (-1 point)
- Hour and minute targets incorrect (-2 points)
- Clock has only 1 hand (-4 points)

Suspected frontotemporal dementia



Clock-drawing test score = 3/15
(Mini-Mental State Examination score = 25/30)

- No contour (-2 points)
- Superfluous markings (-1 point)
- Hour and minute targets incorrect (-2 points)
- Numbers in incorrect order / incorrect position / outside contour (-3 points)
- Clock has no centre or hands / hands not joined / length of hour and minute hands cannot be compared (-4 points)

Scoring the clock drawing

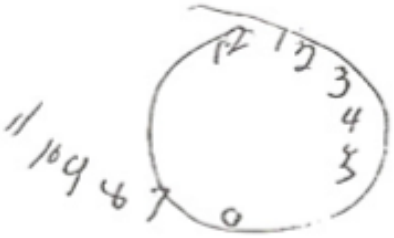
The clock drawing can be scored using the criteria described by Freedman and colleagues.[21] Fifteen items are used to evaluate the drawing and 1 point is given for each item that is present. The following criteria are used — the shape of the circle is acceptable; it is not too small, overdrawn or repeated; only numbers 1 to 12 are present; all numbers are in Arabic numerals; the numbers are in the correct order; the paper is not rotated while drawing the numbers; the numbers are in the correct position; all numbers are inside the contour; the clock has a centre where the hands meet; the clock has 2 hands; the target number for the hour hand is indicated; the target number for minutes is indicated; the minute hand is longer than the hour hand; no superfluous markings are present; the hands are joined or are within 1.27 cm of each other.

Editor's Note: The original list that appears in the print version has been replaced with the above information.

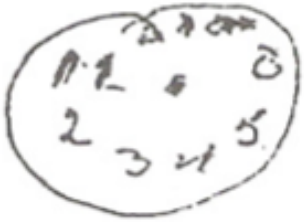
Examples of Clock Drawing Test

Early Alzheimer's Disease

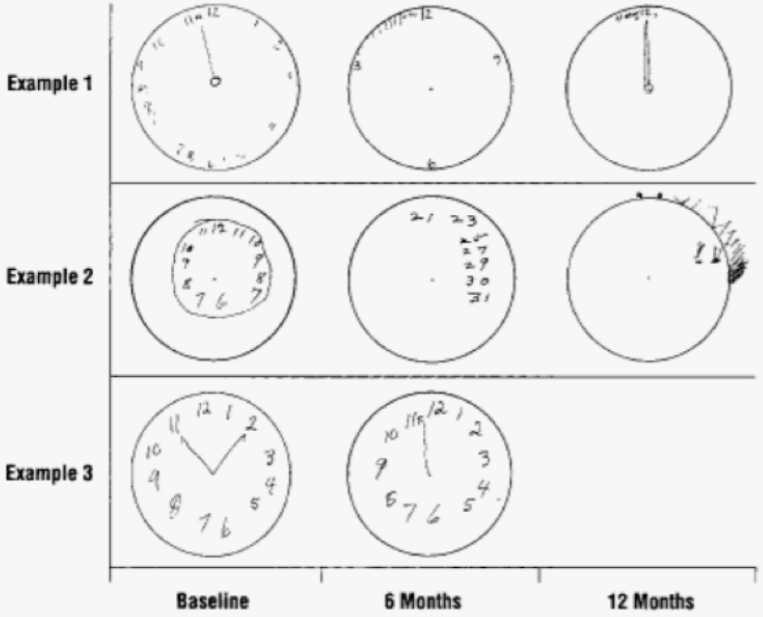
Moderate Alzheimer's Disease



Severe Alzheimer's Disease



Sensitivity to Deterioration in Dementia



Clinical Dementia Rating (CDR) Overview

The CDR is a global measure to assess the impact of cognitive loss on social, behavioural and everyday functioning

Investigators at Washington University (St. Luois, MO) developed the CDR to clinically stage the severity of dementia by standardized and reliable means (Hughes et al 1982)

The necessary information to make each rating is obtained through a semi-structured interview of the patient and a reliable informant or collateral source (e.g., a family member).

Clinical Dementia Rating (CDR)

It characterizes six domains of cognitive and functional performance: **Memory, Orientation, Judgment & Problem Solving, Community Affairs, Home & Hobbies, and Personal Care.**

5 out of 6 domains are rated on 5 point ordinal scale characterizing different level of impairment: 0; 0,5; 1; 2; 3.

A global CDR score is derived from a synthesis of individual rating in each of the domain. It is useful for characterizing a patient's overall level of impairment or stage of dementia at a given point in time.

0 = No impairment,
0.5= Very Mild Dementia
1 = Mild Dementia
2 = Moderate Dementia
3 = Severe Dementia

General Rating Conventions

- The informant and the subject are always interviewed **separately**
- **The informant** interview must be completed **first**; subject interview second
- Use all clinical information obtained from the informant and the subject to make the best judgment for each domain
- Score **each domain** as **independently** as possible
- Only rate impairment if it is due **to cognitive loss alone**; do not rate impairment in CDR domains if due to other factors such as physical handicap or depression
- Severity descriptors are meant to be guides; not to be taken literally
- In case of clinical doubt between two rating levels, **rate up** (more severe)

Subject Initials _____

Clinical Dementia Rating Worksheet

This is a semi-structured interview. Please ask all of these questions. Ask any additional questions necessary to determine the subject's CDR. Please note information from the additional questions.

Memory Questions for Informant:

1. Does he/she have a problem with his/her memory or thinking? ☐ Yes ☐ No
1a. If yes, is this a consistent problem (as opposed to inconsistent)? ☐ Yes ☐ No
2. Can he/she recall recent events? ☐ Usually ☐ Sometimes ☐ Rarely
3. Can he/she remember a short list of items (shopping)? ☐ Usually ☐ Sometimes ☐ Rarely
4. Has there been some decline in memory during the past year? ☐ Yes ☐ No
5. Is his/her memory impaired to such a degree that it would have interfered with his/her activities of daily life a few years ago (or pre-retirement activities)? (collateral sources opinion) ☐ Yes ☐ No
6. Does he/she completely forget a major event (e.g., trip, party, family wedding) within a few weeks of the event? ☐ Usually ☐ Sometimes ☐ Rarely
7. Does he/she forget pertinent details of the major event? ☐ Usually ☐ Sometimes ☐ Rarely
8. Does he/she completely forget important information of the distant past (e.g., birthdate, wedding date, place of employment)? ☐ Usually ☐ Sometimes ☐ Rarely
9. Tell me about some recent event in his/her life that he/she should remember. (For later testing, obtain details such as location of the event, time of day, participants, how long the event was, when it ended and how the subject or other participants got there).

   Within 1 week: _____

   _____

   _____

   Within 1 month: _____

   _____

   _____

10. When was he/she born? _____
11. Where was he/she born? _____
12. What was the last school he/she attended? _____

    Name _____

    Place _____

    Grade _____

13. What was his/her main occupation/job (or spouse's job if subject was not employed)? _____
14. What was his/her last major job (or spouse's job if subject was not employed? _____
15. When did he/she (or spouse) retire and why? _____

1

Memory questions for informant

It provides info about the presence of problems, consistency, interference with everyday life, recent vs. well learned event, pt. personal details

Subject Initials _____

Clinical Dementia Rating Worksheet

Orientation Questions for Informant:

How often does he/she know of the exact:

1. Date of the Month?

☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

2. Month?

☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

3. Year?

☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

4. Day of the Week?

☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

5. Does he/she have difficulty with time relationships (when events happened in relation to each other)?

☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

6. Can he/she find his/her way about familiar streets?

☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

7. How often does he/she know how to get from one place to another outside his/her neighborhood?

☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

8. How often can he/she find his/her way about indoors?

☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

Orientation questions for informant

It provides info about time orientation, time relationship, orientation to space

Clinical Dementia Rating Worksheet

Judgment and Problem Solving Questions for Informant:

1. In general, if you had to rate his/her abilities to solve problems at the present time, would you consider them:
   - ☐ As good as they have ever been
   - ☐ Good, but not as good as before
   - ☐ Fair
   - ☐ Poor
   - ☐ No ability at all
2. Rate his/her ability to cope with small sums of money (e.g., make change, leave a small tip):
   - ☐ No loss
   - ☐ Some loss
   - ☐ Severe loss
3. Rate his/her ability to handle complicated financial or business transactions (e.g., balance check-book, pay bills):
   - ☐ No loss
   - ☐ Some loss
   - ☐ Severe loss
4. Can he/she handle a household emergency (e.g., plumbing leak, small fire)?
   - ☐ As well as before
   - ☐ Worse than before because of trouble thinking
   - ☐ Worse then before, another reason (why) _____
5. Can he/she understand situations or explanations?
   ☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know
6. Does he/she behave* appropriately [i.e., in his/her usual (premorbid) manner] in social situations and interactions with other people?
   ☐ Usually ☐ Sometimes ☐ Rarely ☐ Don't Know

*This item rates behavior, not appearance.

3

Problem solving questions for informant

It provides info about pt's ability to cope with

- small amount of money,
- household emergency,
- financial transaction,
- understand explanations,
- behave appropriately.

Clinical Dementia Rating Worksheet

Community Affairs Questions for Informant:

Occupational

1. Is the subject still working? ☐ Yes ☐ No ☐ N/A
   If not applicable, proceed to item 4
   If yes, proceed to item 3
   If no, proceed to item 2
2. Did memory or thinking problems contribute to the subject's decision To retire? (Question 4 is next) ☐ Yes ☐ No ☐ D/K
3. Does the subject have significant difficulty in his/her job because of problems with memory or thinking?
   ☐ Rarely or Never ☐ Sometimes ☐ Usually ☐ Don't Know

Social

4. Did he/she ever drive a car? ☐ Yes ☐ No
   Does the subject drive a car now? ☐ Yes ☐ No
   If no, is this because of memory or thinking problems? ☐ Yes ☐ No
5. If he/she is still driving, are there problems or risks because of poor thinking? ☐ Yes ☐ No

*6. Is he/she able to independently shop for needs?
   ☐ Rarely or Never (Needs to be accompanied on any shopping trip) ☐ Sometimes (Shops for limited number of items; buys duplicate items or forgets needed items) ☐ Usually ☐ Don't Know

7. Is he/she able to independently carry out activities outside the home?
   ☐ Rarely or Never (Generally unable to perform activities without help) ☐ Sometimes (Limited and/or routine, e.g., superficial participation in church or meetings; trips to beauty parlor) ☐ Usually (Meaningful participation in activities, e.g., voting) ☐ Don't Know

8. Is he/she taken to social functions outside a family home? ☐ Yes ☐ No
   If no, why not? _____
9. Would a casual observer of the subject's behavior think the subject was ill? ☐ Yes ☐ No
10. If in nursing home, does he/she participate well in social functions (thinking)? ☐ Yes ☐ No

IMPORTANT:
Is there enough information available to rate the subject's level of impairment in community affairs?
If not, please probe further.

Community Affairs: Such as going to church, visiting with friends or family, political activities, professional organizations such as bas association, other professional groups, social clubs, service organizations, educational programs.

***Please add notes if needed to clarify subject's level of functioning in this area.**

Community affair questions for informant

It provides info about pt's occupation and social interests

Clinical Dementia Rating Worksheet

Home and Hobbies Questions for Informant:

1a. What changes have occurred in his/her abilities to perform household chores? _____

_____

1b. What can he/she still do well? _____

_____

2a. What changes have occurred in his/her abilities to perform hobbies? _____

_____

2b. What can he/she still do well? _____

_____

3. If in nursing home, what can he/she no longer do well (H and H)? _____

_____

Everyday Activities (Blessed):

	No Loss		Severe Loss
4. Ability to perform household tasks	0	0.5	1

Please describe: _____

_____

_____

5. Is he/she able to perform household chores at the level of:
(Pick one. Informant does not need to be asked directly).

☐ No meaningful function.
(Performs simple activities, such as making a bed, only with much supervision)

☐ Functions in limited activities only.
(With some supervision, washes dishes with acceptable cleanliness; sets table)

☐ Functions independently in some activities.
(Operates appliances, such as a vacuum cleaner; prepares simple meals)

☐ Functions in usual activities but not at usual level.

☐ Normal function in usual activities.

IMPORTANT:
Is there enough information available to rate the subject's level of impairment in HOME & HOBBIES?
If not, please probe further.

Homemaking Tasks: Such as cooking, laundry, cleaning, grocery shopping, taking out garbage, yard work, simple car maintenance, and basic home repair.

Hobbies: Sewing, painting, handicrafts, reading, entertaining, photography, gardening, going to theater or symphony, woodworking, participation in sports.

Home and Hobbies questions for informant

It provides info about pt's ability to perform everyday activities, if and what changes have occurred in his/her ability to perform household chores and hobbies.

Subject Initials _____

Clinical Dementia Rating Worksheet

Personal Care Questions for Informant:

*What is your estimate of his/her mental ability in the following areas:

	Unaided	Occasionally misplaced buttons, etc.	Wrong sequence commonly forgotten items	Unable to dress
A. Dressing (Blessed)	0	1	2	3
	Unaided	Needs prompting	Sometimes needs help	Always or nearly always needs help
B. Washing, grooming	0	1	2	3
	Cleanly; proper utensils	Messily; spoon	Simple solids	Has to be fed completely
C. Eating habits	0	1	2	3
	Normal complete control	Occasionally wets bed	Frequently wets bed	Doubly incontinent
D. Sphincter control (Blessed)	0	1	2	3

*A box-score of 1 can be considered if the subject's personal care is impaired from a previous level, even if they do not receive prompting.

Personal care questions for informant

It provides info about pt's preserved ability of taking care of himself/herself: dressing, washing, eating, sphincter control.

Clinical Dementia Rating Worksheet

Memory Questions for Subject:

1. Do you have problems with memory or thinking? ☐ Yes ☐ No
2. A few moments ago your (spouse, etc.) told me a few recent experiences you had. Will you tell me something about those? (Prompt for details, if needed such as location of the event, time of day, participants, how long the event was, when it ended and how the subject or other participants got there).

Within 1 week

1.0 – Largely correct _____
0.5 _____
0.0 – Largely incorrect _____

Within 1 month

1.0 – Largely correct _____
0.5 _____
0.0 – Largely incorrect _____

3. I will give you a name and address to remember for a few minutes. Repeat this name and address after me: (Repeat until the phrase is correctly repeated or to a maximum of three trials).

Elements	1	2	3	4	5
	John	Brown,	42	Market Street,	Chicago
	John	Brown,	42	Market Street,	Chicago
	John	Brown,	42	Market Street,	Chicago

(Underline elements repeated correctly in each trial).

4. When were you born? _____
5. Where were you born? _____
6. What was the last school you attended?
   Name _____
   Place _____ Grade _____
7. What was your main occupation job (or spouse if not employed)? _____
8. What was your last major job (or spouse if not employed)? _____
9. When did you (or spouse) retire and why? _____
10. Repeat the name and address I asked you to remember:

Elements	1	2	3	4	5
	John	Brown,	42	Market Street,	Chicago

(Underline elements repeated correctly in each trial).

Memory question for subjects

It provides info about problems consistency, recent vs. well learned event memory problems, learning abilities pt. personal details

Clinical Dementia Rating Worksheet

Orientation Questions for Subject

Record the subject's answer verbatim for each question

1. What is the date today? ☐ Correct ☐ Incorrect

_____

2. What day of the week is it? ☐ Correct ☐ Incorrect

_____

3. What is the month? ☐ Correct ☐ Incorrect

_____

4. What is the year? ☐ Correct ☐ Incorrect

_____

5. What is the name of this place? ☐ Correct ☐ Incorrect

_____

6. What town or city are we in? ☐ Correct ☐ Incorrect

_____

7. What time is it? ☐ Correct ☐ Incorrect

_____

8. Does the subject know who the informant is (in your judgment)? ☐ Correct ☐ Incorrect

_____

Orientation question for subjects

It provides info about time orientation, time relationship, orientation to space

Clinical Dementia Rating Worksheet

Judgment and Problem Solving Questions for Subject:

Instructions: If initial response by subject does not merit a grade 0, press the matter to identify the subject's best understanding of the problem. Circle nearest response.

Similarities:

Example: "How are a pencil and pen alike? (writing instruments)

How are these things alike?" Subject's Response

1. turnip.....cauliflower _____
   (0 = vegetables)
   (1 = edible foods, living things, can be cooked, etc.)
   (2 = answers not pertinent; differences; buy them)

2. desk.....bookcase _____
   (0 = furniture, office furniture; both hold books)
   (1 = wooden, legs)
   (2 = not pertinent, differences)

Differences:

Example: "What is the difference between sugar and vinegar? (sweet vs. sour)

What is the difference between these things?

3. lie.....mistake _____
   (0 = one deliberate, one unintentional)
   (1 = one bad the other good – or explains only one)
   (2 = anything else, similarities)

4. river.....canal _____
   (0 = natural - artificial)
   (1 = anything else)

Calculations:

5. How many nickels in a dollar? ☐ Correct ☐ Incorrect

6. How many quarters in $6.75? ☐ Correct ☐ Incorrect

7. Subtract 3 from 20 and keep subtracting 3 from each new number all the way down. ☐ Correct ☐ Incorrect

Judgment:

8. Upon arriving in a strange city, how would you locate a friend that you wished to see?

   (0 = try the telephone book, go to the courthouse for a directory; call a mutual friend)
   (1 = call the police, call operator (usually will not give address)
   (2 = no clear response)

9. Subject's assessment of disability and station in life and understanding of why she/she is present at the examination (may have covered, but rate here):

   ☐ Good Insight ☐ Partial Insight ☐ Little Insight

Problem solving questions for informant

It provide info about problems solving, similarities and differences

CDR Record Form – Rating Table (Boxes)

Subject Initials _____

CLINICAL DEMENTIA RATING (CDR)

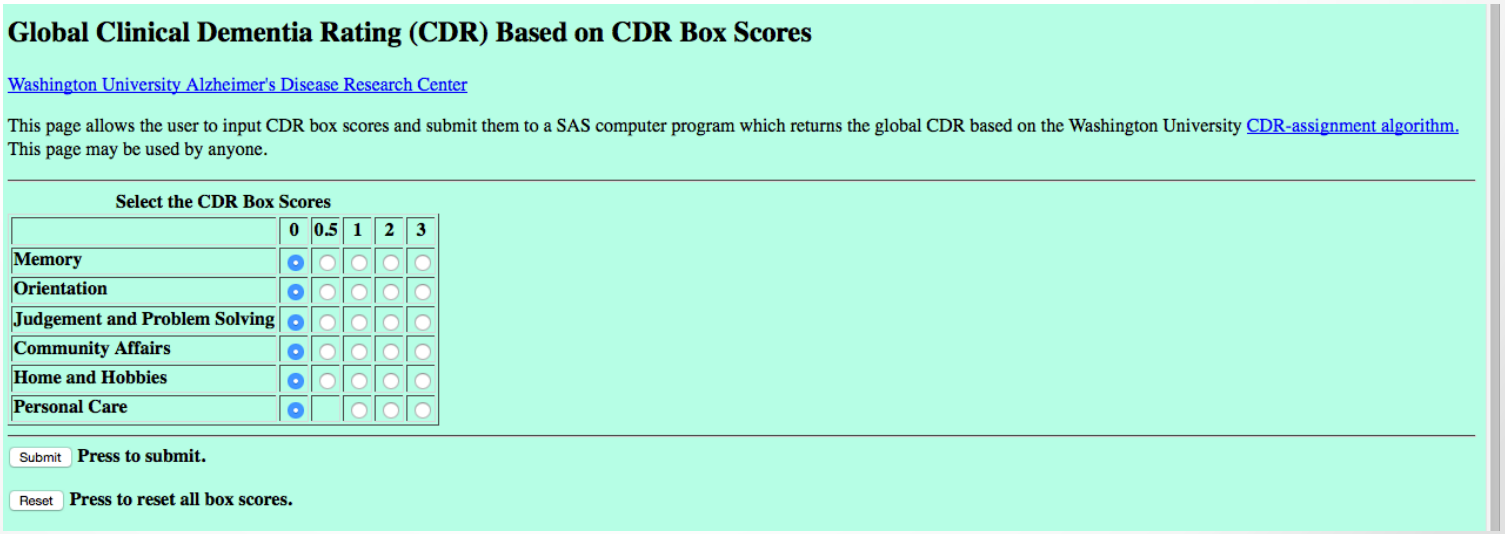
CLINICAL DEMENTIA RATING (CDR):	0	0.5	1	2	3

	Impairment				
	None 0	Questionable 0.5	Mild 1	Moderate 2	Severe 3
Memory	No memory loss or slight inconsistent forgetfulness	Consistent slight forgetfulness; partial recollection of events; "benign" forgetfulness	Moderate memory loss; more marked for recent events; defect interferes with everyday activities	Severe memory loss; only highly learned material retained; new material rapidly lost	Severe memory loss; only fragments remain
Orientation	Fully oriented	Fully oriented except for slight difficulty with time relationships	Moderate difficulty with time relationships; oriented for place at examination; may have geographic disorientation elsewhere	Severe difficulty with time relationships; usually disoriented to time, often to place	Oriented to person only
Judgment & Problem Solving	Solves everyday problems & handles business & financial affairs well; judgment good in relation to past performance	Slight impairment in solving problems, similarities, and differences	Moderate difficulty in handling problems, similarities, and differences; social judgment usually maintained	Severely impaired in handling problems, similarities, and differences; social judgment usually impaired	Unable to make judgments or solve problems
Community Affairs	Independent function at usual level in job, shopping, volunteer and social groups	Slight impairment in these activities	Unable to function independently at these activities although may still be engaged in some; appears normal to casual inspection	No pretense of independent function outside home Appears well enough to be taken to functions outside a family home	Appears too ill to be taken to functions outside a family home
Home and Hobbies	Life at home, hobbies, and intellectual interests well maintained	Life at home, hobbies, and intellectual interests slightly impaired	Mild but definite impairment of function at home; more difficult chores abandoned; more complicated hobbies and interests abandoned	Only simple chores preserved; very restricted interests, poorly maintained	No significant function in home
Personal Care	Fully capable of self-care		Needs prompting	Requires assistance in dressing, hygiene, keeping of personal effects	Requires much help with personal care; frequent incontinence

Score only as decline from previous usual level due to cognitive loss, not impairment due to other factors.

CDR Total score

- The Global Score for the CDR is obtained by entering the Box scores into the Web form located at: http://www.biostat.wustl.edu/adrc/
- For the Personal Care domain, a score of 0.5 is not allowed. Only scores 0, 1, 2, and 3.
- **If Memory is 0.5, the Global CDR Score will be a 0.5 at minimum.** The weighting applied to each domain influences the Global Score greatly



Global Clinical Dementia Rating (CDR) Based on CDR Box Scores

Washington University Alzheimer's Disease Research Center

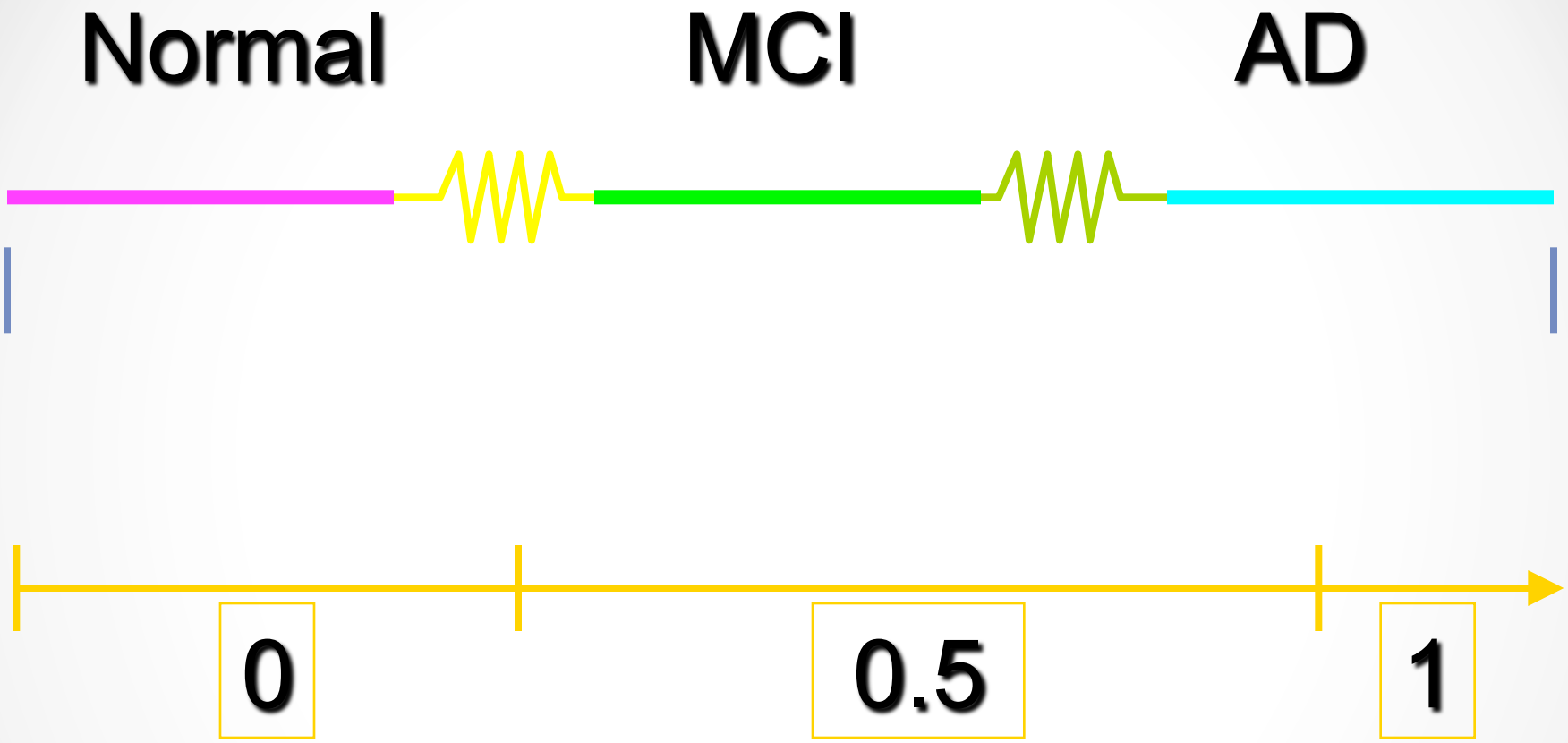
This page allows the user to input CDR box scores and submit them to a SAS computer program which returns the global CDR based on the Washington University CDR-assignment algorithm. This page may be used by anyone.

Select the CDR Box Scores

	0	0.5	1	2	3
Memory	◉	○	○	○	○
Orientation	◉	○	○	○	○
Judgement and Problem Solving	◉	○	○	○	○
Community Affairs	◉	○	○	○	○
Home and Hobbies	◉	○	○	○	○
Personal Care	◉		○	○	○

Submit **Press to submit.**

Reset **Press to reset all box scores.**



CDR (clinical dementia rating scale)