Office-based Assessment of Cognition

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Disclosure/conflict of interest – Last 12 months – for Dr. Atri

● I am not/have not been part of any speakers bureau

● Institutional Research Grants or clinical trials:
  ● Novartis (observational cohort study), Global Alzheimer's Platform, Synexus (Brain Health Registry, observational cohort study)

● Scientific/Medical/Data Monitoring Advisory Board, Consultation, lectures/CME programs, or Work Groups/Committes:
  ● Alzheimer's Association, Biogen, Eisai, Grifols, Harvard Medical School Graduate Continuing Education (HMS CE), Lundbeck, National Institutes of Health (NIH) Roche/Genentech, Suven, Synexus

● Book/Authorship:
  ● Oxford University Press (OUP)
Disclosure for Dr. Solomon

- **Grant Support:** Acadia, AstraZeneca, Avanir, AVID, Biogen, Eli Lilly, Hoffman-LaRoche, Neuronetrix, vTv Pharma
- **Consulting:** Boehringer-Ingelheim, Cognito, Eli Lilly, General Electric, Neuronetrix
- **Royalties:** Elsevier(Saunders), Psychological Assessment Resources
Accurate and appropriate diagnosis requires a patient-centered communication to develop a partnership with the patient and a care partner.

Three fundamental steps in the diagnostic formulation:

Step 1: Is there something potentially wrong? Detection of potential Impairment [Delineate the Cognitive Functional Status]
- At what likely level: Cognitively unimpaired (CU), Mild Cognitive Impairment (MCI), mild Dementia, subjective cognitive impairment (SCD)?

Step 2: What is wrong? [Syndromic Dx]
- What are the characteristic of what is wrong
- Define the Cognitive-Behavioral Syndrome (e.g. amnestic syndrome, PPA, PCA) and refine stage (e.g. Amnestic single MCI; multidomain amnestic and dysexecutive dementia in the mild stages; multidomain, non-amnestic, behavioral and language dementia in mild stages)

Step 3: What is causing it? [Etiological Dx]
- What is/are cause(s)/etiology – the underlying driver(s) and contributing diseases (e.g. AD, LBD, Vascular Brain Injury) and disorders (e.g. OSA, alcohol, polypharmacy)
Evaluation:

- Need to obtain reliable collateral information from a “care partner”: a knowledgeable informant (spouse, partner, adult child, relative, friend, caregiver, confidant)
- History and structured review of cognition, daily function, behavior/neuropsychiatric symptoms, ROS
- Medications and OTC supplements
- Risk factors, Health related behaviors (exercise, sleep, nutrition, alcohol)
- Developmental Hx, Social Hx, Family Hx
- Assess level of and changes in cognition, daily function, mood/anxiety, sleep, sensorimotor function
- Brief Cognitive test (e.g. MoCA, MMSE, SLUMS, GP-Cog)
- Physical and neurologic exam
Care Pathway Model for Dementia CARE-D

Executive/Attention
Symptoms: Similar to above (inability to plan, organize, multi-task, make goals/decisions, problem solve, complete tasks), forget why entered a room, daydream, easily distracted, less mentally efficient (more mental effort needed for some tasks)

Slide courtesy of Dr. Lynn (Lili) Shaughnessy
Has there been a change, and in what domains - patient and care partner can complete separately (then can ask how long, fluctuating, progressive?)

<table>
<thead>
<tr>
<th>COGNITIVE SYMPTOMS</th>
<th>First Symptom</th>
<th>Worst Symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has there been a meaningful decline in your usual abilities for any of the following:</td>
<td>mark only one</td>
<td>mark only one</td>
</tr>
<tr>
<td>Recent or Short-term Memory</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>(problems making new memories, forgetting recent events or conversations, losing/misplacing items)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-term Memory</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>(remembering events from years/decades ago)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention/Concentration</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>(being more distractable, losing your train of thought, having short attention span)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization, Planning, Multi-tasking, completing tasks</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>Judgment, Reasoning or Problem Solving</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>Language</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>(having hesitancy in speech; having difficulty with word finding, ability to communicate, reading, writing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orientation to day, date, time, timing of life events</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>(remembering the correct day, date; time relation)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visuospatial Orientation &amp; Function</td>
<td>Yes</td>
<td>NO</td>
</tr>
<tr>
<td>(getting lost, finding way around, recognizing objects, not seeing things right in front of them)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>Yes</td>
<td>NO</td>
</tr>
</tbody>
</table>

Search for NACC UDS forms (judgment of symptoms – modify to fit your practice and EMR or use AD-8, IQ-CODE, CFI (Cognition Function Index), ADC-Q, etc.)
CFI (Cognitive Function Index)

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Maybe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compared to one year ago, do you feel that your memory has declined substantially?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do others tell you that you tend to repeat questions over and over?</td>
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<td></td>
<td></td>
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<tr>
<td>Have you been misplacing things more often?</td>
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<tr>
<td>Do you find that lately you are relying more on written reminders (e.g., shopping lists, calendars)?</td>
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<tr>
<td>Do you need more help from others to remember appointments, family occasions or holidays?</td>
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<tr>
<td>Do you have more trouble recalling names, finding the right word, or completing sentences?</td>
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<tr>
<td>Do you have more trouble driving (e.g., do you drive more slowly, have more trouble at night, tend to get lost, have accidents)?</td>
<td></td>
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<tr>
<td>Compared to one year ago, do you have more difficulty managing money (e.g., paying bills, calculating change, completing tax forms)?</td>
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<tr>
<td>Are you less involved in social activities?</td>
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<td></td>
<td></td>
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<tr>
<td>Has your work performance (paid or volunteer) declined significantly compared to one year ago?</td>
<td></td>
<td></td>
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<tr>
<td>Do you have more trouble following the news, or the plots of books, movies or TV shows, compared to one year ago?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are there any activities (e.g., hobbies, such as card games, crafts) that are substantially more difficult for you now compared to one year ago?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are you more likely to become disoriented, or get lost, for example when traveling to another city?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have more difficulty using household appliances (such as the washing machine, VCR or computer)?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

See Amariglio RE, et al. JAMA Neurol 2015 for utility
Informant Completed Alzheimers Disease Caregiver Questionnaire (ADCQ)

Advantages

- Test and Instructions freely available on the web (bostonmemory.com)
- 18 item YES / NO questionnaire
- Sensitivity > 90%, Specificity > 85%
- Minimal staff time required

Disadvantages

- Requires presence of caregiver
- Not validated for self-report by patient

Solomon et al.
Background Information
Please answer the following questions by circling the appropriate response.

A. How old is the person being rated? ________

B. What is the person's gender? Male Female

C. How many days each week do you see the person being rated? 1 2 3 4 5 6 7

D. How many times each week do you talk on the telephone with the person being rated? 0-5 6-10 10-20 >20

E. Where does this person live? Own home/apartment Assisted living/community care Nursing home Other (please specify) ________

Questions
Circle Yes to any of the events that have occurred within the last 6 months, and circle No if the events have not occurred in the last 6 months. Circle N/A if the question does not apply to the person you are rating.

1. Does the person repeat questions about the events of the day? 
   Yes No N/A

2. Does the person have trouble recalling conversations the next day? 
   Yes No N/A

3. Does the person have trouble recalling conversations a few days later? 
   Yes No N/A

4. Has there been confusion while doing familiar things? 
   Yes No N/A

5. Has the person become confused about financial matters (for example, paying bills multiple times)? 
   Yes No N/A

6. Has the person become confused regarding the day, month, or year? 
   Yes No N/A

7. Has the person become lost or confused when driving or walking in a familiar place? 
   Yes No N/A

8. Has the person seemed bewildered or confused in familiar places? 
   Yes No N/A

9. Has the person become lost while traveling in an unfamiliar location? 
   Yes No N/A

10. Does the person have difficulties adjusting to changes in his/her day-to-day routine? 
    Yes No N/A

11. Does the person have trouble performing tasks that require many steps (for example, balancing a checkbook or cooking a meal)? 
    Yes No N/A

12. Is the person unable to respond with a reasonable plan to problems at work or home, such as knowing what to do if the bathroom is flooded or the electricity goes out? 
    Yes No N/A

13. Are there pauses in his/her speech? 
    Yes No N/A

14. Is the person often unable to find even common words or familiar names, so that he/she finds it difficult to have a normal conversation? 
    Yes No N/A

15. Does the person often forget what he/she wanted to say in the middle of a conversation? 
    Yes No N/A

16. Have there been any changes in personality (including mood and behavior)? 
    Yes No N/A

17. Has the person been agitated? 
    Yes No N/A

18. Have the person's problems worsened steadily? 
    Yes No N/A
Background Information
Please answer the following questions by circling the appropriate response.
A. How old is the person being rated? ____________
B. What is the person's gender? Male Female
C. How many days each week do you see the person being rated? 1 2 3 4 5 6 7
D. How many times each week do you talk on the telephone with the person being rated? 0-5 6-10 10-20 >20
E. Where does this person live?
   Own home/apartment
   Assisted living/community care
   Nursing home
   Other (please specify) ________________

Questions
Circle Yes to any of the events that have occurred within the last 6 months, and circle No if the events have not occurred in the last 6 months. Circle N/A if the question does not apply to the person you are rating.

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Level of Arousal

- **Describe what you observe**

- Common terms (e.g. “sleepy”) mean different things to different people – everything to awake and relatively alert to nearly comatose)

- The same goes for terms such as “arousable, sleepy, somnolent, obtunded, comatose”.

Orientation

- Context (situation)
- Person (s)
- Spatial location (place: state, city, hospital, bldg, floor)
- Temporal (year, season, month, day, date, time of day, exact time)
Memory

In different domains – verbal, visual, spatial

- Immediate: Registration/encoding (items, name & address, story, copying figures, asking for belongings or hiding objects in the room)
- Delayed Recall and Recognition - after a delay of at least 5 minutes
- Intermediate-term (recent events, conversations)
- Long-term
  - Autobiographical (where born, went to school, jobs, …)
  - Semantic – general knowledge (name of president, VP, year(s) of WWII)
Aphasia: disorder of communication

- **Fluency**
- **Comprehension**
  - “If a lion and a tiger fight and the tiger eats the lion, which animal is still alive?” or
  - A multi-step command, preferably across midline: “Please take your left thumb, touch your right ear, and then point to the door”
- **Reading**
- **Writing** (sentence with subject and verb)
- **Repeating** (“The Bruins scored two touchdowns in the fourth quarter to beat the Trojans”)
- **Naming** (go from high frequency to low frequency)
Visuospatial Skills

Integrating detail, structure, and spatial relations

- Copying a cube or intersecting pentagons
- Construction and mental manipulation of objects
- Drawing a clock-face and the hands of the clock to a specified time (“Please draw a large round clock face with all the numbers in place; now draw the hands of the clock for it to show ten minutes past 11”)
Specialized Mental Functions/ Multimodal Dysfunction

- Calculations
- Reasoning/Problem Solving
- Abstraction
- Agnosia
- Neglect
- Apraxia
Calculation, Reasoning, Problem Solving, Abstraction

- # of quarters in $6.75
- Calculate tip: 15% of $120 bill
- Word problem: “It takes 4 workers to complete a job in 6 hours, how many workers do you need to complete the job in ½ hour?”

Similarities and differences
- Similarity between: train & bicycle, desk & book case, clock & ruler
- Difference between: lie & mistake, river & canal
Praxis

- **Apraxia** - loss of the ability to execute or carry out learned purposeful movements, despite having the desire and the physical ability to perform the movements

- *Ideomotor* (inability to carry out a motor command, for example, "act as if you are brushing your teeth" or "salute") – most common form, is usually caused by lesions of (language) dominant hemisphere
  - *limb apraxia* when movements of the arms and legs are involved,
  - *nonverbal-oral* or *buccofacial* (inability to carry out facial movements on command, e.g., lick lips, whistle, cough, or wink)

- *Ideational* (inability to create a plan for or idea of a specific movement, for example, "pick up this pen and write down your name") – most commonly encountered during encephalopathy (delirium, confusional state)
Need to Assess Multiple Affected Domains in Alzheimer’s Disease – AD is a Complex Disorder Associated with Deficits in Cognition, Daily Living Function, Neuropsychiatric Function, Global Function, and has effects on QoL for individual and her/his community

Representative Assessment Scales in Dementia

<table>
<thead>
<tr>
<th>Domain</th>
<th>Considerations</th>
<th>Example Scale(s)¹,²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognition</td>
<td>• Key change of interest in dementia</td>
<td>MoCA MMSE SLUMS SIB* GP-Cog ADAS-cog* BDS-IMC</td>
</tr>
<tr>
<td>Daily Living Function</td>
<td>• Ability to carry out ADL</td>
<td>ADCS-ADL FAQ IADL</td>
</tr>
</tbody>
</table>
| Neuropsychiatric Function/Behavior | • Often referred to as BPSD  
• Can be hazardous; related to institutionalization and caregiver stress | NPI                |
| Staging/Severity          | • Staging of dementia                               | QDRS CDR GDS FAST  |
| Quality of life           | • Multidimensional; reflects patient’s perception of impact of illness on everyday functioning | ADRQL PDS         |
| Depression                | • Common symptom, but can be challenging to assess  | Cornell Depression in Dementia Scale          |
| Caregiver burden          | • Major issue in dementia                           | General Health Questionnaire Zarit Caregiver Burden Interview (ZBI) |
| Global Impression         | • Designed to assign an overall level and assess changes in patient’s condition | ADCS-CGIC* CIBIS/CIBIC-Plus* |

ADAS-cog, Alzheimer’s Disease Assessment Scale, cognitive subscale; ADCS-ADL, Alzheimer’s Disease Cooperative Study Activities of Daily Living Inventory; ADCS-CGIC, Alzheimer’s Disease Cooperative Study – Clinical Global Impression of Change; ADRQL, Alzheimer Disease-related Quality of Life assessment instrument; BDS-IMC, Blessed Dementia Scale Information Memory and Concentration; BPSD, behavioral and psychotic symptoms of dementia; CDR, Clinical Dementia Rating; CIBIC-Plus, Clinician’s Interview-Based Impression of Change – Plus Caregiver Input; FAQ, Functional Activities Questionnaire; GDS, global deteriorating scale; IADL, Instrumental Activities of Daily Living; MoCA, Montreal Cognitive Assessment; MMSE, Mini–Mental State Examination; NPI, Neuropsychiatric Inventory; PDS, Progressive Deterioration Scale; SIB, Severe Impairment Battery; SLUMS, St Louis University Mental Status Exam. * Mostly used in clinical trials; QDRS – Quick Dementia Rating Scale

### Brief Office-based Cognitive Instruments

<table>
<thead>
<tr>
<th>Cognitive Screen</th>
<th>Comments</th>
</tr>
</thead>
</table>
| Mini Mental State Examination (MMSE)¹  | • Still widely used; copyright (~$1.23 per use required)  
  • Has norms for age, ethnicity, education  
  • Takes 5–10 minutes  
  • Limited executive-function assessment |
| Montreal Cognitive Assessment (MoCA)²   | • Most accessible/multiple languages  
  • Excellent sensitivity for MCI; more difficult than MMSE  
  • Good for executive-function assessment  
  • Takes 8–12 minutes |
| St. Louis University Mental Status      | • Less utilized; mostly studied in VA population  
  • Take 7–10 minutes  
  • Good sensitivity for MCI; more difficult than MMSE |
| Mental Status Examination (SLUMS)³     | • Quick: takes 3–5 min  
  • Simple: consists of clock draw (for executive function) and recall of 3 words  
  • Good sensitivity for dementia (equivalent or better than MMSE); unclear for MCI |
| Mini-Cog⁴                              |                                                                                                                                               |

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Correlational Analysis of 5 Commonly Used Measures of Cognitive Functioning and Mental Status: An Update

Todd M. Solomon, PhD¹,², Guy B. deBros, MA¹, Andrew E. Budson, MD², Nikola Mirkovic, BS¹, Cynthia A. Murphy, PsyD, MBA¹, and Paul R. Solomon, PhD¹,³

Abstract
There are numerous measures for detecting the presence of dementia and quantifying its severity and progression. We analyzed the relations between scores on 5 commonly used measures (Mini-Mental State Examination, Montreal Cognitive Assessment, Alzheimer's Disease Assessment Scale-Cognitive Subscale, Activities of Daily Living Scale, and Global Deterioration Scale) of 101 successive admissions to a memory clinic. Patients were included in the analysis only if they received a diagnosis of mild cognitive impairment (MCI) due to Alzheimer's disease (AD) pathophysiological process or probable AD and if they received all measures. Regression analysis yielded 20 linear equations that allow for conversion between test scores on any 2 measures. Further, participants were grouped by MMSE scores with regard to level of disease severity, allowing for the creation of a quick reference table for estimating an approximate score range between measures. Results from this study provide a useful tool for clinicians when comparing between multiple different instruments that measure the mental status and functional ability of individuals with AD and MCI due to AD pathology.

Table 1. Linear Regressions Allowing for Conversion Between Measures.

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Equation</th>
<th>$r^2$</th>
<th>$r$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>MMSE</td>
<td>MoCA</td>
<td>MoCA = (1.124 × MMSE) − 8.165</td>
<td>.729</td>
<td>.85</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

MOCA + 5 $\cong$ MMSE
MMSE

+ Everyone knows it (common language)
+ Most likely to have been previously administered (for relative comparison)
+ Quick
+ There are good normative data (Crum, 1993)
- Not as sensitive as others (MoCA)
- Copyright (cost)

Blessed (BDS–IMC)

- Based on total errors
- Range = 0-37
- Rule of thumb 0-3 errors is within non-impaired range for older individuals (be wary of the pattern – e.g. if all three errors are on memory)
- Address delayed recall should be 5 minutes
- Generally regarded as a better tool for tracking decline in dementia, less sensitive to early decline
**Montreal Cognitive Assessment (MOCA)**

**Scored out of 30**

**Cut off for Impairment:** <26* (high specificity but impacted by low education)

*Add 1 point if ≤ 12 yrs education*

- 4 different versions
- Available in multiple languages
- Visually impaired version scored out of 22 (skips top two panels)

---

**VISUOSpatial / Executive**
- Copy cube: 3 points
- Draw clock (ten past eleven): 3 points

**Naming**
- Rhinoceros
- Lion
- Camel

**Memory**
- Read a list of words, subject must repeat them. Do 2 trials, even if 1st trial is successful. Do a recall after 5 minutes.

**Attention**
- Read list of digits (1 digit/sec), subject has to repeat them in the forward order
- Read list of digits (1 digit/sec), subject has to repeat them in the backward order

**Language**
- Repeat: Only know that John is the one to help today.
- Fluency: Name maximum number of words in one minute that begin with the letter F

**Abstraction**
- Similarity between e.g., banana - orange: fruit

**Delayed Recall**
- Has to recall words with no cue

**Orientation**
- Date
- Month
- Year
- Day
- Place
- City

---

*Add 1 point if ≤ 12 yrs education*

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**More information on MOCA can be found at www.mocatest.org**
### MOCA Cued Recall

- **FACE:** category cue: part of the body
- **VELVET:** category cue: type of fabric
- **CHURCH:** category cue: type of building
- **DAISY:** category cue: type of flower
- **RED:** category cue: a colour

**DELAYED RECALL**

<table>
<thead>
<tr>
<th>Optional</th>
<th>FACE</th>
<th>VELVET</th>
<th>CHURCH</th>
<th>DAISY</th>
<th>RED</th>
<th>Points for UNCUED recall only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Has to recall words WITH NO CUE</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
</tr>
<tr>
<td>Category cue</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td></td>
</tr>
<tr>
<td>Multiple choice cue</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td>[ ]</td>
<td></td>
</tr>
</tbody>
</table>
MOCA Multiple Choice Recognition

- **FACE**: category cue: part of the body multiple choice: nose, face, hand

- **VELVET**: category cue: type of fabric multiple choice: denim, cotton, velvet

- **CHURCH**: category cue: type of building multiple choice: church, school, hospital

- **DAISY**: category cue: type of flower multiple choice: rose, daisy, tulip

- **RED**: category cue: a color multiple choice: red, blue, green
### MoCA Memory Index Score (MoCA-MIS)

**Montreal Cognitive Assessment**

<table>
<thead>
<tr>
<th>Visual-Spatial / Executive</th>
<th>Copy Cube</th>
<th>Draw Clock (Ten past eleven)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Naming</th>
<th>Face</th>
<th>Velvet</th>
<th>Church</th>
<th>Daisy</th>
<th>Red</th>
</tr>
</thead>
</table>

**MoCA-MIS (Memory Index Score)**

<table>
<thead>
<tr>
<th>Word</th>
<th>Free recall (3 points each correct)</th>
<th>Cued recall (2 points each correct)</th>
<th>Multiple Choice Recognition (1 point each correct)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Velvet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daisy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Red</td>
<td></td>
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</tbody>
</table>

**Subscores**

- (0-15)
- (0-10)
- (0-5)

**MIS Total Score (range 0-15)**

The Memory Index Score (0–15 points)
Number of words recalled in delayed free, category-cued, and multiple-choice conditions, multiplied by 3, 2, and 1, respectively.

The Executive Index Score (0–13 points)

The Visuospatial Index (0–7 points)
Cube Copy, Clock, and Naming.

The Language Index Score (0–6 points)
Naming, Sentence Repetition, and Letter Fluency.

The Attention Index Score (0–18 points)
Digit Span, Letter A Tapping, Serial 7 Subtraction, Sentence Repetition, and Words Recalled in Both Immediate Recall Trials.

Orientation Index Score (0–6 points)
All Orientation items
Case 1: 64 yo RHWM employed executive

- Chief complaint: “some changes at work … finding it more stressful …”
- History: Pt: works in a fast-paced and demanding environment and notices more work stress and mild changes in his work efficiency. He is sleeping less and waking early concerned about work. Wife (did not accompany pt, I called her on the phone): He seems more stressed, has forgotten or misremembered some conversations & and context and timing of life events, some repetitiveness in statements.
- Structured multidomain review of cognition, daily function, behavior/neuropsychiatric symptoms, sensorimotor function
- Cognition: (Scale for below: 0 = wnl, Tr = subtle/very mild, 1+ = mild, 2+ = moderate , 3+ = severe)
  - Memory: 1+
    - Repetitive, misremembering
  - Attention: 2+ (“always been that way to some degree”)
  - Executive Function: 1-2+
  - Language: 0
  - Behavior: 1-2+
    - Judgment and interaction issues with team at work, considered to be more aloof and less sensitive and dismissive, anxious, mildly less motivated
Case 1: 64 yo RHWM employed executive

- **Daily Function:** independent with subtle decline
  - FAQ 9/30 (bill paying, taxes, shopping, current events, remembering appts)

- **Behavior/Neuropsychiatric Symptoms:**
  - NPIQ severity = 7 (irritability, anxiety depression/dysphoria, disinhibition, lability, night-time behaviors)
  - NPIQ distress = 9 (mild distress)
  - Geriatric Depression Scale (GDS) = 3 (not suggestive)

- **Sensorimotor:** none
Case 1: 64 yo RHWM employed executive

- Risk Factors for Cognitive-Behavioral Impairment/Dementia:
  none (parents alive and well) except one minor “concussion” age 14 playing baseball (no LOC)
- Safety: okay
- PMH: “borderline” hypertension – no meds
- Meds: none
- Supplements: multivitamin
- Developmental Hx: no issues; could be inattentive “or absent-minded in a professorial way”, BS/PhD from elite universities
- SHx: married x37 yrs, working as high level executive, adult children
- Health Related Behavior: rare EtOH, good exercise in past less now
- Caregiver: Zarit like scale moderate burden
Case 1: 64 yo RHWM employed executive

- Medical & Elemental Neurologic Exam: Unremarkable
- **Neurobehavioral Status Exam:**
  - Appropriate, attentive to examiner
  - MoCA = 27/30
  - Pattern of points missed: - 3 on recall
  - Encoding of 5 words: 5/5 first trial; 5/5 second trial
  - Recall: MoCA MIS (Memory Index Score 0-15) = 7/15 (0/3 with cue, 1/3 from multiple choice)
## Montreal Cognitive Assessment

### MoCA-MIS (Memory Index Score)

<table>
<thead>
<tr>
<th>Word</th>
<th>Free recall (3 points)</th>
<th>Cued recall (2 points)</th>
<th>Multiple Choice Recognition (1 point)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face</td>
<td>+ (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Velvet</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Church</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Daisy</td>
<td>-</td>
<td>-</td>
<td>+ (1)</td>
</tr>
<tr>
<td>Red</td>
<td>+ (3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Subscores | 6 | 0 | 1 |
| MIS Total Score (range 0-15) | 7 |

Case 1: 64 yo RHWM employed executive

- Medical & Elemental Neurologic Exam: Unremarkable
- Neurobehavioral Status Exam:
  - Appropriate, attentive to examiner
  - MoCA = 27/30
  - Pattern of points missed: - 3 on recall
  - Encoding of 5 words: 5/5 first trial; 5/5 second trial
  - Recall: MoCA MIS (Memory Index Score 0-15) = 7/15 (0/3 with cue, 1/3 from multiple choice)
  - Letter Fluency (F) in 60 sec = 25
  - Animal Fluency in 60 sec = 14
  - Naming (from ACE-R): 12/12 (Very occasional word-finding hesitation)
  - Denied depression and significant anxiety → mood/affect congruent and not suggestive of clinical depression or anxiety
Case 1: 64 yo RHWM employed executive

- Good case for obtaining formal neuropsychological evaluation → need more information!!!
Cognitive Behavioral Syndromes and DDx of Neurpathological Cause – connection between syndrome and cause(s) (etiology) are probabilistic not deterministic associations

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Cognitive-behavioral major characteristics</th>
<th>Differential Diagnosis of Neuropathological Cause(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progressive amnestic syndrome (single- or multi-domain)</td>
<td>Difficulty learning and remembering new information; often accompanied by executive dysfunction, depression, or anxiety</td>
<td>Usually due to AD or AD with co-pathologies (eg, AD+VBI, AD+LBD, AD+VBI+LBD); sometimes hippocampal sclerosis</td>
</tr>
<tr>
<td>Progressive aphasic syndrome/primary progressive aphasia</td>
<td>Speech and language impairments, eg, word-finding difficulty (anomia), speech sound errors, impaired repetition (often due to impaired auditory-verbal working memory), alexia, agraphia</td>
<td>Logopenic variant PPA and related forms of multi-domain aphasic dementias are often due to AD; semantic dementia variant PPA (mostly TDP-43) and progressive non-fluent variant PPA (mostly TDP-tau) are usually due to FTLD-related pathologies but can be due to AD</td>
</tr>
<tr>
<td>Progressive visuospatial dysfunction/posterior cortical atrophy</td>
<td>Difficulty with visual/spatial perception/cognition, often with limb apraxia, alexia, agraphia, acalculia, and related cognitive dysfunction localizable to posterior cortical regions</td>
<td>Usually due to AD; sometimes due to DLB or AD+DLB; occasionally due to CBD; very rarely due to FTLD or CJD</td>
</tr>
<tr>
<td>Progressive behavioral/frontal/dysexecutive syndrome</td>
<td>Changes in comportment, personality, and social/interpersonal/emotional behavior; often includes early difficulty with executive function (judgment, problem solving, reasoning) and attention</td>
<td>Usually due to FTLD-related pathology (FTLD-tau or FTLD-TDP-43); not uncommonly a presentation of young-onset AD, or due to VBI, mixed AD+VBI; sometimes due to DLB, PSP, CBD</td>
</tr>
<tr>
<td>Primary Parkinsonian syndrome with cognitive features/primary somatosensorimotor corticobasal syndrome</td>
<td>Elements of Parkinsonism (asymmetric rigidity, motor dysfunction), REM sleep behavioral disorder, autonomic and/or cortical sensorimotor dysfunction (eg, limb apraxia in CBS), progressive cognitive difficulties (eg, fluctuating attention, executive/visuospatial functions)</td>
<td>LBD (manifest as DLB or PDD) or mixed LBD with AD and/or VBI; sometimes PSP, FTLD, CBD, MSA; rarely AD (sometimes AD in CBS)</td>
</tr>
</tbody>
</table>

Atri, 2019; Shaughnessy et al. 2019
Office Based Assessment Procedures

- Brief Cognitive Assessment Tests
- Informant Completed Questionnaires
Brief Cognitive Assessment Tests

Advantages

- Commonly used, many choices
- Requires only patient (not the caregiver) to be present

Disadvantages

- Requires patient to be present
- Requires patient to be cooperative
- Requires staff time to administer
Case 2

Patient Profile

- 71 year-old
- Female
- Living independently
- 12 years education
- Retired Home Health Aide (1980s)
- Recent death of companion
Medical

Medical History

- Hypercholesterolemia
- Left hip replacement

Physical / Neurological Exam

- Parkinsonism
  - Rigidity

Current Medications

- multivitamin + iron
- Metamucil
- calcium
- B6
History of Cognitive Complaints

Onset: 2-3 years

Initial symptoms: becoming lost in familiar setting

Progression: gradual

Current Complaints:

- **Memory**
  - Mild deficits in recent memory

- **Executive Function**
  - Difficulty managing checkbook
  - Can no longer organize medications

- **Attention**
  - Fluctuating
Cognitive Assessment

- **MMSE = 26**
  - Disoriented to place
  - Could not copy complex figure

- **MOCA = 22**
  - Missed 1/5 delayed item recall
  - Missed 1/4 with cues ➔ Missed 2/3 with multiple choice ➔ MoCA-MIS = 7/15
  - Trailmaking B impaired
  - Clock Drawing impaired, could not copy cube
  - Impaired attention, digits forward

- **Alzheimer’s Disease Caregiver Questionnaire (ADCQ) - positive**
  - Endorsed visuospatial problems (e.g., becoming lost)
  - Endorsed deficits in executive function
  - Problems are progressive
Clock Drawing
(from MOCA)
Function

- ADLs intact
- IADLs impaired
  - Impairment Index = 46%
Differentials

- AD
- MCI
- Dementia with Lewy Bodies (DLB)
Cognitive Lab Panel & Imaging Studies: unremarkable

- **Brain MRI**
  - Generalized atrophy
    - prominent in presylvian area
  - Mild chronic white matter ischemic changes
Diagnosis

Dementia with Lewy Bodies (DLB)
Diagnostic Criteria

Essential Features

- Dementia Present

- Impaired executive function, attention, and visuospatial ability often prominent

- Memory impairment may or may not be prominent initially
Diagnostic Criteria

Core Features (2 for probable, 1 for possible LBD)

- ☑ Fluctuating cognition with pronounced variation in attention and alertness
- ☐ Recurrent visual hallucinations, well formed and detailed
  -- Often or people or animals
  -- Often initially present around sleep/wakefulness transitions
- ☑ Spontaneous features of parkinsonism
Memory
- Immediate (DS-f)
- Recent
  - Verbal (WMS para, 7MS Mem, DWR, ADAS-Recall, Recog)
  - Visual (WMS-Figs)
- Remote (Hx)
- Working (DS-b, DLROW)

Language
- Receptive (ADAS, MMSE)
- Repetition ("no ifs...")
- Expressive (ADAS)
- Naming (ADAS)
- Fluency (7MS-animals)

Executive Function
- (Trails)
- fluency
- working memory
- attention

Visuospatial
- Perceptual (ADAS-objects)
- Constructional (ADAS - figs, 7MS clock, MMSE - pentagons)

Praxis
- ADAS (Env)

Attention
- (DS-f)
Conclusions

“Where there is no hope, there can be no endeavour” ~ Samuel Johnson

“The journey of a thousand miles begins with one step” ~ Lau Tzu

THANK YOU!

… the glass is more than half full!