The Neuropsychological Assessment of Dementia

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Neuropsychological Assessment Course

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Overview

- Normal Aging
- Types of Dementia
- Clinical Interviewing for Dementia
- Neuropsychological Assessment Tools
- Interpretation of Findings
- Case presentations

Aging demographics

- 39+ million Americans aged 65+
- One out of every eight Americans
- 80 million by 2030, twice the current number
- People over 85 are the fastest growing age group
- 57 to 83 % of Older Adults report some type of memory complaint, such as forgetting names, phone numbers, or losing objects (keys)

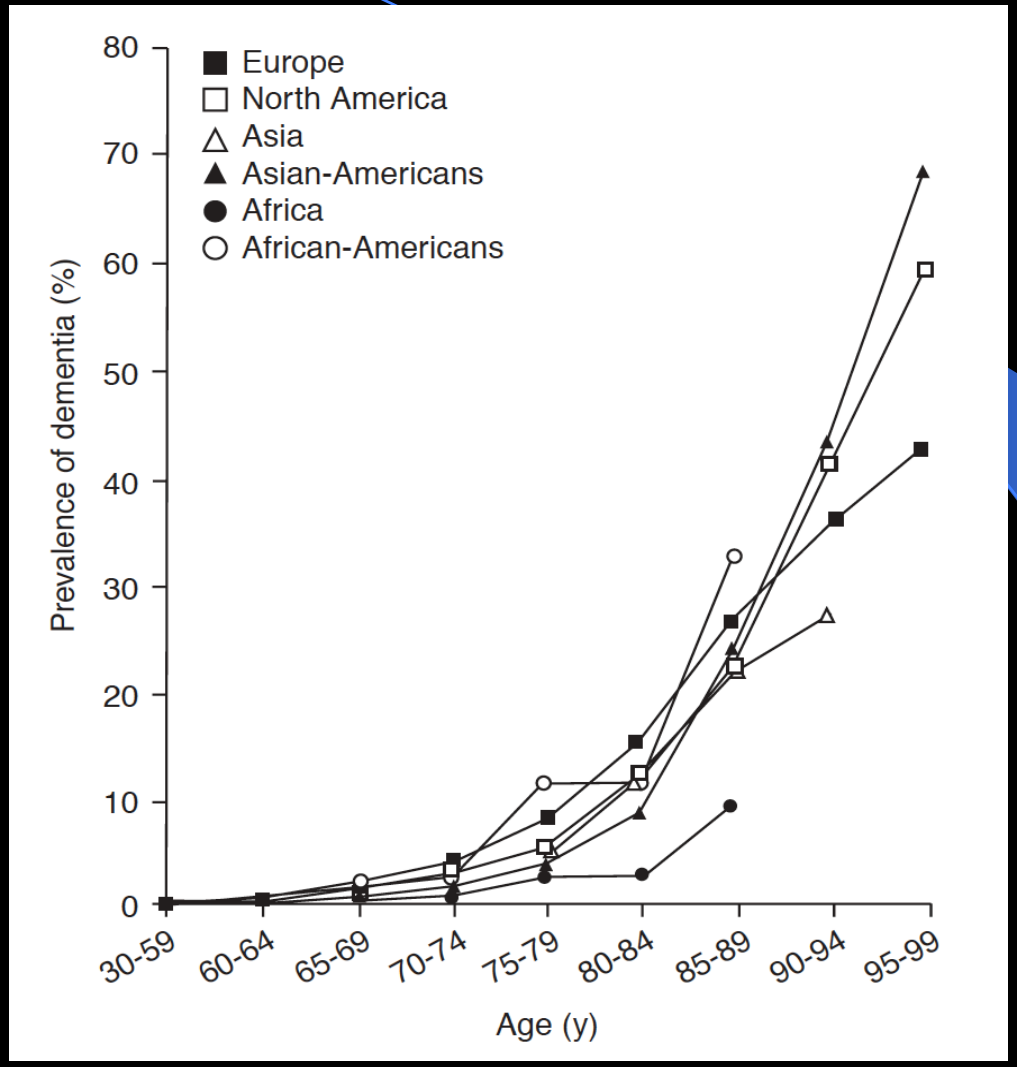
From Administration on Aging; http://www.aoa.gov/ from 2008

Senior Moments

Cognition in normal aging

Domain	Declines	Intact
Memory	Working memory Recent long-term memory Episodic long-term memory Encoding and retrieval Prospective memory	Remote long-term memory Semantic memory Procedural memory Storage
Processing speed/attention	Cognitive and psychomotor speed	Simple attention span
Executive functioning	Complex problem-solving Divided attention Inhibition Set-shifting for verbal information	Set shifting for visual information Some abstract verbal reasoning Some cognitive flexibility
Overall intelligence	Fluid intelligence Perceptual-integrative skills	Crystallized intelligence Verbal skills

Dementia Frequency



Adapted from Fratiglioni, L., De Ronchi, D., Aguero-Torress, H. (1999) Worldwide prevalence and incidence of dementia. *Drugs & Aging, 15, 365-375*

DSM-IV Criteria for Dementia♪

A. The development of multiple cognitive deficits manifested by both:

1) memory impairment (impaired ability to learn new information and to recall previously learned information)

2) one or more of the following cognitive disturbances

(a) aphasia (language disturbance)

(b) apraxia (impaired ability to carry out motor activities despite intact motor function)

(c) agnosia (failure to recognize or identify objects despite intact sensory function)

(d) disturbance in executive functioning

DSM-IV Criteria for Dementia♪

B. Cognitive deficits cause significant impairment in social or occupational functioning and represent a significant decline from a previous level of functioning

C. Clinical course involves gradual onset & progression

D. Must not occur exclusively during delirium & must not be attributable to other CNS conditions or major psychiatric disorders

Proposed DSM-V changes♪

1) Diagnostic category, "Delirium, Dementia, Amnestic, and Other Cognitive Disorders"
2) Removing the term "Dementia" and adding "Major Neurocognitive Disorders"
3) Adding a category of "Minor Neurocognitive Disorders"
4) Add Subtypes for Major and Minor Neurocognitive disorders including vascular, FTLD, DLB, Huntington's, Parkinson's, TBI, etc.

Cummings & Benson Criteria

Dementia using Benson and Cummings' criteria, defined as:

Acquired impairment in at least 3 of 5 domains, including memory, language, visuospatial ability, higher cognition, and mood or personality.

Cummings JL, Benson DF. Dementia: definition, prevalence, classification, and approach to diagnosis. In: *Dementia: A Clinical Approach. 2nd ed. Newton, Mass: Butterworth-Heinemann; 1992.*

Disorders that may Produce Dementia

- Alzheimer's disease
- Vascular dementia
- Frontotemporal lobar degeneration
- Dementia of Lewy Bodies
- Parkinson's disease
- Huntington's disease
- Creutzfeldt-Jakob disease
- Corticobasal degeneration
- Progressive supranuclear palsy
- Infectious Diseases (HIV, Syphilis, Lyme Disease etc.)
- Substance Abuse
- Traumatic Brain Injury
- Hydrocephalus

Reversible Causes of Dementia

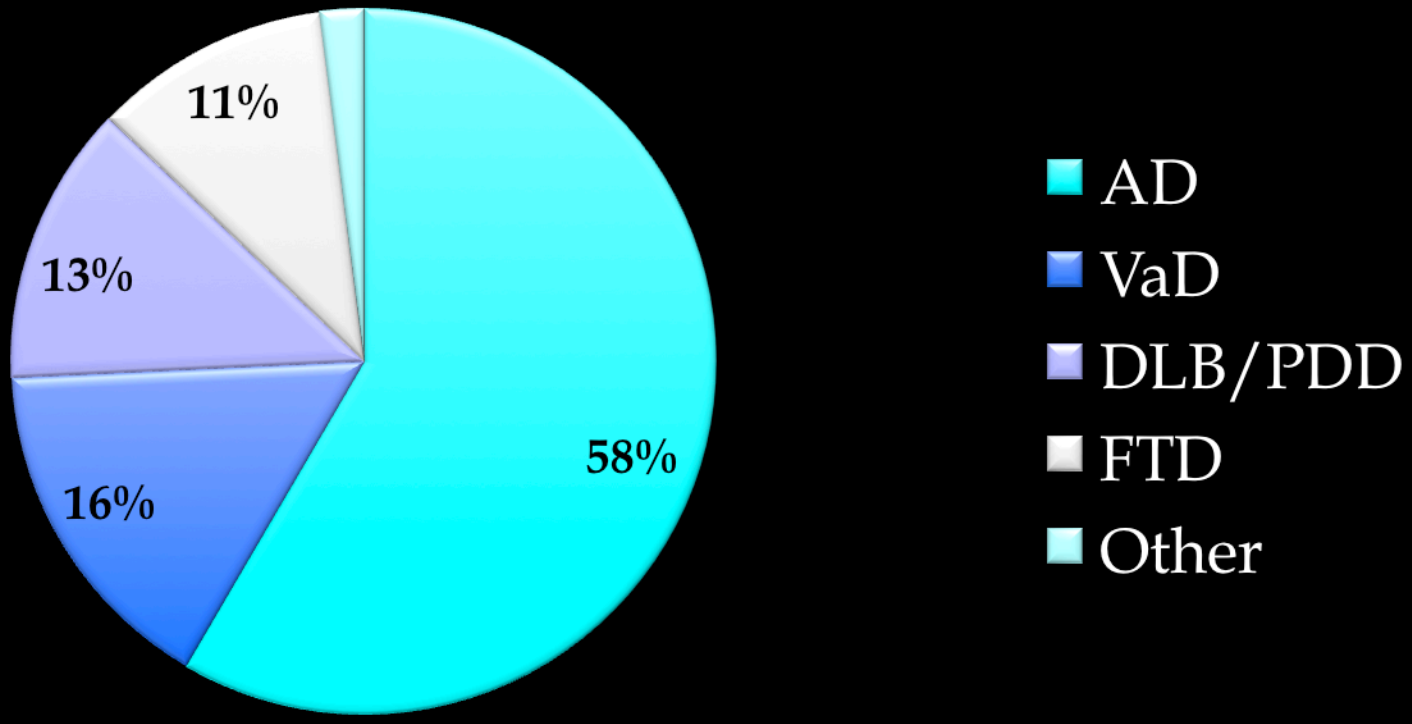
- Depression
- Adverse Drug Reactions (side effects, e.g. Ambien)
- Metabolic Changes (i.e., diabetes, thyroid disorders)
- Nutritional Deficiencies (B-12 deficiency, poor protien intake)
- Urinary Tract Infections

Cortical Versus Subcortical Dementias

- CORTICAL:
  - Alzheimer's Disease,
  - FTD
  - DLB

- SUBCORTICAL:
  - Huntington's Disease
  - Parkinson's disease
  - Often vascular related cognitive impairment
  - Progressive Supranuclear Palsy
  - HIV related dementia

Dementia Incidences



Adapted from van der Flier and Scheltens. J Neurol Neurosurg Psychiatry. 2005;76(Supl V):v2-v7; Grossman H, et al. Mt. Sinai J Med.2006;73:985-992.

National Prevalence Estimates

Aging, Demographics, and Memory Study (ADAMS; Plassman, 2007)

- Alzheimer's Disease (AD) is the most common cause of dementia in the U.S.
- In 2002, 3.4 million dementia cases ages 71+
- Of these, 2.4 million were AD
- With increasing age, AD accounts for more dementia cases
  - 46.7% of dementia in ages 71-79
  - 74.8% of dementia ages 80-89
  - 79.5% of dementia in ages 90+

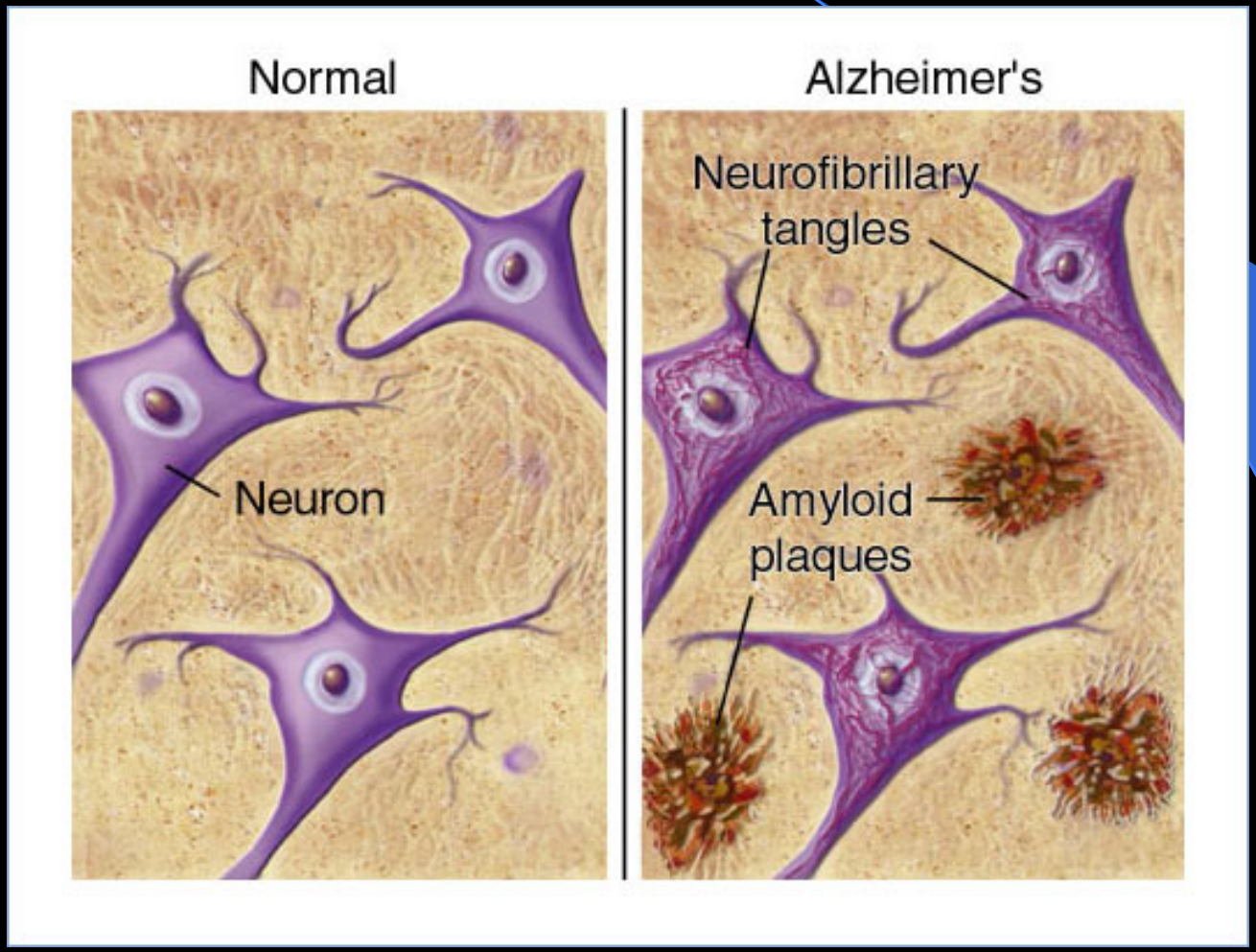
Criteria for Diagnosis of Probable Alzheimer's Disease (NINCDS-ADRDA)

- Dementia established by clinical examination
- Deficit in 2+ areas of cognition (memory required) of at least 12 months in duration
- Gradual onset and progression
- Absence of other systemic disorder or brain disease that can account for the cognitive deficits

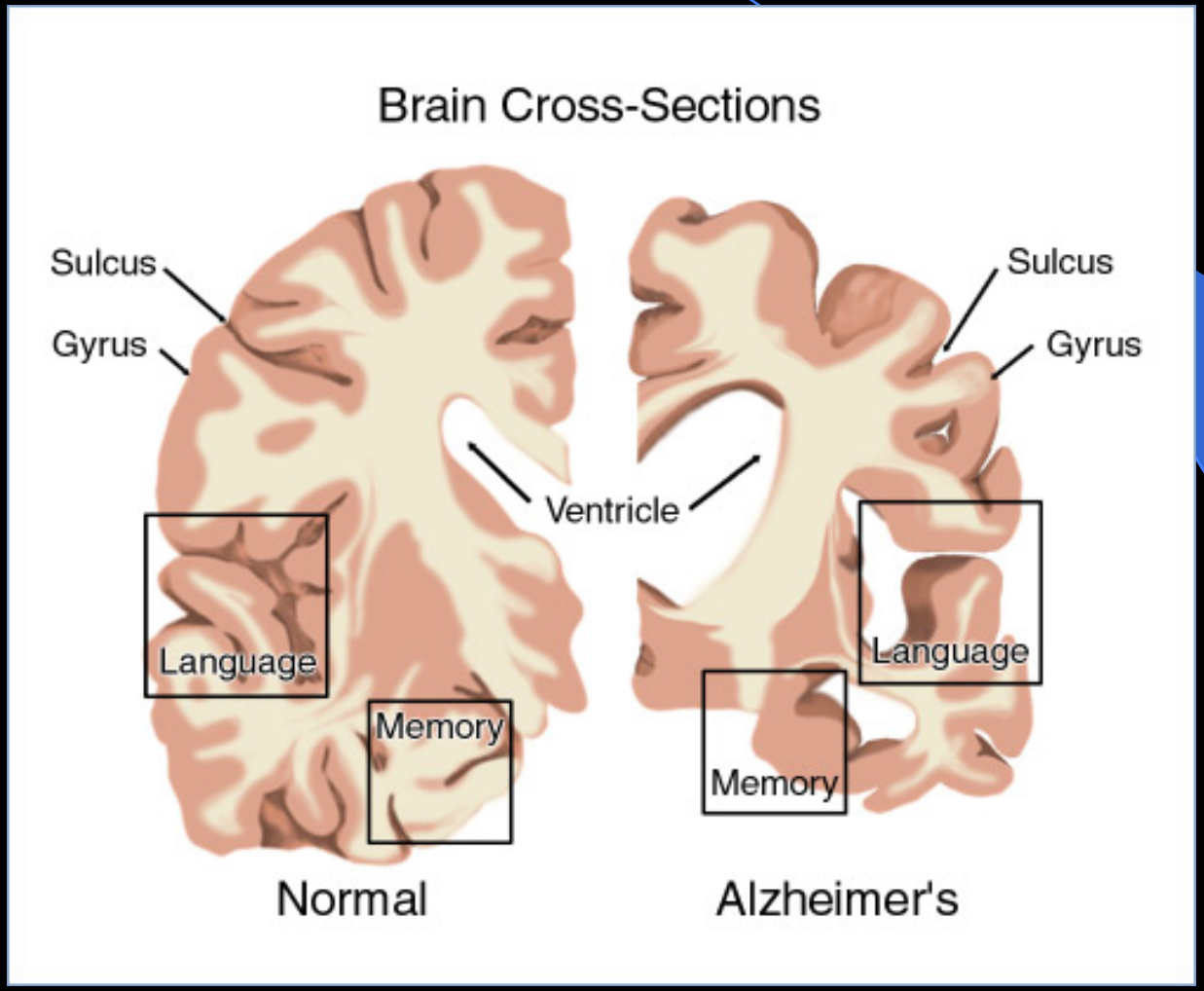
Risk Factors for AD

- Age
- Female gender
- History of head trauma
- Low level of educational attainment
- Apolipoprotein e4 (ApoE-4) allele

Pathology of AD



Structural Correlates of Cognitive Dysfunction in AD



Clinical and Neuropsychological Features of Early AD

- Prominent decline in memory (amnestic)
- At least mild decline in:

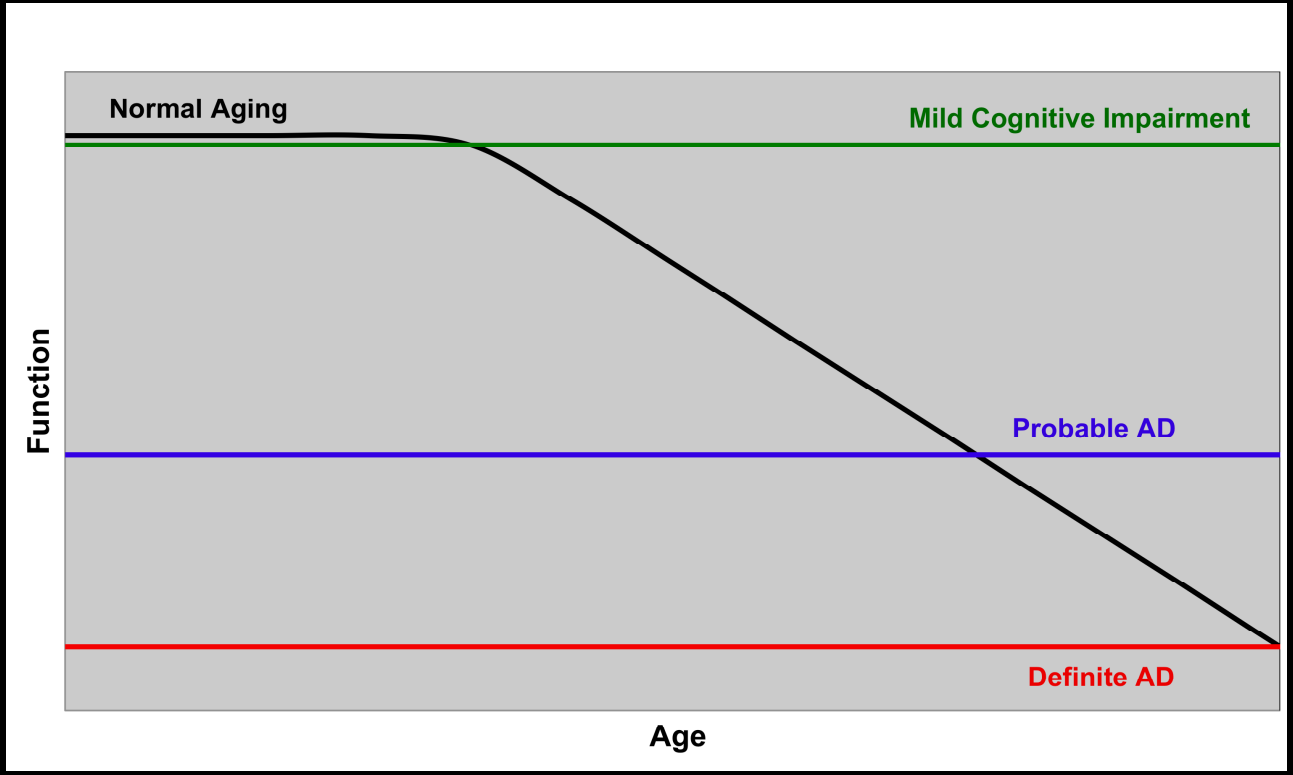
  - Visual perceptual spatial skills

  - Language (word-finding; reduced semantic fluency relative to letter fluency)

  - Executive functioning
- Basic attention, remote memory, vocabulary, and motor dexterity relatively preserved

What is Mild Cognitive Impairment?

- Identified a prodromal/transition stage between normal cognitive decline associated with aging and Alzheimer's disease.



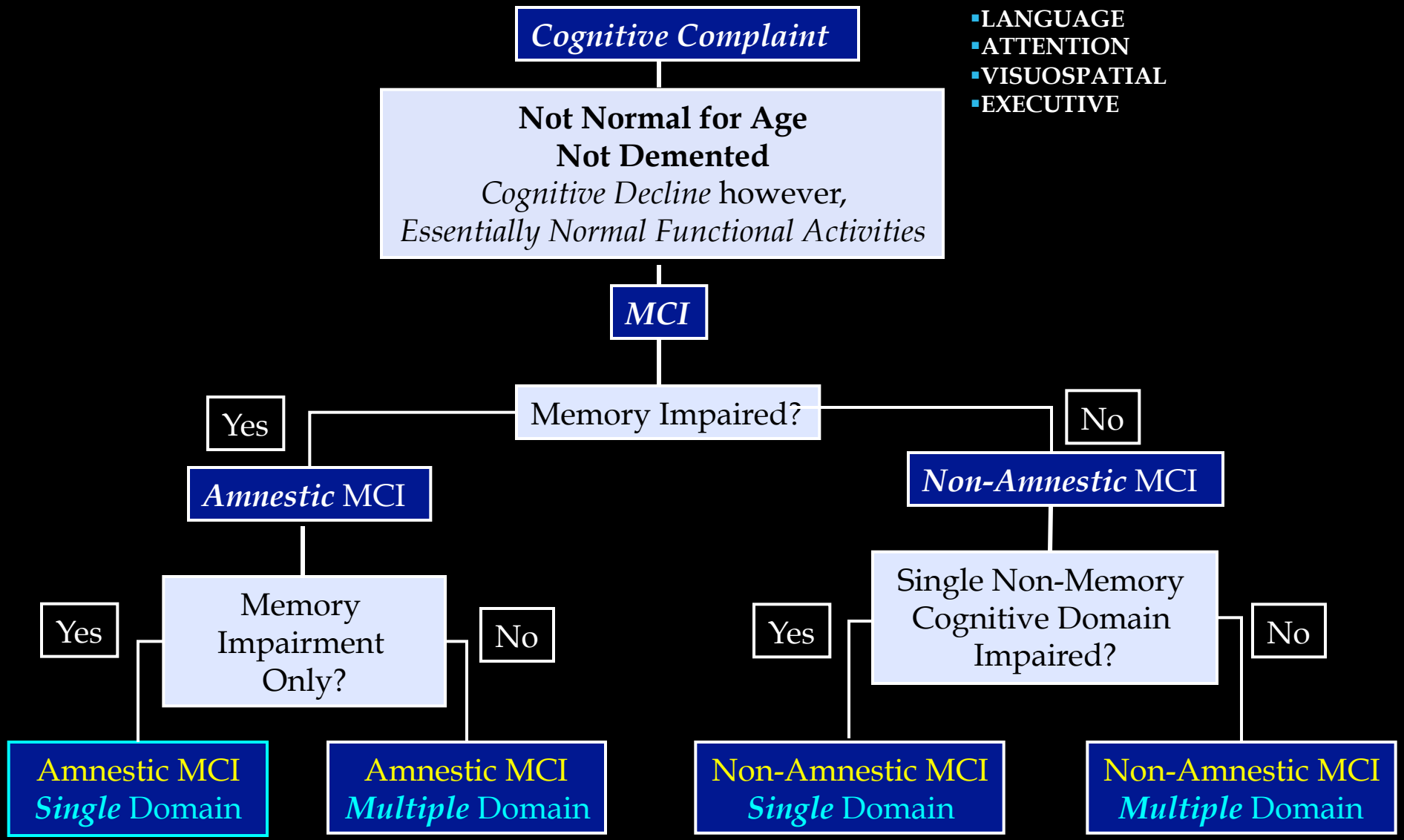
Petersen's Criteria for Mild Cognitive Impairment

- Memory concerns, preferably corroborated by a reliable informant
- Cognitive performance significantly worse than same age- and education-matched peers on objective testing

  (>1.5 SD below age-appropriate norms)
- Normal activities of daily living
- Normal global cognitive function
- Not demented

Mild Cognitive Impairment (MCI)

- MEMORY
- LANGUAGE
- ATTENTION
- VISUOSPATIAL
- EXECUTIVE



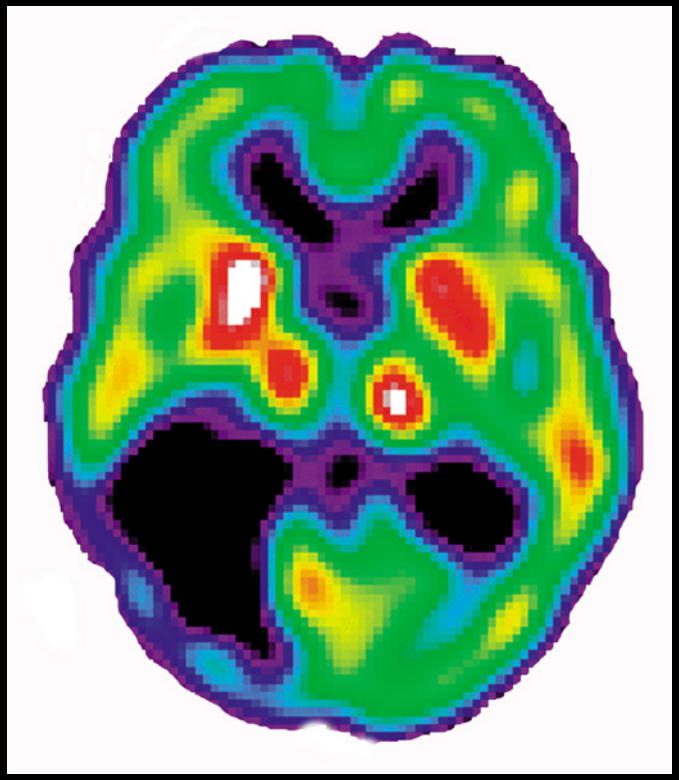
Vascular Dementia

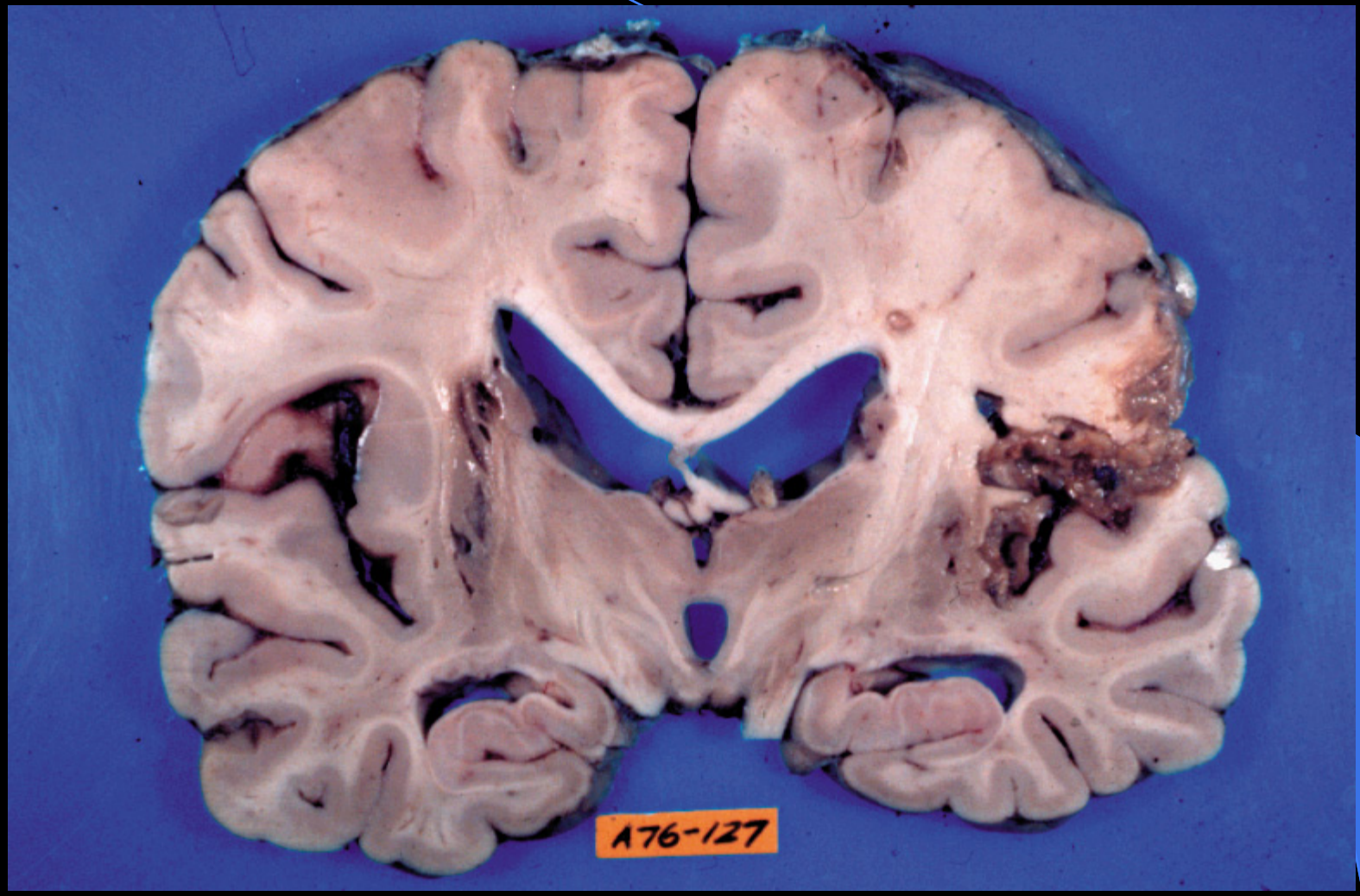
- Significant public health problem
- 2nd leading cause of dementia (Alzheimer's Disease 1st)
- Caused by blockages in brain's blood supply – stroke
- Age 60-75; more men than women
- 15-30% of dementia cases
  - Higher number of patients with "vascular cognitive impairment" (VCI)
- Difficult to differentiate from other dementias
  - Highly variable location and underlying pathology → variable neuropsychological profile → limited ability to rule out other causes
- Possible etiologies: ischemia, hemorrhage, or hypoxia-ischemia
  - Clinical features vary depending on etiology

Vascular Dementia

- Abrupt onset
- Stepwise progression or fluctuating course
- Focal neurological signs
- Gait disturbances

MRI and SPECT of Vascular Dementia

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NINDS-AIREN Diagnostic Criteria

Supporting features

- Subtle onset and variable course of cognitive deficits
- Early presence of gait disturbance
- History of unsteadiness, frequent and unprovoked falls
- Early urinary frequency, urgency, and other urinary symptoms not explained by urologic disease
- Pseudobulbar palsy
- Personality and mood changes, abulia, depression, emotional incontinence, and subcortical deficits, including psychomotor retardation and abnormal executive function

NINDS-AIREN Diagnostic Criteria

Probable VaD

- *Dementia*
  - Decline from a previous higher level of cognitive functioning
  - Impairment of two or more cognitive domains
  - Deficits severe enough to interfere with activities of daily living and not due to physical effects of stroke alone
  - Absence of delirium; absence of psychosis, aphasia, or sensorimotor impairment that precludes neuropsychological testing; and absence of any other disorder capable of producing a dementia syndrome
- *Cerebrovascular disease (CVD)*
  - Focal neurologic signs consistent with stroke, and
  - Neuroimaging evidence of extensive vascular lesions (CT, MRI)
- *Relationship between dementia and CVD*, as evidenced by one or more of the following:
  - Onset of dementia within 3 months of a recognized stroke
  - Abrupt deterioration OR fluctuating or stepwise progression of the cognitive deficit

Neuropsychological Profile of VaD

Subcortical white matter 'is the first to go'

Declined processing speed & motor slowing (earlier than AD)

Frontal lobe 'also goes' because it is connected to white matter

Declined executive functioning

Cognitive Impairment in VaD

- Impairment of executive functions mediated by frontal-subcortical circuits
  - Shifting mental set, response inhibition (Stroop Color Word Interference Test)
  - Word list generation (COWAT)
  - Motor programming tests
  - Attention and psychomotor speed (Digit-Symbol, Digit Span, Trails A & B)
- Word-finding difficulty, articulation abnormalities
- More severe executive function impairment and less memory impairment (esp. recognition) than AD patients

Neuropsychological Features of Vascular Dementia

- Type of cognitive impairment depends on region and size of infarction
- With multiple infarcts, “patchy” deficits are common
- Ischemic injury to the subcortical white matter, produces a “frontal-subcortical” pattern of deficits:
- - retrieval deficit type of memory impairment
- - prominent frontal/executive dysfunction
- - slowing in speed of information processing

Frontotemporal Lobar Degeneration (FTLD)

- Composed of a spectrum of related disorders resulting from degeneration of the frontal lobes and/or anterior temporal lobes
- Manifest as profound behavioral and personality alterations, language disturbance, or both

Frontotemporal Lobar Degeneration (FTLD)

- Includes:
  - **FTD behavioral variant**
  - **Progressive nonfluent aphasia**
  - **Semantic Dementia**
  - Cortico basal degeneration (CBD)
  - Primary progressive aphasia
  - Progressive Supranuclear Palsy (PSP)
  - Pick's disease
  - Familial chromosome 17-linked frontal dementia

Primary FTLD Clinical Syndromes

- **Frontotemporal dementia (FTD):**

  Bilateral or asymmetric atrophy of the frontal lobes, anterior temporal lobes, or both

- **Progressive non-fluent aphasia (PNA):**

  Atrophy is asymmetric, involving chiefly the left frontotemporal lobes

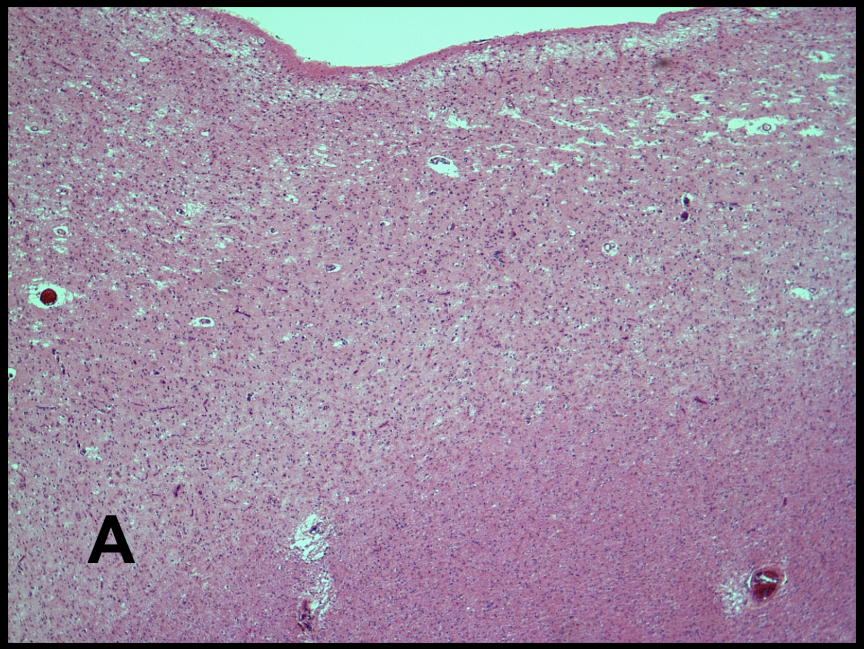
- **Semantic dementia (SD):**

  Bilateral atrophy of the anterior temporal neocortex with inferior and middle temporal gyri predominantly affected

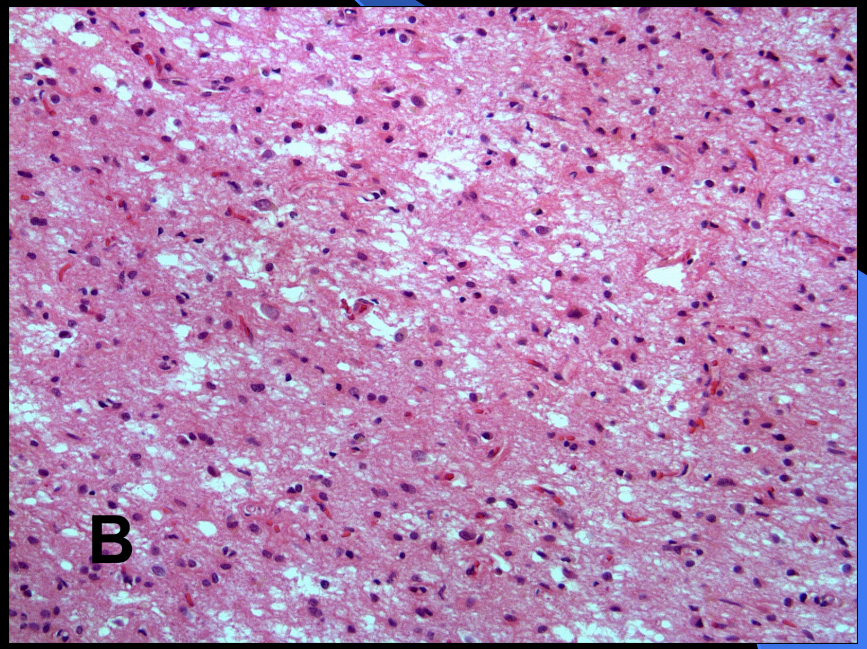
Demographic Characteristics

- FTLD is the third most common primary neurodegenerative disease after Alzheimer's disease and dementia with Lewy bodies (Neary et al. 1998)
- It is the most common cause of early-onset dementia.
- Affects 250k Americans per year or 6.7 people per 100k among people ages 45 to 64.
- Age of onset usually ranges from 51 to 63 with an average of 57 years. However have been seen from 18 to 90.
- Males and females equally affected

Section of dorsolateral posterior frontal cortex (from an FTD patient) showing spongiform change and astrocytic gliosis of the superficial cortical layers.



Low magnification (A)



High magnification (panel B)

Core Diagnostic Features FTD (Consensus Criteria, Neary et al. 1998)

- Insidious onset and gradual progression
- Early decline in social interpersonal conduct
- Early impairment in regulation of personal conduct
- Early emotional blunting
- Early loss of insight

Supportive Features

- Decline in personal hygiene and grooming
- Mental rigidity and inflexibility
- Distractibility and impersistence
- Hyperorality and dietary changes
- Perseverative and stereotyped behavior
- Utilization behavior

Neuropsychological Characteristics of **FTD**

- **Attention & Processing Speed**

  Mildly reduced performance due to distractibility or poor self-monitoring

- **Memory**

  Mild deficits; Memory performance between that of normal controls and AD patients

- **Visual-spatial functions**

  Simple construction generally preserved; complex construction may be compromised due to disorganization

Neuropsychological Characteristics of FTD

- **Language**: Mildly depressed or generally preserved
- **Executive Function**: *Significantly Impaired**

  - poor set shifting
  - deficits in problem-solving
  - concreteness of thinking
  - perseveration
  - poor letter and design fluency
  - inability to inhibit overlearned responses
  - poor organization
  - impaired temporal sequencing

Diagnostic Considerations

- 86% of autopsy-confirmed FTD patients had been clinically misdiagnosed with AD during their lifetime. (Mendez et al., 1993)
- Standard neuropsychological measures of executive functioning tend to be most sensitive dorsolateral prefrontal functioning and not orbitofrontal or anterior frontal lobe functioning.
- FTD is primarily a behavioral disorder. Therefore, collateral information and measures of social/ behavioral functioning are may be more sensitive.
- FTD is often misdiagnosed in its early stages as a primary psychiatric disorder.

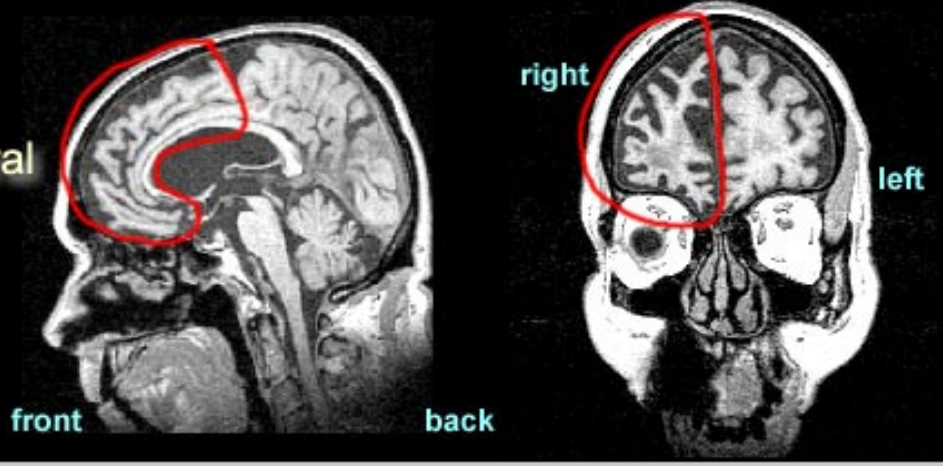
Core Diagnostic Features of **Progressive Nonfluent Aphasia**

- Insidious onset and gradual progression
- Nonfluent spontaneous speech with at least one of the following: agrammatism, phonemic paraphasias, anomia.

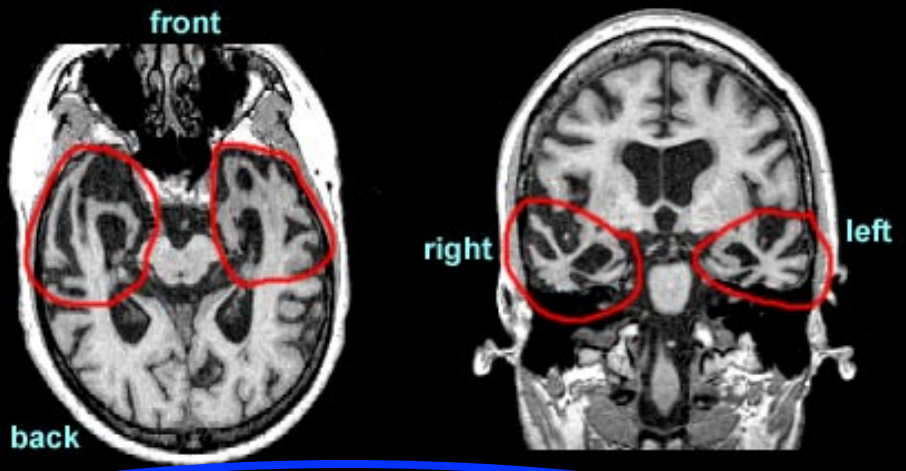
Supportive Features

- Stuttering, oral apraxia, effortful speech
- Impaired repetition
- Agraphia
- Early preservation of word meaning
- Late mutism
- Early preservation of social skills
- Late behavioral changes similar to FTD

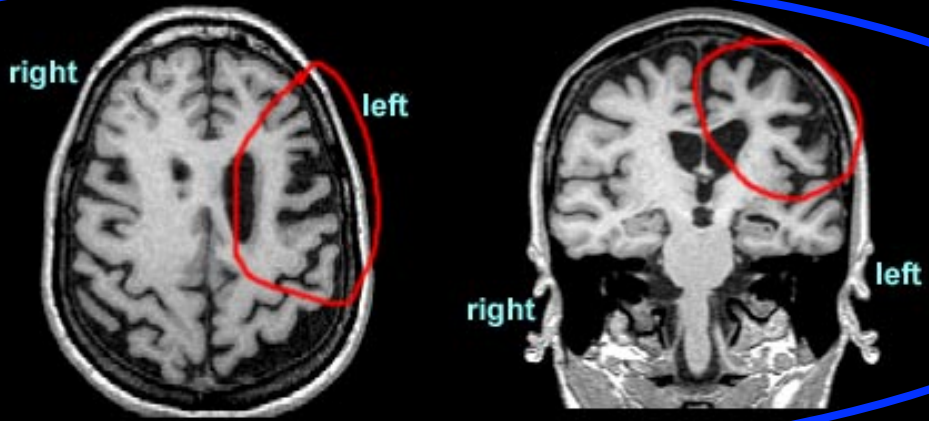
Frontotemporal Dementia (FTD)



Semantic Dementia (SD)



Progressive Non-Fluent Aphasia (PNFA)



Core Diagnostic Features of Semantic Dementia

- Insidious onset and gradual progression
- Language disorder characterized by
  - progressive, fluent, empty spontaneous speech
  - loss of word meaning (impaired naming and comprehension)
  - semantic paraphasias
- Perceptual disorder characterized by
  - prosopagnosia and/or associated agnosia
- Preserved perceptual matching and drawing reproduction
- Preserved single-word repetition
- Preserved ability to read aloud and write to dictation orthographically regular words

Dementia w/ Lewy Bodies

- DLB is the second most common primary neurodegenerative disease, after Alzheimer's disease (AD; Neary et al 1998)
- Men may be more susceptible to DLB and have a worse prognosis than women
- Mean age of onset of symptoms is 68 yrs
- Average time from onset to death is 6.4 years, with the most frequent cause of death being aspiration pneumonia (Khotianov et al 2001)

Lewy Body Dementia (DLB)

- A progressive dementia associated with a distinct clinical profile
- Pathologic hallmark is presence of Lewy bodies (LB)
- At autopsy, confirmatory diagnosis made with presence of LB in the brainstem and cortex
- Shares clinical and neuropathological features with AD and Parkinson's disease (PD).

Core Diagnostic Features DLB (Consensus Criteria, McKeith et al 1996)

- **Progressive dementia**
- **Two of the following core features:**
  - fluctuating cognition
  - visual hallucinations
  - motor features of parkinsonism
- **Supportive features (not essential for diagnosis)**
  - repeated falls and syncope
  - neuroleptic sensitivity
  - REM sleep behavior disorder
  - delusions and hallucinations in other modalities

DLB Neuropsychological Profile

- Attention & Processing Speed: Significantly reduced
- Visual-spatial functions: Disproportionate impairment
- Executive Function: Significantly impaired set shifting, deficits in problem-solving, and poor verbal fluency.
- Memory: Prominent or persistent memory impairment may not necessarily occur in the early stages but is usually evident with progression
- Language: Mildly depressed or generally preserved

Note that the selectivity of this pattern may be lost beyond the early stages, with the progression of dementia, when deficits in memory, language, and other cognitive skills frequently overlap with those seen in AD.

VaD "Quick" Differentials

VaD

- Abrupt onset, fluctuations
- Retrieval problematic
- Processing speed decline
- Executive functioning decline
- Vascular history
- Non-Parkinsonian tremors
- Falls

AD

- Insidious onset, gradual progression
- Encoding problematic
- Amnestic (high intrusions, rapid forgetting of info)
- Confrontation naming decline
- Attention spared until later
- Age and memory

DLB

- Visuospatial deficits
- Hallucinations
- Fluctuating cognition

FTD

- Early age of onset (40-50s)
- Marked personality changes
- Rapid progression
- Executive decline before memory

Clinical Interviewing for Dementia

Different Domains:

Memory: for names, numbers, etc

- Onset?
- Progression?
- Fluctuations?

(See interview form)

Assess ADLS & IADLS.

- How is there cognition impacting their functioning?

Screening Measures for Dementia

MMSE – widely used, sensitive at lower end, not for MCI.

MOCA – More sensitive that MMSE, better frontal functioning measure, more challenging visuospatial demands

Dementia Rating Scale – brief measure good at detecting lower end of dementia.

RBANS – Global brief cognitive screen, low ceiling, may not sensitive enough for high functioning adults.

ADAS Cog – Clinical dementia screen, global assessment. Not sensitive ceiling. Used in clinical trials. Good at lower end.

Clock Drawing – quick screen score 1-10 insert reference. Not very specific.

CDR – Interview based caregiver and patient review.

Tests Administered

UCLA Outpatient Geriatric Psychiatry

Beck Anxiety Inventory (BAI)
Boston Naming Test (BNT)
California Verbal Learning Test II (CVLT-II)
Controlled Oral Word Association Test ("FAS"; Animals)
Finger Tapping Test (FTT)
Geriatric Depression Scale (30-item version)
Memory Functioning Questionnaire (MFQ)
Mini Mental State Exam (MMSE)
Rey-Osterreith Figure Copy, 3" Recall, 30" Recall, and Recognition (at 30")
Stroop (Golden Version)
Trail-Making Test Part A
Trail-Making Test Part B
WAIS-III subtests:
Arithmetic, Block Design, Digit Span, Digit Symbol Coding, Letter-Number Sequencing, Matrix Reasoning, Picture Completion, Similarities
Wechsler Memory Scale – Third Edition (WMS-III; Logical Memory I, II, & Recognition; Visual Reproduction I, II, & Recognition)
Wechsler Test of Adult Reading (WTAR)
Wisconsin Card Sort Task (WCST)

Supplementary Measures for FTD

- Frontal Assessment Battery (FAB)
- Frontal Behavioral Inventory (FBI)
- Neuropsychological Assessment Battery (NAB) Judgment Module
- The Executive Interview (Exit 25)
- Iowa Gambling Task
- The Western Aphasia Battery

Memory: Key Terms

Memory: Active system that stores, organizes, alters, and recovers (retrieves) information

Encoding: Converting information into a useable form

Storage: Holding this information in memory

Retrieval: Taking memories out of storage

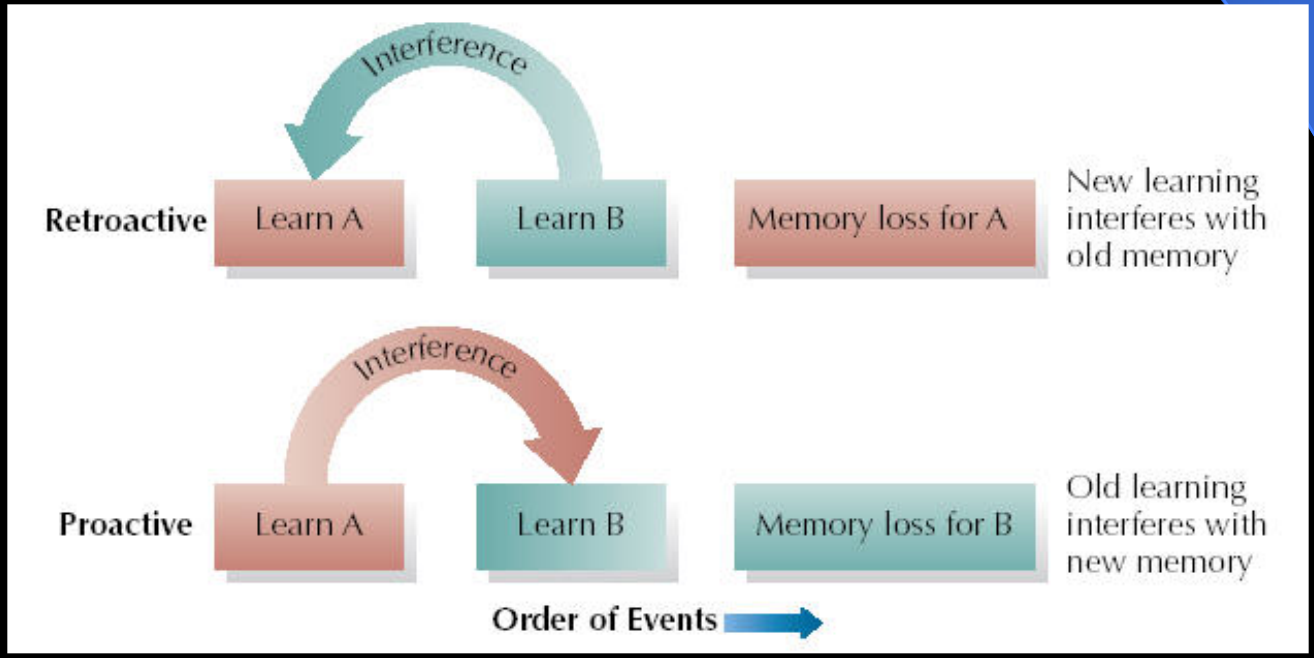
Interpretation of Memory Findings

- Verbal Memory

Learning	Recall	Recognition	Characterization
Good	Poor	Good	Retrieval Deficit
Good	Poor	Poor	Amnestic Pattern
Poor	Poor	Good	Attention/Recall Deficit

Interpretation of Memory Findings

- **Interference theory**: a theory that proposes that forgetting is due to other information in memory interfering
- **Proactive interference:** old information interferes with the retrieval of newly-stored information
- **Retroactive Interference:** newly-stored information interferes with the retrieval of previously-stored information



Qualitative Language Impairments

- Nonword phonemically based paraphrasic error (more than half of the target word phonology is preserved)
- Real word phonemically based paraphrasic error
- Verbal paraphasia, semantically related to the target word
- Verbal paraphasia unrelated to the target word
- Neologism (less than 50% overlap with the phonology of the target word)
- Multi-word paraphrasic error
- Circumlocution
- Perseveration
- Perceptual misnaming

Sample Behavioral Observations

The patient arrived for her appointment on time, accompanied by her husband, Bob. The patient was casually dressed and adequately groomed. Eye contact was inconsistent, and the patient exhibited periods of fixed gaze. She ambulated with a walker; her gait was small-stepped. She exhibited a slight intention tremor in her hands bilaterally, as well as psychomotor retardation.

She was only partially oriented to time; she could recall the month, but was unable to state the year, date, or day of the week. When asked about important historical events, she was unable to recall details about President Kennedy's assassination or what happened on 9/11.
Her speech rate was slowed, monotonic, slightly hypophonic and output was underproductive and hesitant. She had long response latencies when answering questions.

Sample Behavioral Observations

Mood was reported as “blue", and she displayed a restricted range of affect that was generally congruent with the content of the conversation.
She admitted to a variety of depressive symptoms including depressed mood, decreased interest in and pleasure from activities, fatigue, psychomotor retardation, and poor concentration. She denied suicidal or homicidal ideation. She reported adequate appetite. Sleep was described as "alright" with frequent mid-insomnia and increased daytime fatigue. Her thought processes were linear and content was normal with no hallucinations.

Praxis was generally intact for simple acts (i.e. throw a ball, brush her teeth, comb her hair, and wave goodbye); however, she was unable to demonstrate how to strike and blow out a match. No perceptual disturbances or bizarre ideations were noted in her thought content. The patient’s insight and judgment appeared poor, given the limited appreciation she demonstrated for her cognitive and functional strengths and limitations, compared to that reported by her husband.

Mr. PE

- 59-year-old, Mexican-American male
- Began experiencing cognitive problems about 1.5 years ago but his wife had noticed significant behavioral changes as far back as 4 years ago
- No identifiable precipitating event

Cognitive Changes

- Significant word finding problems
- Tendency to repeat greetings and phrases
- Short-term memory loss
- Poor reasoning ability

Behavioral Changes

- Leave home and disappear for hours
- Two hit-and-run accidents over a period of 6 months
- Acquired craving for sweets resulting in weight gain of 20 lbs in 4 months
- Newly developed interest in pornography

Medical & Psychiatric History

- Hit over the head with a tire iron about 30 years ago with brief LOC
- High blood pressure, controlled with medication
- Minor heart attack in 1991
- Alcohol abuse since age 21; Sober for 5 years
  Multiple citations for DUI; Most recent offense resulted in 4-month jail sentence
- SPECT scan shows symmetrical decreased perfusion in orbitofrontal and inferior frontal lobes, also affecting the anteromedial temporal lobes

Socially Inappropriate Behavior

- Disregard for one's social space
- Laughed out loud at things that amused him
- Growled like a lion when asked to make an angry face
- Inappropriate gestures on a hand gesture generation task
- Danced in front of a car

Neuropsychology - PE

- Attention
  - Digit Span (5F,3B): *Low Average*
  - Stroop Color-Naming: 136 sec (*Impaired*)
  - Stroop Word Reading: 78 sec *(Impaired)*
  - Trailmaking Number Sequencing: 46 sec. (*Low Average*)
- Memory

  Shopping List Trials 1-5: 6, 7, 6, 7, 7
    - 15-min Delay: 6
    - Recognition: 10/10, 1 FP error

  WMS-III Logical Memory I: *Average*

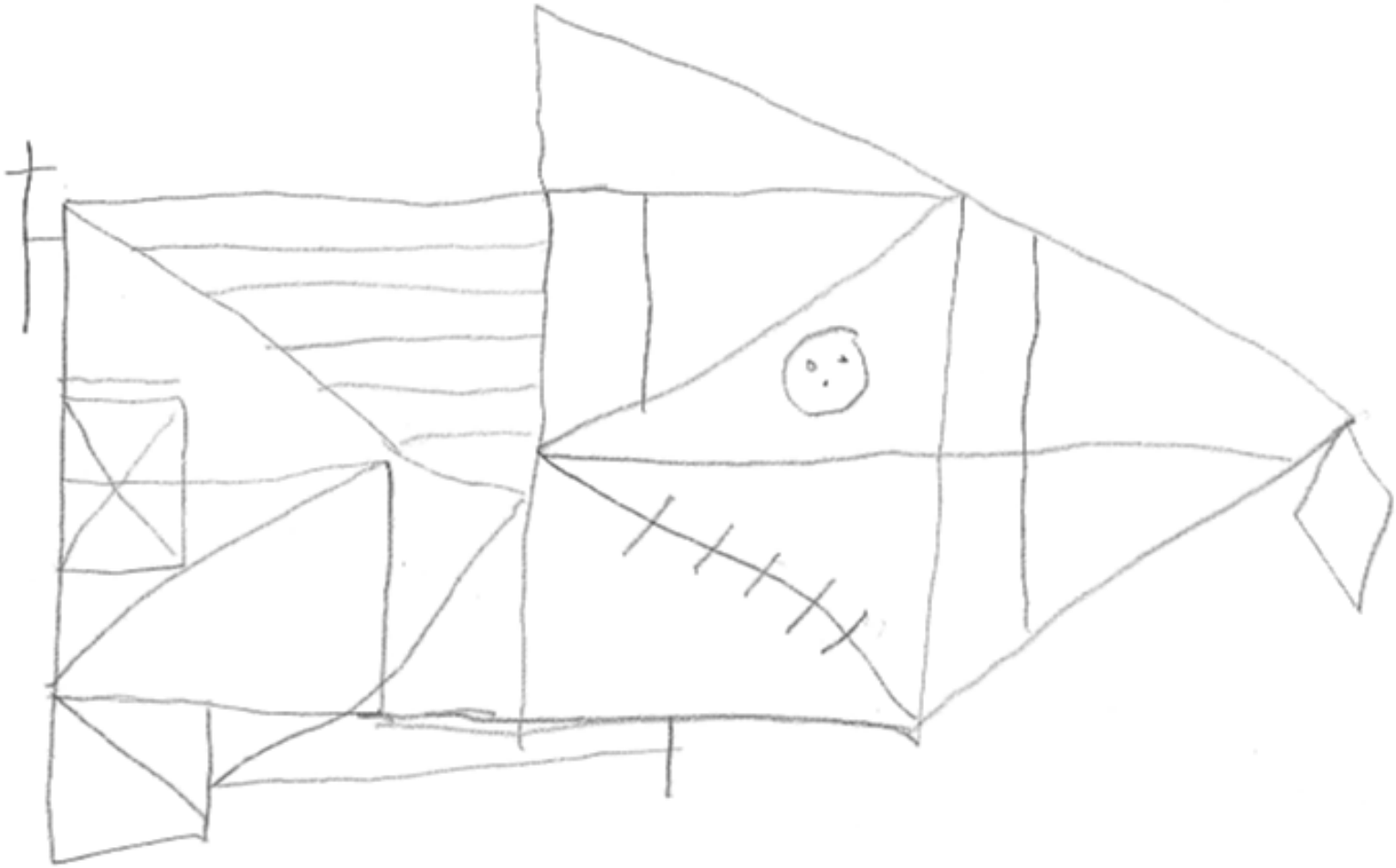
  WMS-III Logical Memory II: *Low Average*

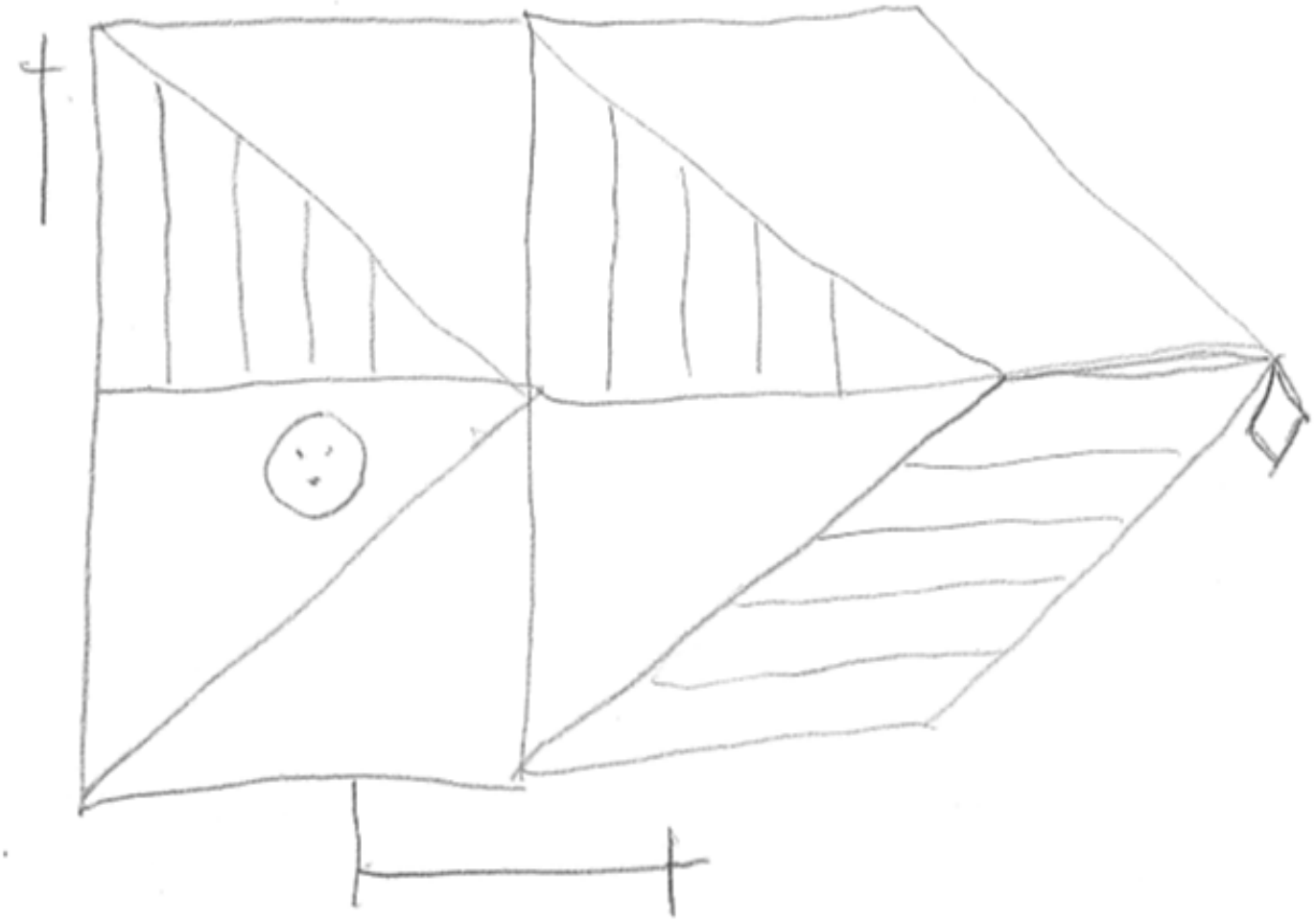
  Rey Complex Figure 3-min recall: *Low Average*

  Rey Complex Figure Recognition: 11/12, 4 FP errors (*Low Average)*

Neuropsychology - PE

- Visual-Spatial Construction
  - Picture Completion: *Superior*
  - Block Design: *Low Average to Borderline*
  - Rey Complex Figure Copy: 29.5/36 (*Borderline*)
  - Object Assembly: *Average*
- Language
  - Naming – BNT: 50/60 (*Borderline*)
  - Vocabulary word knowledge: *Low Average*
  - Fund of knowledge: *Average*
  - Verbal Fluency – Animals: 14 (*borderline*)





Neuropsychology - PE

- Executive/Frontal Systems Functioning
  - WCST (1 deck) - Categories: 0/6 (*Impaired*)
    Errors: 48 (*Impaired*)
    Perseverations: 62 (*Impaired*)
  - Trailmaking Number-Letter: 118 sec. (*Impaired*)
  - Stroop Inhibition: 236 sec. (*Impaired*)
  - Verbal Fluency - FAS: 18 (*Impaired*)
  - Design Fluency: 6
  - Abstraction (Similarities): *Impaired*
  - Picture Sequencing: *Low Average to Borderline Impaired*

E Scale

"I'm going to ask you some questions about how you handle social situations"

Behavior:

1) What would you say to an overweight person who was piling food on their plate? Fatso

2) What would you say if you saw a disabled person in a wheelchair? Go up to him & give him a handshake

3) What would you say to someone who was wearing an ugly outfit? tell him that he's wearing an ugly outfit

4) What would you say to someone whose zipper was down on their pants? tell him that "You're meat's hanging out."

5) What would you say or do if someone slipped and fell down in front of you? help him up

6) What would you say if someone gave you a present you didn't like? tell him I didn't like it

7) What would you say to an attractive woman/man wearing a swimsuit? nice buns

8) What would you say or do if you were stuck talking to someone who was not interesting? ignore him

9) What would you say or do if you were talking to someone and you needed to use the restroom? excuse me

10) What would you say or do if you were sitting next to someone with body odor? tell him that he smell

11) What would you do if you needed to use the restroom and couldn't find one? just look for one (a) crap in the alley pee

Geropsy Case presentation

See handout