BEDSIDE COGNITIVE ASSESSMENT

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Introduction

Bedside cognitive assessment is the informal evaluation of cognition performed without specialised instruments or standardised test batteries.[1-3] It can be performed in any clinical setting – clinic, office, or hospital bedside – without paper-based tools or specialised equipment.

Bedside cognitive assessment provides a rough estimate of cognitive ability; a more thorough evaluation requires standardised instruments with normative data. The gold standard is formal neuropsychological assessment, which offers the greatest sensitivity but requires specialised tools, preparation, and considerable time.

Bedside cognitive assessment can form part of a standard psychiatric or neurological examination to detect cognitive impairment and identify its underlying causes.

Goals of bedside cognitive assessment:

1. To document the presence and extent of cognitive impairment.
2. To describe the profile of cognitive impairment and aid in the differential diagnosis.
3. To monitor disease progression and response to treatment.
4. To screen for the need for a comprehensive neuropsychological assessment.
5. To provide basic information regarding cognitive functioning in a forensic context.
6. To assist in the evaluation of mental capacity for making decisions.

Bedside cognitive assessment is most useful for characterising moderate-to-severe cognitive impairment. For mild impairment, more comprehensive standardised instruments and neuropsychological referral should be considered.

Clinicians often overlook cognitive assessment as part of routine psychiatric evaluation. Cognitive assessment is viewed as time-consuming and can only be done with a special instrument such as the Mini-Mental Status Examination (MMSE) or Montreal Cognitive Assessment (MoCA). [4,5] Others believe they can

assess cognitive ability through casual conversation alone, and are often surprised by the extent of cognitive deficits uncovered when dedicated assessment tools are employed.

Quantifying cognitive impairment determines the level of decline from baseline, supports a formal diagnosis, and guides treatment. It also helps provide feedback to patients, as most want to know if they have cognitive impairment and to what extent – information that can assist them in developing coping strategies and planning for the future.

The cognitive impairment associated with dementia can be a devastating experience for both patients and their caregivers. Clinicians often witness the despair of patients dealing with this condition. However, it is important to recognise that most dementia patients can still find happiness and contentment in their lives. They can continue to enjoy the ups and downs of daily life, despite having dementia. Clinicians should share this understanding with patients and their caregivers to help them cope with the challenges of living with dementia.

The profile of cognitive impairment can point to a specific underlying condition. Prominent memory impairment in an older adult with few other deficits suggests early Alzheimer's disease – a diagnosis increasingly supported by biomarker evidence. Mild memory deficits with executive dysfunction in the context of vascular risk factors suggest vascular dementia. In schizophrenia, the typical profile involves impaired attention, executive dysfunction, and working memory difficulties.

Serial cognitive assessment monitors disease progression and treatment response. For example, a 10-word recall task repeated at 3–6 month intervals can track early-to-mid Alzheimer's disease. The Alzheimer's Disease Assessment Scale (ADAS) has been used in research trials evaluating cholinesterase inhibitors.[6] It contains a 10-word recall task that can be used to measure change. Ten words are presented for recall over three trials, and some versions include delayed recall after an interference task.

A bedside cognitive assessment is a quick method to estimate a person's cognitive function, but it is not as sensitive as a neuropsychological assessment. It can be a preliminary screening tool for a more comprehensive cognitive examination. If someone has high intellectual ability and mild cognitive deficits, it is advisable to use neuropsychological tests. On the other hand, bedside tests are more suitable for

moderate to severe deficits because they provide more precise information, which is easier to interpret. Bedside assessments often produce less noise when cognitive impairment is revealed, helping clinicians focus on significant deficits.

Clinicians are frequently asked to comment on cognitive ability in forensic contexts. Bedside cognitive assessment can serve as a useful initial screen, though standardised tools such as the Montreal Cognitive Assessment (MoCA) are preferred where robust normative data are required.[5]

Bedside cognitive assessment is a valuable tool when assessing a person's capacity to make decisions regarding their medical treatment, lifestyle, accommodation, and finances. An individual's cognitive ability plays a critical role in decision-making. The ability to understand a specific situation, reason for the choices presented, evaluate the risks and benefits, and communicate them consistently implies intact cognition, particularly executive functioning and memory.

When a cognitive assessment appears normal during a capacity evaluation, other factors—such as psychosis or personality traits—must be considered to determine decision-making capacity. Moderate to severe cognitive impairment often impairs the ability to make complex decisions; however, an individual may still have the capacity to make simpler decisions (e.g., consenting to a minor procedure) despite significant impairment. Further clinical assessment is always necessary to evaluate reasoning behind any specific decision.

Normal vs. Impaired Cognitive Ability

Cognitive impairment is diagnosed only if there is a decrease in cognitive ability from an individual’s premorbid level. Premorbid cognitive ability can be estimated by asking about years of schooling and further education. Occupation and most recent employment give more information. Knowing the education and occupation of parents and siblings may also help. Based on this information, premorbid cognitive function can be categorised into three groups: below average, average, and above average. Most standardised norms have been established for average premorbid intellectual function. Discretion must be applied for patients with above-average and below-average premorbid cognitive ability, as the norms for bedside tests may not always apply.

Age affects cognitive performance and should be considered when interpreting results in an older adult patient. For instance, the expected MMSE score decreases significantly with increasing age. The usual cut-off score for the MMSE is < 25. This changes to 23 at about age 80 and is even lower for persons older than 85.[7]

Elements of Cognition

The brain is the seat of cognition. The nervous system is designed to interact with the environment through sensory and motor components. Sensory systems provide input to the brain, and motor systems provide the output.

Neurocognitive processing occurs between the input and output systems. The processing requires language and sequencing or planning functions. Memory provides a repository of information that can be recalled when information is needed. Attending and focusing on cognitive tasks is vital during all stages, from input to processing and output.

This framework categorises cognition into six key domains:

1. Attention and concentration
2. Language
3. Executive or planning functions
4. Memory
5. Higher-order sensory processing or gnosis
6. Higher-order motor processing or praxis

The brain processes sensory input primarily in the primary sensory gyrus, and this information is passed on to unimodal and heteromodal association areas. To perform motor acts, the heteromodal association areas project to unimodal motor association areas that, in turn, project to the primary motor gyrus. From here, the muscles are directed to perform actions.

Executive functioning encompasses the planning and sequencing of cognitive tasks, including problem-solving, decision-making, and cognitive flexibility. It is a distributed ability that modulates many aspects of cognition, from sensory and motor processing to memory.

Attention and concentration is another distributed cognitive task. Impairment of attention can affect all aspects of cognition.

See Table 1 below for a summary of the six elements of cognition with a description and clinical equivalent.

Table 1: Elements of cognition.

Elements of Cognition	Description	Clinical Equivalent
Attention	Selecting and maintaining focus.	Attention and Concentration
Language	Expressive and receptive components.	Aphasia
Planning	Problem-solving, decision-making and cognitive flexibility.	Executive Function
Memory	Holding information for online processing and storage for later recall.	Amnesia
Sensory systems	Higher order processing of vision, auditory, olfaction, taste, touch, vibration, proprioception, pain, and temperature information.	Agnosia
Motor systems	Higher order control of skilled movement.	Apraxia

Systematic assessment of each cognitive domain, with grading of its strengths and weaknesses, provides a profile of cognitive ability and helps classify the type of cognitive deficit. As noted above, an older adult who shows impaired memory on bedside testing with relative preservation of other cognitive functions may have early Alzheimer's disease. In contrast, early language impairment in the absence of other cognitive problems may suggest primary progressive aphasia. Poor executive functioning accompanied by behavioural changes may indicate the behavioural variant of frontotemporal dementia.

Bedside Cognitive Assessment and Neuropsychiatry

Neuropsychiatric disorders present with behavioural changes and cognitive impairment. Neurological and medical conditions cause these disorders. Clinicians working in neuropsychiatric clinics need to be skilled at cognitive assessment.

The DSM-5-TR (Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition Text Revision, 2022) defines criteria for dementia (now termed major neurocognitive disorder), mild neurocognitive disorder, and delirium.[8] The criteria for dementia include the cognitive elements mentioned above; gnosis and praxis are classified under perceptual-motor functions. The DSM-5-TR also recognises social cognition – which involves recognising emotions and understanding theory of mind – as a separate neurocognitive domain.

Cognitive Tasks that make up a Cognitive Test Battery

Most individual tasks within a bedside cognitive assessment battery measure more than one aspect of cognition. For instance, asking a patient to provide the correct date mainly involves memory functions. However, closer examination reveals that language and attention are also involved. Language is engaged because the patient must first understand the question asked by the examiner. Then, the patient needs to respond clearly in speech. Attention and concentration are also necessary because focus is required to learn and remember the date. A patient with delirium may find it difficult to concentrate when told the date and may not retain or recall this information. They may also give incorrect answers if their attention is impaired during the assessment, as they might not have fully registered the question.

The total MMSE and MoCA scores are often over-emphasised at the expense of the valuable information provided by the tasks that comprise the assessment. The total score will only reflect general cognitive performance and overlook an individual’s unique cognitive strengths and weaknesses. Similar to an IQ test score, the total IQ score does not describe a person's talents or identify cognitive shortcomings.

Further examination of performance on individual tasks that make up the test battery can provide information regarding the profile of impairment. As described above, this analysis provides insight into the specific diagnosis. An example is a 70-year-old university graduate with a 6-month history of progressive cognitive impairment. The patient scored 28/30 on the MMSE, losing 2 points on delayed recall in the 3-

word recall test. An above-average premorbid IQ would be expected in this person, and the inability to recall 2 of the 3 words indicates impairment. A verbal memory deficit with a history of progressive cognitive decline means possible early Alzheimer's disease. This hypothesis can be further examined with more sensitive verbal memory tests, such as a 10-word recall test, as described in the section on memory below.

Procedural Aspects of Cognitive Assessment

Correct technique is essential for reliable results. For example, when asking about the current season on the MMSE, the question may be repeated once; if the patient still cannot respond, do not award the mark and move on. Avoid converting free-recall tasks into multiple-choice questions (e.g. "Is it winter, spring, summer, or autumn?"), as providing options fundamentally changes the task by offering retrieval cues.

Sufficient time to complete the cognitive assessment without interruptions is essential. It is not helpful to interrupt the administration of a word-list recall task by answering a phone call during the assessment. If this occurs, a different word list must be administered at another time or on another day to assess this patient's memory.

Bedside assessment should not include tests used in neuropsychological testing as it can induce a practice effect and thus complicate the interpretation of neuropsychological tests for a neuropsychologist. It is best to stick to assessments that fall outside the domain of neuropsychology. The Trial Making Test (TMT) is an example of a test that can easily be downloaded from the internet and administered to a patient with little training in procedural aspects. However, the TMT is a popular task for inclusion in neuropsychological assessment and should be reserved for neuropsychologists.

Attention & Concentration

Introduction

Attention is the ability to focus on a stimulus, and concentration is the ability to maintain that focus. Arousal refers to an individual's background level of wakefulness or alertness.

Attention and concentration can be assessed at varying levels of sensitivity: simple observation during the interview provides a rough estimate, while specialised computer-based testing offers the greatest precision.

Arousal can be documented by describing a patient's response to stimuli. For example, "The patient opened her eyes when her name was called aloud." or "The patient appeared sleepy and could not be aroused when her shoulder was touched." Arousal can be further described along a continuum of awake, drowsy, stuporous, and comatose. The Glasgow Coma Scale (GCS) measures arousal in patients who are stuporous or comatose.

Attention and concentration can be examined by measuring the ability to maintain focus on repetitive or continuous stimuli. The patient must sustain and process focus consistently. This is also known as online processing, which overlaps with other cognitive functions, such as working memory. While maintaining focus, the patient must ignore distractions and avoid switching to other cognitive tasks; this intersects with executive functions. Therefore, there are close functional and anatomical connections in the brain between the following neurocognitive functions:

- Attention and concentration
- Working memory
- Executive functioning

Apparent poor performance on tests for attention and concentration may be related to impaired working memory or executive functioning. Further assessing working memory and executive functioning will clarify the most relevant deficit.

Attention and concentration can fluctuate over time and must be examined repeatedly. This can be done on the same day or the next day at a different time.

Localisation

Arousal is mediated by neuronal circuits projecting from the reticular formation to the thalamus and neocortex. The neurotransmitters involved in these circuits include dopamine, serotonin, noradrenaline, acetylcholine, and histamine.

The prefrontal cortex, striatum, parietal cortex, and cerebellum regulate attention and concentration. An issue with the connections between these areas or pathology in these specific regions can result in Attention Deficit Hyperactivity Disorder (ADHD). The neurotransmitters dopamine and noradrenaline play a significant role in these processes. Often, difficulties with attention are accompanied by impulsivity, which can be seen as two sides of the same coin. Patients can switch between them quickly in their day-to-day lives. The nucleus accumbens also plays a role in both attention and impulsivity.

Tests

The vigilance test described below is the most suitable assessment for attention and concentration, as it does not involve working memory or executive functioning to a significant degree.

1. Observation

Attention and concentration can be assessed by observing the patient's quality of interaction during the mental status examination. However, this provides only a rough estimate and is a precursor for further testing.

2. The Spelling of a 5-letter Word Backwards

Ask the patient to spell the word forwards first to verify correct spelling, then ask the patient to spell the word backwards. Some experts advocate using silent letters in words, such as "world" and "right." However, asking the patient to spell the word forward first may negate the difficulty of a silent letter. In many situations, words like "April" or "March" are a good choice as these words are familiar.

Baseline or normal score:

Most individuals can spell a five-letter word backwards without any mistakes.

3. Serial 7's or 3's

For serial 7's, the patient is asked to: "Subtract seven from one hundred." Wait for the response. "Now subtract seven again and continue to do this until I ask you to stop." For serial 3's, start with 20. An easier version of this task is to ask the patient to count backward from 20.

Baseline or normal score:

Most individuals can do the serial 7's and 3's correctly and count backwards from 20 without making any mistakes.

Video illustration:

https://vimeo.com/162259525

4. Vigilance Test

Inform the patient: "I will say a long series of letters. Whenever you hear the letter A, tap the desk. If you hear any other letters, then do not tap." Say a random series of letters at a rate of about one letter per second with the letter A occurring regularly, as in the following example: "K T B A O S A W I E A A G H C A T A A A E ..." Monitor the number of A's that were correctly indicated by a patient tapping the desk and note the number of additional taps. The extra taps may mean an inability to inhibit an unwanted response called perseveration.

Baseline or normal score:

Most people complete this task without any errors.

Video illustration:

https://vimeo.com/162247583

5. Digit Span

This can be done forward and/or backward. The example given here is for forwards.

"I will now say a series of numbers and would like you to repeat them. Are you ready? 4 9." Note the response and continue increasing the series with an extra number until a sequence of 9 is reached.

If a patient fails the sequence, repeat it with another random sequence of the same length. This helps confirm the patient's cognitive limit and excludes other reasons for failure, such as not hearing the instruction well or misunderstanding it.

Baseline or normal score:

Most individuals can repeat a sequence of 6-8 random digits forwards and 5-7 digits backward.

Video illustration:

https://vimeo.com/158806267

Language

Introduction

Expressive language produces sounds that form understandable words and sentences, allowing us to express ourselves. Movements of the mouth, jaw, tongue, palate, and larynx will enable us to produce sound so that we can speak at a rate of about three words per second. To have discourse, we also need to understand the language created by others. Thus, in simple terms, language has both verbal output and verbal input components. Other aspects of language include reading and writing, which involve processing in standard language areas and in additional cortical areas, such as the visual cortex for reading and the motor cortex for writing.

Localisation

In about 96% of right-handers, the perisylvian language areas of the left hemisphere are responsible for language processing. About 70% of left-handed individuals have left hemisphere dominance. When left- and right-handed individuals are grouped, 95% of individuals show left-hemisphere dominance. Language processing areas in the dominant hemisphere include Wernicke's area, the arcuate fasciculus, Broca's area, and connections between these areas and associated cortical areas.

The right hemisphere, or non-dominant hemisphere, is involved in other aspects of language, such as humour, metaphor, and the emotional content of language. Changes in rhythm, intonation, pitch, and loudness convey emotional aspects of language. These are called prosodic aspects of language, and they can be further divided into expressive prosody, for the expression of emotion in speech, and receptive prosody, for the understanding and interpretation of emotion in speech.

Aphasia is an impairment of language function. The most common type of aphasia is mixed aphasia. Mixed aphasia is a language disorder wherein two or more language modalities have been impaired. A very simplistic breakdown of language function identifies six modalities: spontaneous speech, comprehension, repetition of words or phrases, naming objects, reading, and writing. Impairment in a specific language modality is described in various ways, as indicated in Table 2 below. The assessment of the six language modalities is described in more detail below.

Table 2: Aphasia Syndromes

Language modality	Syndrome associated with impairment
Spontaneous speech	Broca's aphasia, motor aphasia, nonfluent aphasia, expressive aphasia
Comprehension	Wernicke's aphasia, sensory aphasia, fluent aphasia, receptive aphasia, semantic aphasia
Repetition	Conduction aphasia
Naming	Nominal aphasia
Reading	Alexia
Writing	Agraphia
More than one modality	Mixed aphasia

Tests

A comprehensive assessment of language involves evaluation of the following six aspects of language:

1. Spontaneous speech
2. Comprehension
3. Repeating words or phrases
4. Naming objects
5. Reading
6. Writing

1. Spontaneous Speech

To assess spontaneous speech, the patient is allowed to speak freely, and the quality of speech is assessed. Free speech is usually evaluated as part of the standard psychiatric assessment, including a history and mental status examination. However, aphasic patients may find it difficult to speak freely

because their language production is impaired, and they often don't say much during an interview. They may also prefer to produce standard or stock phrases in response to questions such as "thingy" or "the whatsit" to replace intended words.

Another way to assess spontaneous speech is to use a more standard, structured approach, such as showing the patient a complex picture and asking them to describe what is happening. The well-known "Cookie Jar Theft" picture is an example. The patient is expected to give a narrative connecting the picture's components.

Abnormalities in spontaneous speech are indicated by impaired fluency, articulation, agrammatism, and effortful or halting speech. Defective speech production may include paraphasias, which are word substitutions that can be phonemic (sound the same), e.g., "sitter" for "sister", or semantic (category substitutions), e.g., "jug" for "glass".

Impaired spontaneous speech is associated with pathology in Broca's area and close connections to this area.

Baseline or normal score:

The typical standard is smooth language production with clear speech, fluent grammar, and no paraphasias.

2. Comprehension

Language comprehension involves understanding language by decoding sounds and piecing together sound bites to form meaningful words and sentences. Comprehension can be seen as the reverse of language production.

The patient's ability to understand language and follow instructions during bedside cognitive assessment is essential, as impaired comprehension can affect the outcome of cognitive assessment. It is important to confirm that comprehension is intact before beginning the cognitive assessment. For example, aphasia can lead to a very low score on the MMSE, especially if comprehension is impacted. However, further assessment might reveal relatively preserved functioning in activities of daily living, indicating a

mismatch between actual functioning and a low score on the MMSE test. This illustrates how aphasia can produce a misleadingly low cognitive test result.

Comprehension at its most basic level can be assessed by asking the patient to follow basic commands like “Make a fist” or “Touch your nose with your finger.” More advanced comprehension is assessed through more complex commands, such as Marie’s Three Paper Test, which involves giving this instruction: “Here are three pieces of paper: Crumple the large one, give me the medium-sized piece, and place the small one in your pocket.” This task also requires remembering three steps, so it not only assesses aphasia but also begins to overlap with verbal working memory functions.

Along with understanding instructions, the comprehension or grasp of a word's meaning can be evaluated. The patient is given a word, and its meaning is tested by asking them to match the word to a picture. The patient needs to understand the word to complete the task. An example is the Sydney Language Battery[13] Word Comprehension Task, which includes the instruction: “Now, I would like you to point to the picture that matches the word I say. Where is the strawberry?” See Figure 1 below.

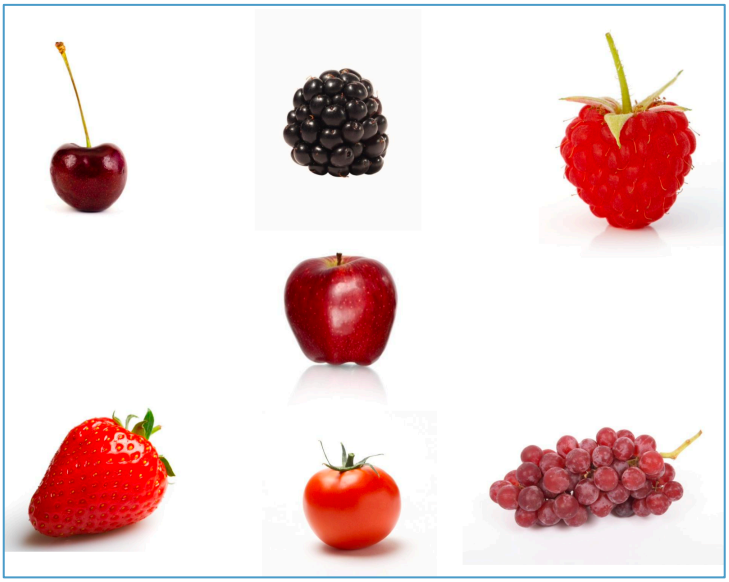


Figure 1: Sydney Language Battery Word Comprehension Task

Impaired word comprehension is linked to semantic variant primary progressive aphasia, or semantic dementia, as some clinicians refer to it. This deficit correlates with pathology in Wernicke’s area and the semantic association regions in the dominant temporal lobe.

Word comprehension involves not just language functions but also memory for the meaning of words. Impaired memory for the meaning of words is called semantic memory impairment, which is a deficit in our knowledge of vocabulary or our factual understanding of words. It can be difficult to distinguish between semantic aphasia and semantic memory impairment in clinical settings, and the context should guide the clinician. If other aspects of language are affected, then aphasia is the more probable diagnosis. If there is no accompanying aphasia but memory is affected, then it is more likely a semantic memory deficit. Semantic memory is discussed in more detail below in the section on memory.

A further test for word meaning is the semantic association task. In the Sydney Language battery Semantic Association Task, the patient is shown a word and asked to match it with the correct picture from four different images. The instruction is: “In this task, you will see five pictures on each page: one at the top and four pictures below. I would like you to choose which of the four pictures below best matches the picture at the top. Which one does the strawberry go with?” See Figure 2 below.

Figure 2: Sydney Language Battery Semantic Association Task

The word comprehension and semantic association tasks assess knowledge of presented items by providing a visual stimulus alongside a related word. In the examples above, the word 'strawberry' is provided, and the individual is asked to identify or associate it with a corresponding picture. Another aspect

of language function involves naming an item. The patient is shown a picture and asked to name what it depicts. See Figure 3 below. This process entails visual recognition, followed by knowledge of the item, and then naming the image. More details on this process are provided in the section below on the assessment of naming as a language function.

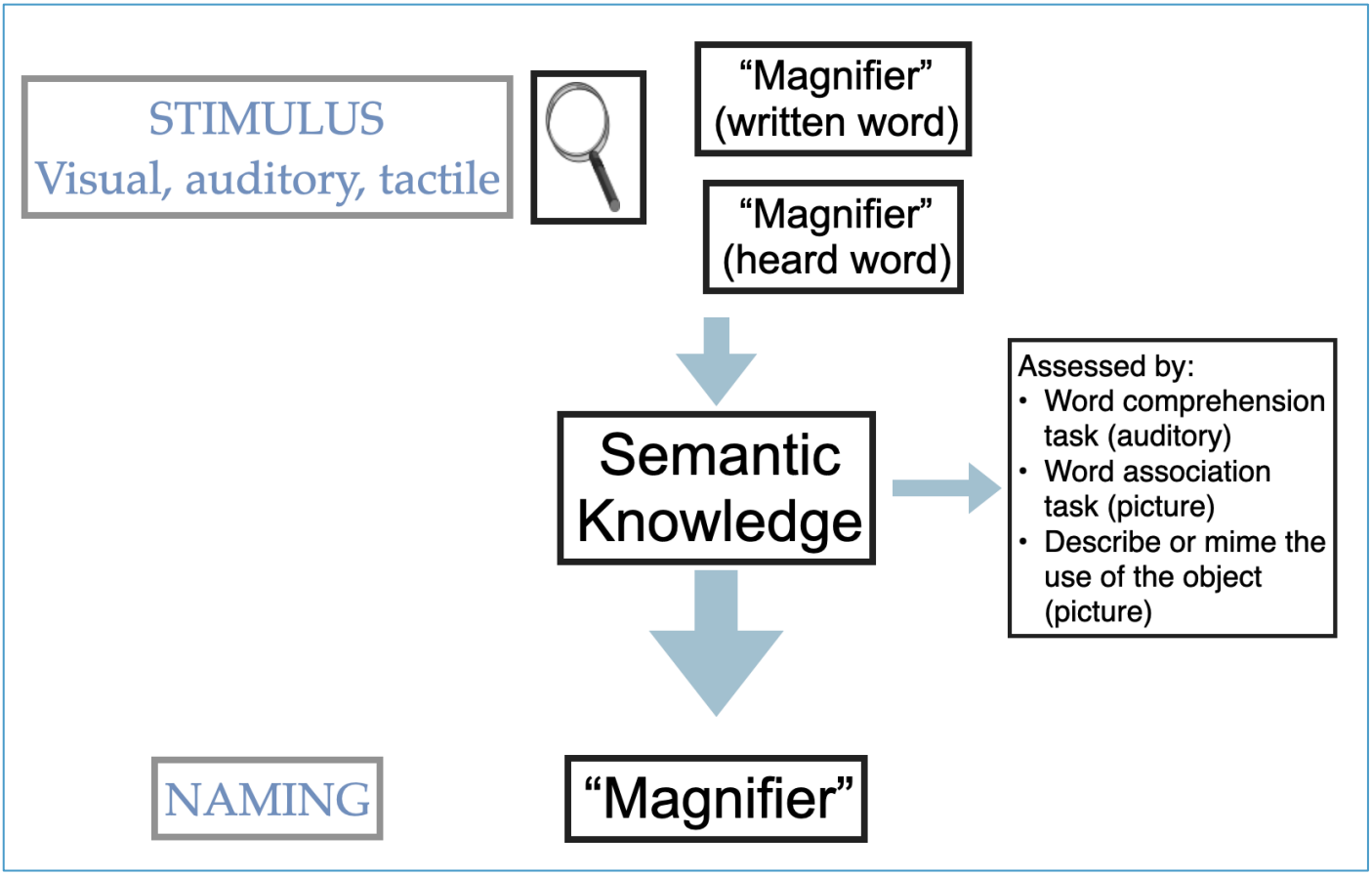


Figure 3: Cognitive processing involving stimulus presentation, acquiring knowledge, and naming. The stimulus can be presented visually, in writing, or auditorily.

The following tasks can be used to assess language comprehension.

2.1 Stage 1-4 Commands

A simple way to check for impairment is to give a 3-stage command: "Point to the ceiling, floor and the door." If the response is affected, follow the method below for a more detailed assessment.

Give a patient the following verbal commands without non-verbal cues (like hand gestures) to assess their comprehension.

Stage 1	"Point to the ceiling."	Assess the response and continue to the next stage.

Stage 2	“Point to the ceiling and then to the floor.”	Assess the response and continue to the next stage.
Stage 3	“Point to the ceiling, the floor and then to the door.”	Assess the response and continue to the next stage.
Stage 4	“Point to the ceiling, the floor, the door and then to the window.”	Assess the response and continue to the next stage.

Baseline or normal score:

Most individuals can complete a 4-stage command without errors.

Video illustration:

https://vimeo.com/158806262

2.2 Instructions to Move 3 Objects

Place three objects in front of the patient and name them while they are being placed to rule out naming difficulties and object agnosia as confounding factors. Everyday items such as a coin, keys, and a piece of paper can be used. Start with simple commands and then progress to more complex instructions. “Turn the coin over”, “Place the keys on the other side of the paper”, and “Place the coin between the keys and the paper and turn the paper over.”

Baseline or normal score:

No errors on 2-3 stage commands.

Video illustration:

https://vimeo.com/158806264

3. Repetition

To evaluate for repetition, ask the patient to repeat words, phrases, or a sentence. The MMSE test includes a phrase for repetition: “No ifs ands or buts.” Other sentences can also be used, such as: “The little boy went to the shopping mall to spend his money.” The MoCA test offers the following examples: “I only know that John is the one to help today” and “The cat always hid under the couch when dogs were in the room.”

If repetition is the only aspect of language that is impaired, it indicates a pathology in the arcuate fasciculus connecting Wernicke’s and Broca’s areas. Poor repetition is also referred to as conduction aphasia.

Baseline or normal score:

Most individuals can repeat a short phrase or sentence without errors.

4. Naming

Naming can be assessed by asking the patient to identify everyday objects, with the difficulty level increased by including less familiar items. Physical objects in the interview room can be used, or line drawings or photographs can be used if available.

Naming a visually presented object involves a series of cognitive steps, including seeing, recognition, knowledge, and ultimately the spoken word for the object. See Table 3 below.

Table 3: Sequential Cognitive Processing for Naming an Object: A pen is shown, and the patient is asked to name the stimulus.

COGNITIVE PROCESS			CLINICAL CORRELATE	ASSESSMENT
Looking at the stimulus.	Seeing		Vision	Visual acuity
It is about 10 cm long, thin, round, with a pointy end, and the examiner holds it between their thumb and forefinger.	Recognition	Recognising form, colour, pattern, orientation, and context. Able to integrate components of a stimulus.	Apperceptive agnosia	Ask the patient to describe or draw what has been seen. For more, see below under the heading gnosis.
I know it is something you can write with, and it uses ink.	Knowledge	It is an office tool and belongs to the category of stationery or writing implements.	Defective retrieval of knowledge pertinent to a given stimulus Overlaps with deficits in semantic language, semantic memory, and associative agnosia.	Ask the patient to mime the use of the object or describe where it will be used and with what other things it can be used. See specific tests described in the language, memory, and gnosis sections.
It is a pen!	Naming	Selecting the correct name from different writing implements.	Nominal aphasia	Present different objects for naming to confirm the deficit.

4.1 Naming Objects

To assess naming ability, ask the patient to name the following familiar objects: a watch, pen, tissue, button, shoe, and shirt. Less common objects include knuckles, ring finger, eyebrows, the winder of a watch, and a collar.

Baseline or normal score:

Most individuals can name these objects.

4.2 Naming Line Drawings

The patient may be asked to name the drawings below. If they cannot name the picture, they can be asked to describe it to evaluate recognition. This will assess for apperceptive agnosia. Additionally, the patient can be asked to mime the use of the object and explain where it is used or what it can be paired with. This will determine if the visual stimulus has been processed further to gain knowledge of it. Knowledge of the stimulus involves semantic language functions, semantic memory, and associative gnosis. Further assessment of memory, language, and gnosis will help distinguish whether the deficit is due to language, memory, or visual processing (agnosia).

Figure 4: Pictures for naming task.

Baseline or normal score:

Most individuals can correctly name the guitar and dice, as shown in Figure 4. Low average premorbid intelligence may explain difficulties with naming the magnifier and scale, and therefore may not help distinguish from an actual neuropsychiatric deficit. Some individuals with normal cognition may find it difficult to name the stapler.

Addenbrooke's Cognitive Assessment provides further line drawings that can be used for assessing naming and semantic association.[10]

5. Reading

Ask the patient to read words and sentences. The MMSE provides the sentence, “Close your eyes.” The MMSE requires the patient to read, understand, and respond to the task before scoring a point. If the patient struggles with this task, it may indicate poor comprehension and warrant further assessment.

Addenbrooke’s Cognitive Examination provides a task for reading ability.[10] The patient is asked to read words such as sew, pint, soot, dough, and height. An inability to read irregular words that do not follow standard pronunciation rules is called surface dyslexia. For example, saying something that sounds like “mint” for “pint” indicates a loss of semantic knowledge for words.

Baseline or normal score:

Most individuals can read common sentences and words.

6. Writing

Writing ability is assessed by asking the patient to write words or sentences. The MMSE offers a task to evaluate this skill. The patient is asked to write a sentence of their choice. An understandable sentence with a subject, verb, and object is required to earn a mark.

Baseline or normal score:

Most individuals can write short, understandable sentences.

Executive functions

Introduction

Executive functions are higher-order cognitive abilities involved in planning, multitasking, and goal-directed behaviour. They enable a person to plan a task, follow through with that plan, and suppress distractions – supporting independent, purposeful action. These functions exert top-down control over cognition and behaviour, particularly in novel or unstructured situations.

Executive functions also refer to the ability to observe the environment for relevant information and adjust cognition or behaviour if necessary. An inability to adapt is called cognitive inflexibility; in more severe cases, perseveration is observed. Perseveration is when someone gives the same response even though the stimulus has shifted and a new response is required.

Initiating thoughts and actions is the first step in engaging executive functioning. Lack of initiation and motivation manifests as apathy.

Executive functioning overlaps with attention, working memory, motor function, and behaviour (personality). It is a distributed cognitive process, and impaired executive functioning typically appears across the board, affecting all areas of behaviour and cognition.

Impaired executive functioning is most noticeable in unstructured situations. Bedside tests for executive functioning, which are structured to minimise distractions and increase motivation, might not always detect executive dysfunction.

Patients with executive dysfunction may find it hard to sequence tasks like cooking or DIY home repairs. They might understand the idea of how to do something but need help to problem-solve or figure out the steps, especially if the task is new to them. They could be slow to start activities and appear underactive or hypoactive. Disinhibition may be evident in social settings, with noticeable reduced social skills.

Localisation

Executive functions plan and organise behaviour. Behaviour is primarily an output or motor function of the brain, and executive functions are mainly located in the frontal lobes. The frontal cortices connect closely with subcortical structures and form loops that project from the frontal cortex to the striatum, globus pallidus, and thalamus, and back to the frontal cortex. A lesion in any part of this circuit will impair executive functioning. The anterior cingulate has many connections with the frontal lobes and is also involved in executive functioning.

Tests

1. Luria Hand Movements I

Alternating hand movement tasks assess switching aspects of motor function and serve as a reasonable measure for executive dysfunction. The movements are named after Luria, and two versions are used.[11] Luria I is easier to perform and less often affected by frontal lobe injury than Luria II.

For Luria I, the patient is instructed to: "Place both hands on the table as I do. Observe me because I want you to do the same as I am doing. Can you see that I am making a fist with one hand? Now I swap it around. Can you do that as fast as you can?" See Figure 5 below. Execute a few cycles of alternating movements with the patient imitating the examiner. Then let the patient continue the task and count the number of cycles completed without errors. Most individuals can complete five cycles.

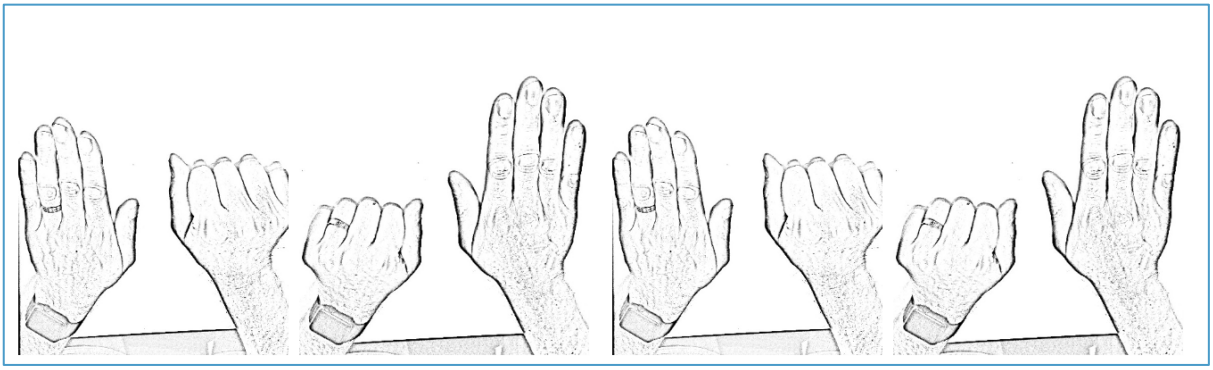


Figure 5: Luria I alternating hand movements

Baseline or normal score:

Five cycles without any errors.

Video illustration:

https://vimeo.com/161349540

2. Luria Hand Movements II

The examiner performs alternating movements with the right hand by making a fist, then opening the hand so the edge touches the surface, followed by the palm touching the surface. The sequence fist-edge-palm is repeated. See Figure 6 below.

The instructions are: "Can you see what I am doing? Please join me and do the same." The examiner should avoid saying “fist, side, flat” as this gives a verbal plan for the sequence, which alters the assessment. The patient needs to perform five cycles correctly. Remember to test both hands.

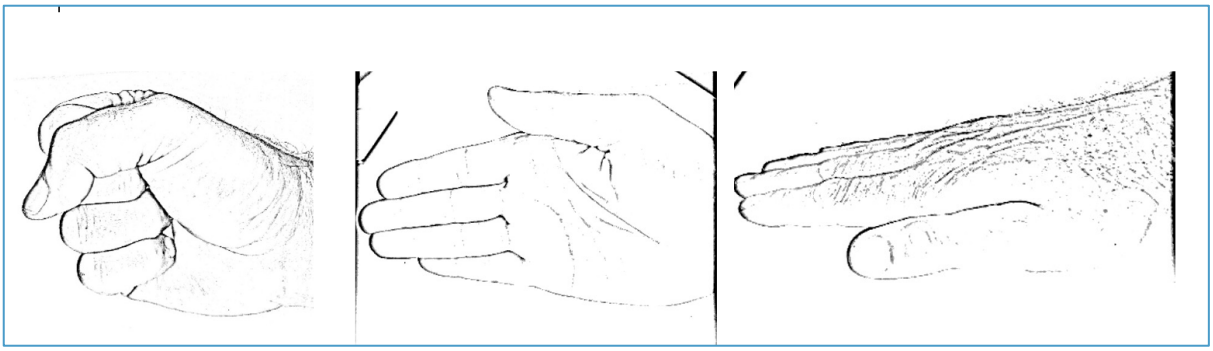


Figure 6: Luria II alternating hand movements

Baseline or normal score:

Most individuals would be able to complete five cycles without errors.

Video illustration:

https://vimeo.com/161349541

3. Word Fluency Test

Word fluency tests evaluate problem-solving skills. The patient is given a problem to solve, and the examiner monitors performance. The task for the patient is to consider how to generate words from a specific category within a set time, while the examiner monitors. For instance, in a task to name animals,

the patient needs to consider effective strategies to list as many suitable words as possible. They might start by naming different types of pets, then move on to farm animals, zoo animals, and wild animals from the African plains, among others. If the patient has executive dysfunction, they could begin with pets but then stumble and appear to stall without speaking. After a pause, they might switch to another category and struggle to name more than a few words. This leads to a low count of animal words produced per minute.

Word fluency tests are also used to evaluate other cognitive functions, such as language. Impaired word fluency is associated with expressive aphasia. Poor word fluency also occurs in the context of a lack of behavioural initiation and apathy.

3.1 Animal Naming Test

Instruct the patient to do the following: “I will give you one minute to name as many different animals as possible. Any animal will do. Are you ready? Go." The patient can name mammals, birds, reptiles, or fish. Repetitions are not scored. Note how many words are generated in the first and last 30 seconds. Individuals with brain injury often produce a few words quickly in the first 10-20 seconds and then find it difficult to produce more words in the last 30 seconds.

Baseline or normal score:

Most individuals generate more than 12-14 animals per minute.

Video illustration:

https://vimeo.com/158806167

3.2 Lexical Fluency Test

Another version of a word fluency task asks the patient to generate as many words as possible with a given letter. Most commonly, the letters F, A, and S are used. The instructions are: "Say as many words as possible, beginning with the letter F.' You can’t say capitalised words, such as names of people or places. I will give you one minute to complete the task. Are you ready? Go." Repetitions are not scored, but they should be noted, as they may indicate perseveration. Most individuals generate 11 or more words. Again, note how many words are produced in the first and last 30 seconds.

Baseline or normal score:

Eleven or more words for a letter per minute.

4. Design Fluency Test

The design fluency test is a visual alternative to word fluency tests and assesses the ability to produce designs.[12] This test is likely more sensitive to non-dominant frontal lobe damage because it is more non-verbal or visual. Word fluency tests are more closely linked with dominant frontal lobe pathology.

The instructions are: “You have one minute to draw anything using four lines. The drawings must be different, and I must be able to count the lines. I will give you two examples.” Draw a hash sign and steps as shown in Figure 7. Count the lines as you draw them. “Do you have any questions? Your minute starts now."

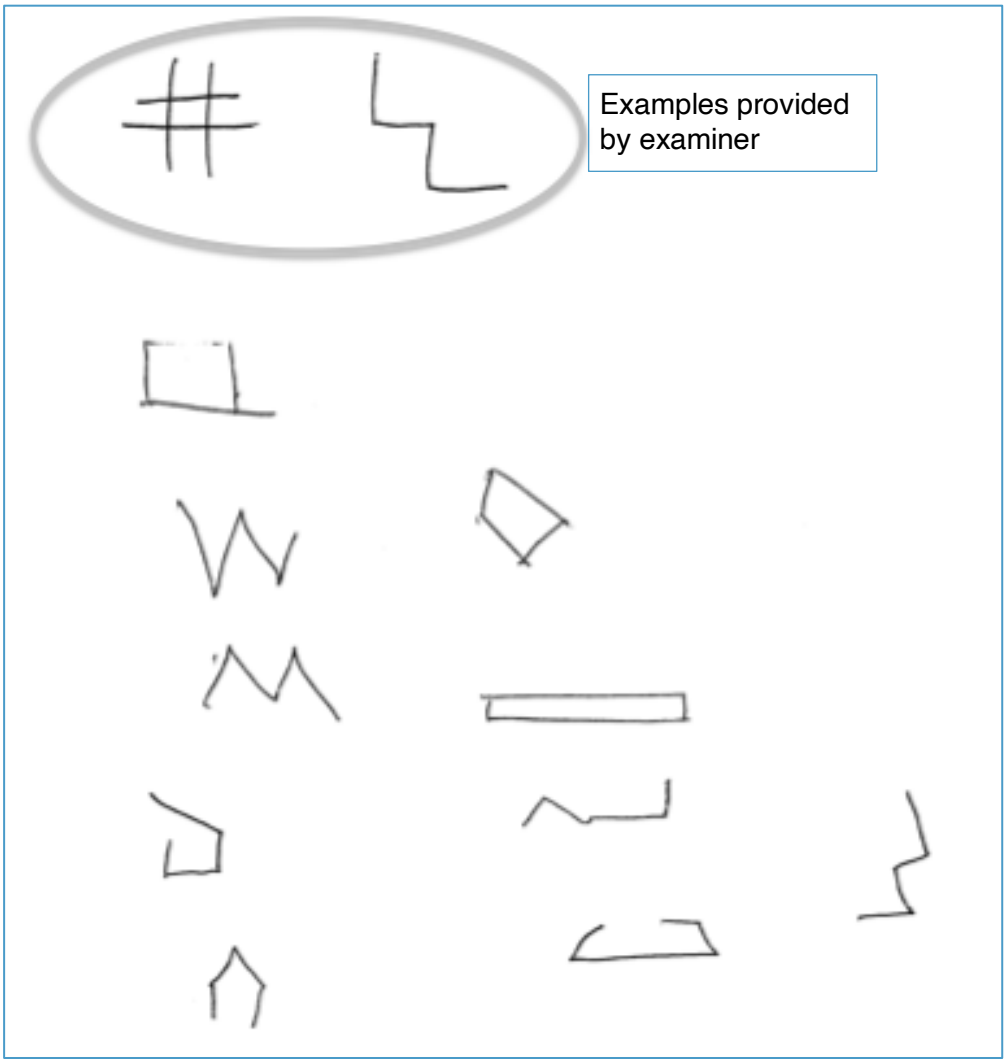


Figure 7: Design fluency task with examples provided by the examiner and patient responses.

Baseline or normal score:

Most people can generate 5-7 different drawings, depending on their education level.

Video illustration:

https://vimeo.com/158806260

5. Go-No-Go Tasks

The Go-No-Go tasks assess the ability to inhibit behaviour and switch between different behavioural sets when necessary. These tests often induce perseveration, which happens when the patient continues with the same response despite a change in the stimulus.

A common example of perseveration is when a patient is asked orientation questions in the MMSE test, and the patient keeps giving the same answer even though the question has changed. For instance, the patient is asked what day of the week it is and replies, “Monday”, and when asked about the season, they respond with the same: “Monday”.

5.1 Finger-Nose Task

The examiner raises their finger, and the patient is asked to touch their nose in response. Then, when the examiner touches their nose, the patient is asked to raise their finger. The patient must resist copying the examiner and do something different. The examiner makes it more challenging by establishing a pattern, such as repeating the same movement and then switching to another.

The instructions are: "Listen carefully. When I touch my nose, you raise your finger like this. When I raise my finger, you touch your nose. Let’s try it now." The examiner performs five variations, such as *Finger-Nose-Nose-Finger-Nose.*

Baseline or normal score:

Most individuals can complete this task without making a mistake.

Video illustration:

https://vimeo.com/158806269

5.2 Tap Task

Tap on a surface like a table and instruct the patient to: "Tap once when I tap once. Do not tap when I tap twice." Perform a random sequence of tapping once or twice and observe the patient’s response. Try to

establish a set and then change it to see if the patient can switch. Difficulty with switching indicates perseveration.

Baseline or normal score:

Most people can do this without any mistakes.

Video illustration:

https://vimeo.com/162241521

6. Alternating Sequences

Alternating sequences assess the ability to switch thinking and demonstrate cognitive flexibility. It also involve working memory and attention as concepts are stored in memory and manipulated.

"I will say a sequence of letters and numbers. Listen carefully, as I want you to complete it for me. A 1 B 2 C...? Good, now start from A and continue this sequence until I tell you to stop. Score the following sequence: A 1 B 2 C 3 D 4 E 5.

Baseline or normal score:

Most people can complete this task without any mistakes.

Video illustration:

https://vimeo.com/158805839

7. Months of the Year Backwards

This task involves cognitive flexibility and working memory. Instruct the patient to: "Say the months of the year starting with January." Let the person complete the task up to December. Then say: "Now start with January and go backwards." Stop the test when “August” is reached or after two or more mistakes have been made.

Baseline or normal score:

Most people can complete the task without any errors.

8. Abstraction

The patient may be asked to explain the similarities between words. For example, the similarity between the words “apple” and “banana” is that both are fruit. This task assesses abstract thinking, and difficulties with abstract thinking are linked to executive dysfunction and frontal lobe impairment. Other pairs of words that can be used to question for similarities include: “coat” and “dress”, “pen” and “pencil”, and “watch” and “ruler”.

Baseline or normal score:

Most people can complete the task without any errors.

Memory

Introduction

Memory relates to the brain's ability to store information for future use. The process includes encoding, storing, and retrieving information.

Localisation

The hippocampus and parahippocampal regions in the medial temporal lobes are primarily involved in information storage, while the frontal cortex is responsible for retrieval. However, memory is also a distributed function involving multiple cortical areas, the basal ganglia, and the cerebellum.

There are inconsistencies across textbooks regarding how memory is classified, as many classification systems exist. We will examine two classification systems here. The first is based on the recall process, and the second is time-based.

Memory that is explicitly processed through deliberate effort is called declarative memory and can be further divided into episodic and semantic memory. See Table 4 below. Episodic memory involves the conscious recall of personal experiences or episodes within our own context. An example is recalling what you did last night. You might remember having a meal and watching TV in a relaxed setting. It was a cool evening, and you can recall many additional details about that experience.

Semantic memory is our general store of conceptual and factual knowledge. Remembering the date of the Second World War or the chemical formula for water are examples. The initial memory trace for semantic memory may be episodic in nature, but the contextual or episode information is lost over time. Thus, we remember the chemical formula for water but forget where or how we learned it.

Semantic memory plays a key role in many aspects of higher-order cognitive processes. See Figure 8. Language, praxis, gnosis, executive planning, and emotional processing all rely on semantic memory to complete processing tasks. Word comprehension and semantic association are language functions that use semantic memory to find the correct word for an object. Ideational praxis involves semantic memory to process knowledge of a tool or object and execute the appropriate movement for that tool. Associative

gnosis uses stored knowledge to link a perception of an object to similar objects. Executive planning connects with semantic memory to plan and execute tasks. Emotional memory is linked to semantic memory, and damage to semantic memory can impair the ability to assign appropriate emotions to stimuli or contexts.

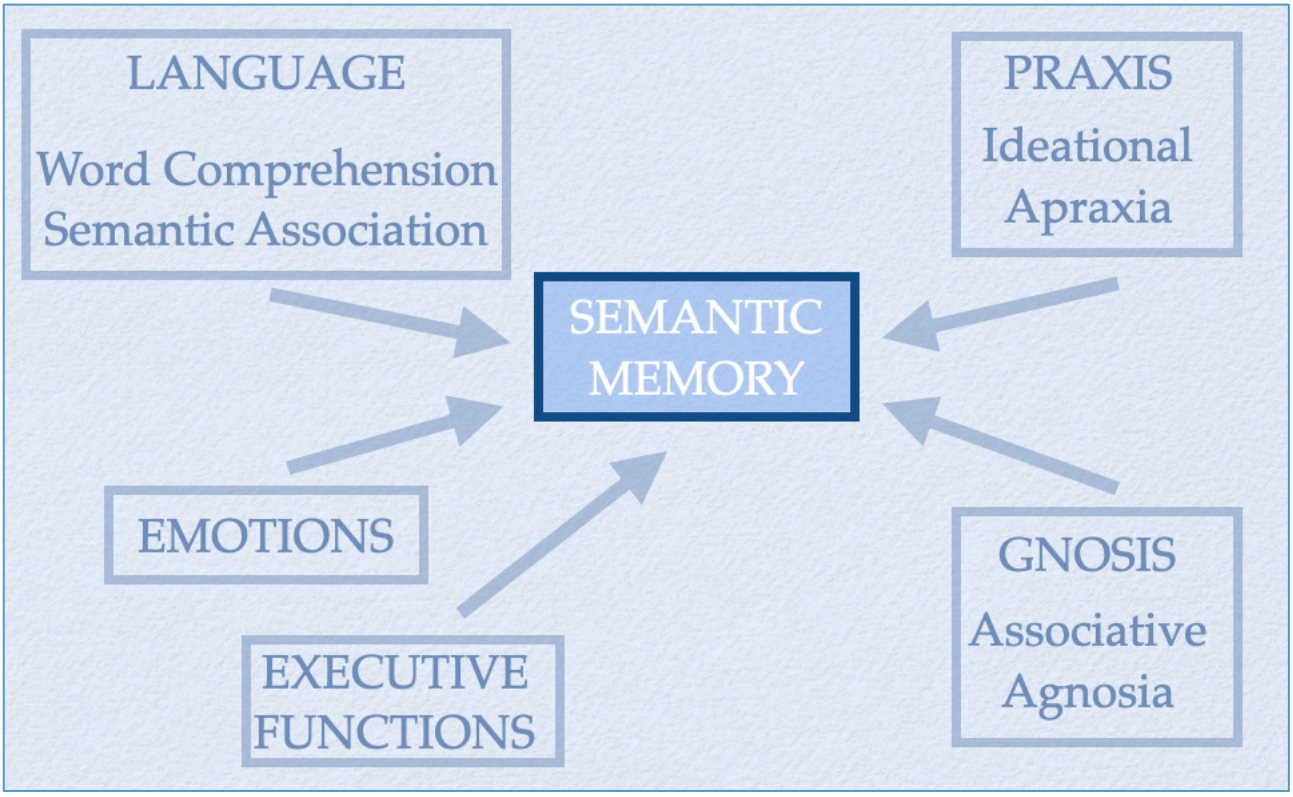


Figure 8: Different components of cognitive processing access semantic memory.

Implicit or non-declarative memory is recalled without conscious thought and involves procedural memory. This type of memory is used to remember how to ride a bicycle. See Table 4.

Table 4

Classification of Memory According to the Process of Recall	
Explicit Memory or Declarative Memory	Episodic
	Semantic
Implicit Memory	Procedural memory, priming, conditioning

Timing the delay to recall information offers another way to classify memory. This involves providing a stimulus, either verbal (written or spoken) or visual, and then testing for recall after a certain period.

Working memory is also known as our ‘online’ memory and refers to the ability to store and manipulate information for less than a minute. It involves a network of frontal cortical and subcortical circuits that communicate with a central executive. It has a verbal component in the dominant hemisphere called the phonological loop, and a visual component in the non-dominant hemisphere called the visuo-spatial sketch pad.

For assessing working memory, ask for recall immediately after presenting the stimulus. For short-term memory, allow a delay of minutes to hours before asking for recall. Long-term memory can be evaluated by querying historical facts, such as the dates of the Second World War or who was the first person to land on the moon. See Table 5 below. Educational background influences long-term memory performance, and poor results should be interpreted with caution.

Some clinicians use the term episodic memory to refer to short-term memory. Episodic memory is also occasionally divided into verbal and visual episodic memory.

Table 5

Classification of Memory According to Time Elapsed Since Stimulus Presentation	
Working Memory	Verbal Visual
Short-term Memory	Verbal Visual
Long-term Memory	

Tests

1. Working Memory

1.1 Verbal Working Memory

Verbal working memory is evaluated by presenting a verbal stimulus and immediately requesting recall. The stimulus can consist of words or numbers. Working memory significantly overlaps with attention and concentration. Digit Span is a test for working memory that involves numbers and is discussed earlier in the section on assessment of attention and concentration.

Immediate recall of 3 words

"I want you to remember three words. Listen carefully, as I will say the words only once. Rock, house, and flag. Can you tell me what those three words were?" Most people can immediately recall all three words. Usually, this test moves on to a delayed recall task. If the patient cannot recall all three words right away, it's okay to repeat them 4-6 times. If they still can't repeat the words, move on to the next task. Warn the patient about the delayed recall: "Remember these three words as I will ask for them later." It's best to choose three unrelated and unfamiliar words. Avoid using the same words from the MMSE, as patients might have heard them before, making the task easier due to practice.

Immediate recall of 10 words

"I am going to show you a list of words to read and remember. I will show you the same list twice and ask what you can recall each time. Later, I will ask if you can still remember the words. Are you ready? I will turn the page for you." Allow the patient to read the words from cards or a computer monitor. The list of words is provided below. "Which of the words can you remember?" Most people can recall five or more words on the first trial.

Another trial can be conducted using the same words but in a different order. This is technically not a verbal working memory task, as most people start relying on memory strategies and less on 'online' recall abilities. It begins to overlap with short-term memory.

“Thank you. Please read the words again and try to remember them. What can you remember now?” Most people will demonstrate a learning curve and can build on the initial recall task to remember six words or more.

List of Words for Verbal Recall:

Trial I

CARROT BOAT LION EYE JUG CAT SOUP LEG HOUSE TICKET

Trial II

LION JUG EYE BOAT CARROT LEG TICKET HOUSE CAT SOUP

Baseline or normal score:

- Immediate recall of 3 words: most people will score 3/3.
- Immediate recall of 10 words:
    - Trial I: Most people will score 5 or more out of 10.
    - Trial II: Most people will score 6 or more out of 10.

1.2 Visual Working Memory

This can be evaluated by presenting a patient with a visual stimulus like a simple line drawing and requesting immediate recall. The patient then draws what they remember, and their response can be scored.

See Figure 9 below from Strub and Black for examples of line drawings that can be used for immediate recall. [13] Show the patient a line drawing for 10 seconds, remove the drawing and ask the patient to wait another 10 seconds, then ask them to draw what they saw.

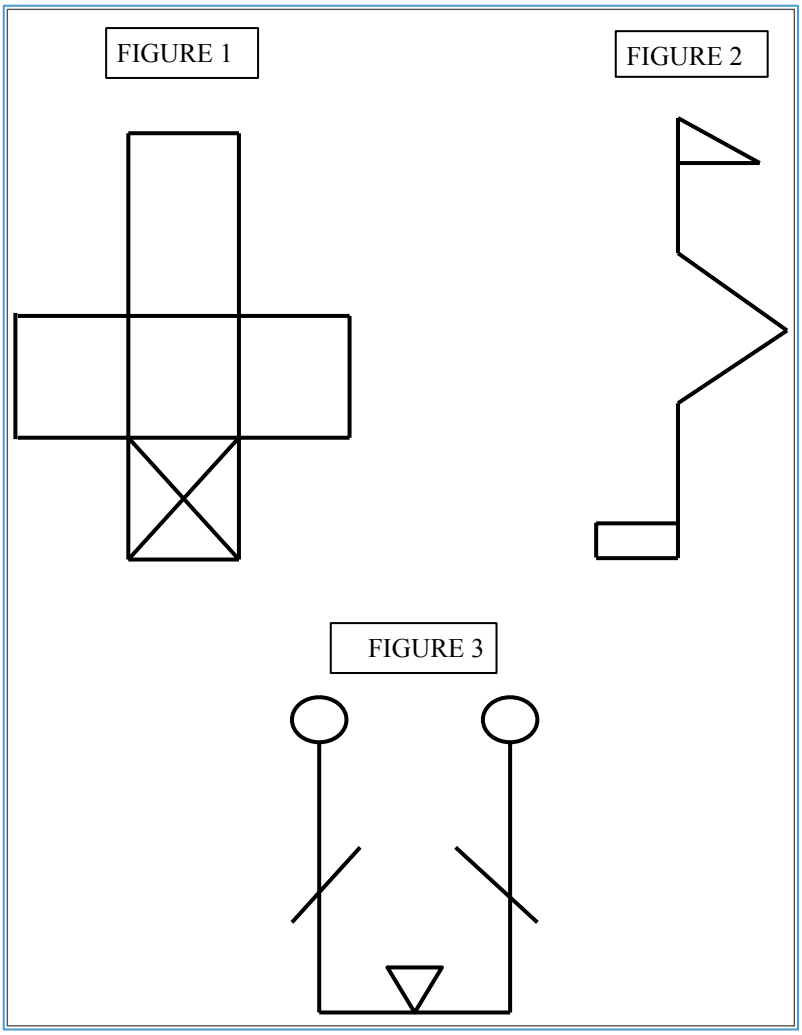


Figure 9: Examples of line drawings from Strub and Black for immediate recall.

The patient's response can be scored using a simple scoring system ranging from 0-3; 0 indicates a failure to recall anything, 1 means poor recall, 2 signifies a few omissions, and 3 denotes no mistakes.

Impaired ability to copy line drawings due to apraxia or agnosia can hinder the interpretation of visual memory tests that rely on line drawings. It is important to verify that the patient can copy these drawings before assessing their visual memory. Refer to the section on constructional ability in the chapter on praxis for more information on assessing constructional ability.

Baseline or normal score:

Most people will score 7-9/9 for the three drawings described by Strub and Black.

2. Short-term Memory

Short-term memory can be evaluated by postponing the recall task for a few minutes, ideally about 5-10 minutes. During the interval between assessing working memory and short-term memory, other cognitive tests are usually performed to complete a battery of assessments. Short-term memory can be divided into verbal and visual short-term memory.

2.1 Verbal Short-term Memory

3 Words delayed recall

“Can you please tell me the three words that we learned earlier?” Most people can recall all three words.

10 Words delayed recall

Earlier, I showed you some words on cards or the computer screen. Can you tell me which of those words you remember? It helps to point to the actual cards or screen. Recollection of four or more words is considered normal.

CARROT BOAT LION EYE JUG CAT SOUP LEG HOUSE TICKET

Cued recall

Cueing recall aids patients with frontal lobe injury to retrieve information from their memory banks in the temporal lobes. Improved performance on cued recall may suggest an issue with the frontal cortex. If cueing fails to enhance performance, it could indicate poor memory function in the temporal lobes, meaning the memory trace was never formed, and assistance with retrieval does not improve the outcome.

Cued recall can be evaluated with a recognition recall task: “I am now going to read a list of words. Some of the words are from the original list that I showed you (pointing to the list of words on the examination table or the computer screen helps to remind the patient of the previous list), and some of the words are new and not from the original list. Please tell me which of the words were from the original list. If you don’t know the answer, just guess." Read the words below. A mark is given for correctly identifying a word from the original list (in bold) and correctly saying that the word was not in the list (words not in bold). The instructions may be repeated if they are forgotten.

Recognition Memory List

CARROT ONION BUG **JUG** SHIP **BOAT LION** GOAT SPY **EYE SOUP** BUTTER BAT ARM **CAT LEG** MOUSE **TICKET HOUSE** BUCKET

Most people make only one or two mistakes, as cued recall is surprisingly effective. Individuals with medial temporal lobe pathology continue to perform poorly despite cueing, and patients with frontal lobe memory impairment will have intermediate results.

Baseline or normal score:

- 3 Words delayed recall
    - Most people can recall all three words.
- 10 Words delayed recall
    - A recall of 4/10 or more is expected.
- Cued recall
    - A normal score is 17/20 or more.

2.2 Visual Short-term Memory

Delayed visual recall can be evaluated by asking the patient to remember the figures from the visual working memory task described above.

An alternative is to start with a constructional ability task at the beginning of the assessment. Delayed visual recall can be tested by asking for recall of the drawings later in the assessment. See Figure 10 below in the praxis section.

To ensure accurate delayed verbal and visual recall, it is important not to contaminate the information presented for recall by presenting similar verbal and visual materials before the recall is assessed. For instance, if you provide a line drawing for delayed visual recall and then evaluate for nominal aphasia by presenting line drawings for naming, the patient may recall a mixture of the original visual recall stimulus and the nominal aphasia drawings when asked for delayed visual recall.

Baseline or normal score:

- Most people will score 5-6/9 or more on delayed recall of the Strub and Black figures.

- Most people will score 6/9 or more on delayed recall of Figure 10 using the same scoring system described for the Strub and Black figures.

3. Semantic Memory

Semantic memory can be assessed by asking for historical facts. Educational level influences performance, so it is best to use well-known historical facts.

The Addenbrooke's Cognitive Examination provides examples of a semantic memory test.

- "What is the name of the current Prime Minister?"
- "What is the name of the current USA president?"
- "Name the USA president who was assassinated in the 1960s?"
- "When was the Second World War?"

Baseline or normal score:

Most people can correctly answer three or more of the questions listed in Addenbrooke's Cognitive Examination.

4. Name and Address Test

This is a useful alternative test for verbal memory because it is brief and includes both verbal working memory and verbal short-term memory. It can be used as a quick cognitive screening tool when combined with other tasks, such as a short screen for executive functioning.

I want you to remember a name and address. Listen carefully, as I will say it only once, and then I will ask you for the name and address shortly: Peter Black, 32 Long Street, Albany. Can you repeat that?" Score 1 mark for each of the five components. If the patient has repetition errors, repeat the phrase up to three times.

Allow about five minutes to pass while distracting the patient with another cognitive task, such as the months of the year task described in the section on executive functions. Ask the patient to say the months of the year starting with January. Then ask the patient to start with January, but this time go backwards, and score the first five months done correctly backwards.

"Tell me the name and address that you learned earlier." Score 1 mark for each component correctly recalled. The test can be further expanded by giving cues. See Table 6 below.

Table 6: Name and address recall with suggestions for cued recall.

	RECALL	CUE
1.	Peter	“John, Peter, or Shaun?”
2.	Black	“Black, Smith or Jones?”
3.	32	“32, 34, or 36?”
4.	Long Street	“Long, Church, or Market Street?”
5.	Albany	“Busselton, Harvey, or Albany?”

Baseline or normal score:

Most people will score 5/5 on immediate and delayed recall for the name and address task.

Praxis

Introduction

Praxis is the ability to translate an idea into motor action and oversee the successful execution of that action. In apraxia, there is an inability to perform skilled, purposeful movements despite having normal basic motor and sensory functions.

The terminology used to describe the various types of apraxia is confusing and inconsistent across textbooks. This section on praxis uses the generally accepted definitions of apraxia.

The motor association areas and their connections to other multimodal association areas provide instructions or programs that guide the pyramidal neurons to execute movement. The motor program instructions can be divided into two categories. The first is when to move, called intentional programs, and the second is how to move, known as praxis programs.

Intentional programs can be regarded as part of executive functioning because there is significant overlap. These programs decide when to initiate a movement, when not to initiate, when to continue or sustain it, and when to stop or complete a movement. See Table 7 below for a summary of intentional instructions with clinical correlates.

Table 7: Types of intentional instructions with clinical correlates

MOVEMENT INSTRUCTION	CLINICAL CORRELATE
1. When to start a movement	Akinesia or hypokinesia
2. When not to start a movement	Defective response inhibition
3. When to continue or sustain a movement	Motor impersistence
4. When to stop or complete a movement	Motor perseveration

The praxis programs or “how to move” programs include the following steps:

1. How to position the limb when performing skilled movement.
2. How to move the limb in space.
3. How to orientate the limb towards the intended target of movement.
4. How to time the skilled movement.

5. How to imitate movement.
6. How to order components of a movement to achieve the intended goal.
7. How to conceptualise and solve movement-related problems. For instance, when given a racket and tennis ball for the first time, the praxis programs must interpret how to use these objects to achieve a goal. The motor program can then be assembled and transmitted to the motor neurons as a sequence of instructions.

Impairment of the praxis programs is known as apraxia. Apraxia can be categorised as either ideational apraxia or ideomotor apraxia. Ideational apraxia represents the initial stage in executing a movement, involving conceptual systems for actions and understanding of tool functions necessary for performing a motor task. For instance, ideational apraxia is evident when the patient cannot grasp the purpose of a screwdriver or how to use it properly.

Ideomotor praxis can be seen as the next step in completing a motor task. It follows ideational praxis and involves the final step in sending instructions to the motor neurons to produce an action. This is where the praxis program is compiled and consists of sequencing motor acts to use a tool to achieve the desired goal. Ideomotor apraxia involves action programmes for the generation and control of movement. Ideomotor apraxia can be further divided into limb-kinetic apraxia or buccofacial apraxia. In limb-kinetic apraxia, the limbs cannot perform motor programmes, and examples are an inability to demonstrate how to comb hair or brush teeth. Buccofacial apraxia is an inability to complete learned mouth and face movements. Examples include blowing out a match, licking the lips, coughing, sipping through a straw, or smelling a flower.

Gesture comprehension involves recognising and understanding the meaning of gestures made by others. Gestures are a form of nonverbal communication that can express meaning, intention, or emotion without using words. To understand gestures, one must first process visual-perceptual information and then interpret the semantic content to grasp their meaning. Examples of gestures with specific meanings include a nod to indicate agreement or a wave as a greeting. Patients with ideational apraxia may find it difficult to understand the significance of gestures and may struggle to perform them.

See Table 8 for a classification of apraxia.

Table 8: Classification of apraxia.

APRAXIA			CLINICAL
Ideational			Impaired gesture knowledge. Poor tool–object action knowledge.
Ideomotor	Limb-kinetic	Deficits in limb movements	Gesture knowledge preserved. Tool-object action knowledge preserved. Impaired action production system.
	Buccofacial	Deficits in buccofacial movements	

Dressing apraxia refers to an inability to complete dressing tasks. For example, difficulty putting one's arm into a shirt sleeve, putting the shirt on backwards, and being unable to fasten buttons. Constructional apraxia is an inability to copy line drawings. Both dressing apraxia and constructional apraxia are misnomers because they involve visuospatial or input functions, not just output or motor functions, as the names suggest. Further assessment will be needed to distinguish visuospatial dysfunction (agnosia) from apraxia.

To put on a shirt, a person must see and visually interpret the different parts of the shirt. The sleeves, front and back, collar, and buttons must be recognised, and their positions in space must be accurately processed to initiate the motor sequence of dressing. Continuous visual observation occurs as the person gets dressed.

The ability to copy a line drawing relies on accurately recognising the stimulus drawing through visual input and processing. Once the drawing is correctly processed visually, motor programs are generated, and the hand is guided to draw the picture. Visual monitoring occurs during the drawing process, allowing motor programs to be adjusted as needed. Visuospatial processing and motor output form part of gnosis and praxis.

Localisation

Planning a new movement sequence initially occurs in the posterior aspect of the dominant hemisphere. These plans are then transmitted to the multimodal association regions in the prefrontal

cortex, the supplementary motor area, the unimodal motor association regions, and finally, the primary motor cortex for movement execution.

Tests

1. Movements in the Hands and Fingers

It can be assessed by asking the patient to rotate a coin between their thumb, index finger, and middle finger. Remember to evaluate both hands. If a coin isn't available, use a pen and ask the patient to rotate the pen using their fingers.

Baseline or normal score:

Most people can complete this task without any mistakes.

Video illustration:

https://vimeo.com/158806270

2. Object use

The examiner asks the patient to perform a series of simple movements such as:

- “Show me how you would throw a tennis ball to someone.”
- “Show me how you would brush your teeth.”
- “Show me how you would comb your hair.”

Both arms and hands should be assessed.

Baseline or normal score:

Most people can complete this task without any mistakes.

3. Buccofacial Apraxia

Orofacial apraxia can be evaluated by asking the patient to demonstrate how they would blow out a match, lick crumbs from their lips, blow a kiss, cough, sip through a straw, or smell a flower.

Baseline or normal score:

Most people can complete this task without any mistakes.

4. Gestures

Ask the patient to complete the following gestures:

"Show me how you would …"

- Wave goodbye
- Beckon: "Come here."
- Salute like a soldier
- Hitch a lift

Baseline or normal score:

Most people can complete this task without any mistakes.

5. Dressing Ability

Dressing ability is evaluated by asking the patient to don a hospital gown or cardigan. Observe whether the patient can correctly insert their hands and arms through the sleeves and fasten the buttons. Further cognitive assessment will determine if the deficit is due to agnosia, apraxia, or a combination of both.

Baseline or normal score:

Most people can complete this task without any mistakes.

6. Constructional Ability

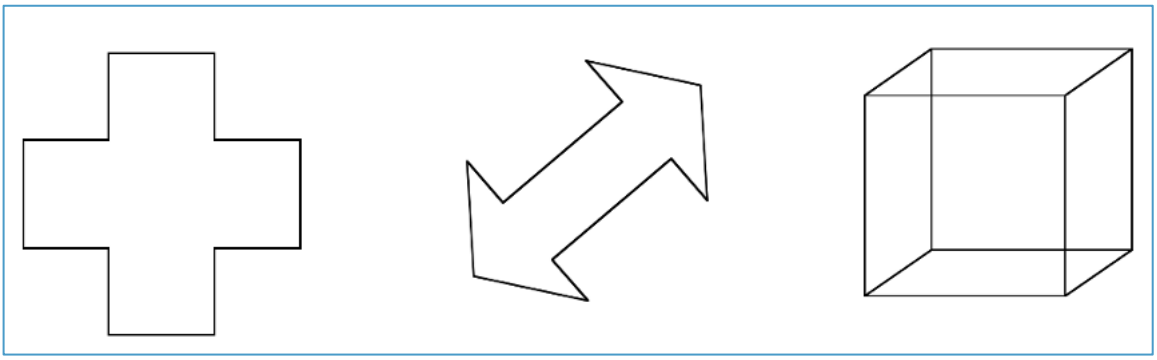


Figure 10: Examples of line drawings for a copy task

Line drawings are shown, and the patient is asked to copy them. These drawings can be presented either in printed form or sketched by an examiner. Examples include a cross, arrows, and a 3D cube (shown in Figure 10). If the examiner draws the pictures, care should be taken not to let the patient see how it was drawn, as this could make the task easier to complete.

Impaired constructional ability should be further assessed to differentiate agnosia from apraxia. The patient can be asked if their drawing matches the stimulus drawing. If the patient states the drawing is different from the stimulus but cannot explain how to draw it correctly, this may suggest apraxia. In such cases, the patient perceives a difference between the drawings but is unable to draw them accurately.

Baseline or normal score:

Most people can complete this task without any mistakes.

Gnosis

Introduction

Agnosia is a deficit in perceptual ability caused by a failure in higher-level processing of sensory stimuli.

We gather information about our environment through our primary senses: vision, hearing, tasting, smelling, touching, temperature, position, and vibration. This information is sent to the cortex via the spine and thalamus, where it is arranged somatotopically. Further processing enables form recognition, colour analysis, discrimination, pattern detection, and orientation. If impairment occurs at this stage of further processing, it is known as apperceptive agnosia.

The next step in processing sensory stimuli involves recognising the stimulus and retrieving relevant knowledge about it. Associative agnosia is the difficulty in recognising the stimulus and accessing its associated knowledge. An individual with associative agnosia may be able to draw the stimulus object, as basic perception remains functional, but will not be able to provide information about the stimulus. Once recognition has occurred, the object may be correctly named if language function is normal (see Figure 11).

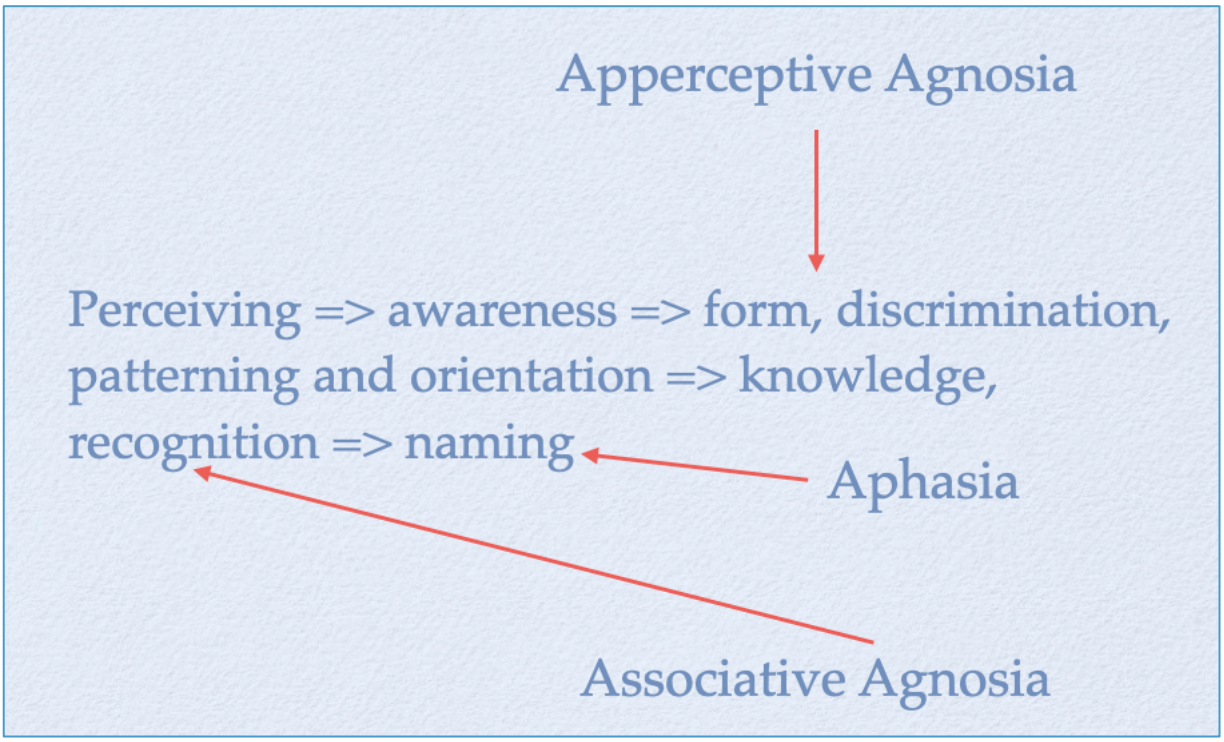


Figure 11: Sequence of cognitive processing when presenting an object for naming.

Visual apperceptive agnosia can be assessed through object recognition, copying drawings, unusual views tests, overlapping line drawings, partially degraded or fragmented images, and judgment of line orientation. Figure 12 below shows a degraded and fragmented view of a stapler that can be used for assessing agnosia. Addenbrooke's cognitive assessment includes a dot counting task and fragmented view of letters for this purpose. The MoCA Basic Test features an overlapping line drawing task to evaluate agnosia.

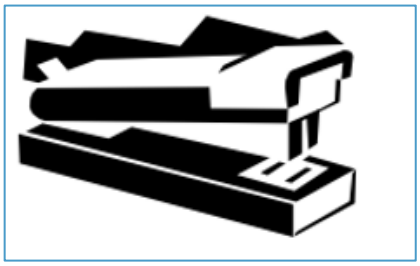


Figure 12: Fragmented view of a stapler

Associative agnosia is a disruption of knowledge, and impairment at this level begins to overlap with semantic memory and semantic language functions. See the chapters on memory and language for further details.

Localisation

Primary processing of visual information takes place in the occipital cortex, with further processing in the visual association areas and multimodal sensory association areas. The visual cortex connects to dorsal parieto-occipital regions for depth perception, movement direction, and position in space. This is the "where" pathway. Connections to the lateral occipital lobe and inferior temporal lobe facilitate form and colour processing with recognition, forming the "what" pathway.

Tests

1. Identify Objects Visually

Visual object agnosia is the inability to recognise objects by sight. Ask the patient to identify and name common and uncommon objects. Most people can identify the following: watch, pen, tissue, button, shoe, and shirt. Less common objects include knuckles, ring finger, eyebrow, winder of a watch, and collar.

This test overlaps with naming ability, so further assessment is needed to differentiate between nominal aphasia and visual object agnosia. If the patient has difficulty naming an object, then ask them to describe or draw what they have seen. A deficit at this level could be described as apperceptive agnosia.

The next step is to ask the patient to mime the use of the object, describe where the object is used, or with what other objects it can be used. A deficit at this level would suggest associative agnosia.

If there are no deficits suggesting impaired perception and the patient still cannot name the object, then the issue is more likely anomia. Patients might be able to say at this stage that they know what the object is but struggle to find its name. The patient can be helped with a language cue by providing either part of the word or a phonetic hint. For example, say; “col...” for collar or suggest it sounds like "dollar." Some patients may then be able to say the word, and the deficit is more likely a nominal aphasia.

Baseline or normal score:

Most people can complete this task without any mistakes.

Video illustration:

https://vimeo.com/161349545

2. Identify Objects by Touch

An inability to identify objects solely through touch is called astereognosis. It is assessed as follows: “Please hold out your right hand. I will ask you to close your eyes and then place an object in your hand. Identify this by touch only.” Place common objects like keys or a coin in the patient’s hand. Repeat the same with the left hand.

Baseline or normal score:

Most people can identify the everyday objects mentioned above without any mistakes.

Video illustration:

https://vimeo.com/161349544

3. Finger Perception Test

This test assesses touch, pressure, and proprioception. Ask the patient to place their hands on the table in front of you. “I am now going to touch two of your fingers, and you must say how many of your other fingers are in between my fingers.” Touch the fingers on the black markings as shown in the first picture below. The patient should answer “one.”

Now close your eyes while I continue this test. How many of your fingers are between the fingers that I touch? Continue to touch the patient's fingers as shown in Figure 13. Most people are able to complete this test without errors. The test becomes much easier if patients move their fingers while answering.

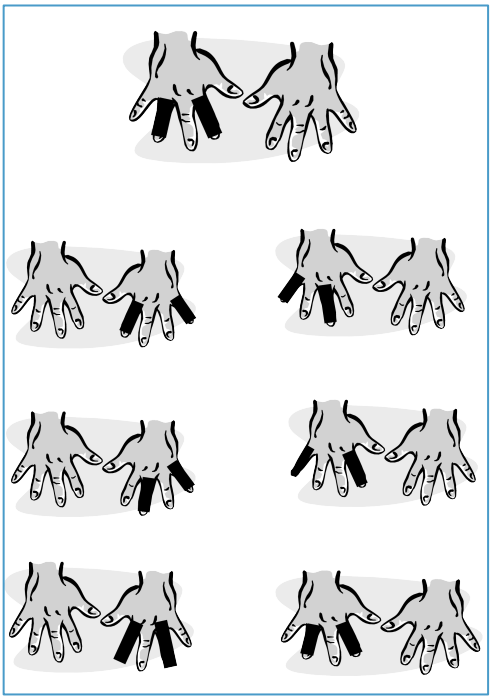


Figure 13: Finger perception test

Baseline or normal score:

Most people can complete this task without any mistakes.

Video illustration:

https://vimeo.com/158806265

4. Finger Agnosia

Identifying and naming fingers is done by asking the patient to place his hand on the table in front of you. Point to different fingers and ask for their names. The inability to name fingers can indicate either agnosia or anomia. It is often difficult to distinguish between the two. Some patients may be able to describe the function of a finger; for example, the ring finger is where a ring goes. If patients can describe this but cannot name the finger, it may suggest anomia. Further cognitive assessment may reveal whether the issue is more consistent with agnosia or anomia, which could help determine whether the problem is finger agnosia or finger anomia.

Baseline or normal score:

Most people can complete this task without any mistakes.

5. Clock Drawing

The clock drawing test is a useful measure of overall cognitive impairment, although it does not show which particular cognitive domain is affected.

Different elements of cognition play a role in the clock-drawing task. Language comprehension is involved since the instructions are verbal. Praxis is also involved, as drawing the clock is a motor output. Executive functioning assists in planning the execution of the drawing, ensuring that the circle, numbers, and hands are correctly organised. While drawing the clock, visual monitoring guides the completion of the task. This monitoring process relies on visuoperceptual or gnosis abilities.

The clock drawing task instructions are: “Draw a clock face with the time set to 10 past five. It must have all the numbers and hands so that a child can read the time.” The instructions may be repeated if necessary.

A total of five points are awarded. Most people would be able to score full marks.

1. Score one point if the outer circle is present.
2. Score one point if all the numbers are in the correct order and placed in the appropriate quadrant. No other numbers or letters are permitted.
3. Score one point if all the hands are present, with the minute hand longer than the hour hand.
4. Score one point if the time is accurately shown.
5. Score one point for overall planning, starting with a circle and arranging the numbers in their proper quadrants.

Baseline or normal score:

Most people would be able to score full marks.

Video illustration:

https://vimeo.com/158806261

Suggested Cognitive Assessment Protocols

Bedside tests can be performed as individual tasks to evaluate specific cognitive skills. However, combining these tasks into an assessment battery that covers all the key aspects of cognitive functioning is preferable. This enhances the diagnostic value of bedside cognitive assessments by ensuring that all major cognitive domains are assessed and avoids missing impairment localised to a single domain.

The MMSE and MoCA tests effectively combine different tasks into a cognitive assessment tool. However, a drawback of this approach is that clinicians may focus on the overall score and overlook how individual elements or domains of cognition are impacted. This contrasts with a standard clinical neurological examination, where neurologists do not rely solely on a single summary “score” for a neurological exam. Instead, they interpret abnormal findings to develop a central theme that supports a hypothesis for a specific neurological condition.

A cognitive test battery should include tests that assess cognition at a consistent difficulty level. Mixing sensitive and rough measures within the same protocol is unhelpful.

Tests must be administered in a specific order. It is common practice to start with memory tests so that delayed recall can be assessed later during the assessment. Other visual test items should not interfere with visual memory tasks. To prevent this, line drawings for other tasks, such as constructional ability, are given only after completing visual memory tests.

The MMSE and MoCA are useful tests to begin with. These assessments help establish a baseline score that clinicians can easily share. Tasks can be added as needed to evaluate different aspects of cognition and investigate a specific cognitive domain not sufficiently covered in the tests.

For example, the only part of the MMSE that assesses some executive functioning is the serial 7s and backward spelling of a five-letter word. Including the Luria hand movements and the animal naming task in the MMSE markedly enhances the assessment.

The MMSE can also be supplemented with additional tasks for praxis and gnosis. This is especially important when a patient fails the overlapping pentagon copy task, and further clarification is needed to determine whether the deficit stems from apraxia, agnosia, or a combination of both.

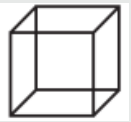
A suggested short protocol of tests to complement the MMSE:

- Luria hand movements
- Animal naming task
- Finger-nose task
- Limb-kinetic praxis (coin-turning task)
- Identifying and naming everyday objects

An alternative to the MMSE is a short set of tasks, listed in Table 9 on the next page. The page can be printed and used at the bedside. The tasks cover the following cognitive domains:

Table 9: Short Cognitive Assessment

COGNITIVE DOMAIN	TASK
Verbal Working Memory	Immediate recall of Name and Address
Verbal Short-Term Memory	Delayed recall of Name and Address
Executive Functions	Luria Hand Movements I Luria Hand Movements II Animal Naming Test Design Fluency Test
Praxis	Limb-Kinetic Praxis: Coin Task
Naming and Gnosis	Identifying and Naming Objects

SHORT COGNITIVE ASSESSMENT	
Task	**Result**
Name and Address Memory Test. Peter - Black - 32 - Long Street - Albany	
Copy Cube 	
Luria Hand Movements I	
Luria Hand Movements II	
Animal Naming Test	
Design Fluency Test	
Limb-Kinetic Praxis: Coin Task	
Identifying And Naming Objects: knuckles, ring finger, eyebrow, winder of a watch and collar.	
Delayed Recall: Name and Address Memory Test. Peter - Black - 32 - Long Street - Albany Recall can also be assisted with cueing.	

The Armadale Short Cognitive Assessment (ASCA) is a quick bedside screening tool that assesses four cognitive domains: working memory, executive functions, orientation, and delayed recall. It can be included as part of a routine mental state examination. This assessment is appropriate for everyday practice when patients do not overtly display cognitive impairment.

ARMADALE SHORT COGNITIVE ASSESSMENT

Bedside Screening Tool

No total score | Each domain assessed independently

Patient Name	Date of Birth	Date	Examiner

Clinician instructions are in *italics*. Say aloud the text in regular type. Scoring criteria appear beneath each task.

1. WORKING MEMORY *Registration & Immediate Recall*

SCORE / 5

I am going to ask you to remember a name and address. Listen carefully, then repeat it back to me.

Read each item slowly, allowing 1 second between items.

Peter	Davis	32	Long Street	Brookton

Score 1 point per item recalled correctly. Repeat up to 3 times if errors occur — note trials required (do not re-score).

Trials needed: 1 / 2 / 3

2. EXECUTIVE FUNCTIONS

2a Animal Fluency

COUNT _____

I would like you to name as many different animals as you can. You have one minute. Begin when you are ready.

Cutoff: ≥ 13 = normal | ≤ 12 = impaired

2b Luria Hand Movements

RESULT *Pass / Inconclusive / Fail*

Place your hands flat on your knees. I am going to show you different hand positions. Watch carefully, then copy me.

Demonstrate the sequence: fist one hand → swap (fist other hand, flatten first) → return to start. Repeat twice, then ask the patient to continue independently.

Pass: 5 consecutive cycles with no unprompted errors.

2c Months Backwards

SCORE / 5

I would like you to recite the months of the year in reverse order, starting with December and working backwards.

Stop when the patient reaches July. Score 1 point per month in correct sequence starting from November. Accept self-corrections; do not prompt.

Dec	Nov	Oct	Sep	Aug	Jul

3. ORIENTATION *Date, Time & Place*

SCORE / 5

Ask each question below. Do not provide cues or accept approximate answers for date items.

Question	Correct	Score
What is today's date?	☐	1
What month is it?	☐	1
What year is it?	☐	1
What day of the week is it?	☐	1
Where are we right now? (building / suburb)	☐	1

4. DELAYED RECALL *Free & Cued Recall*

SCORE / 5

Ask the patient to recall the name and address learned at the start. Do not initially provide cues. Follow-up with cued recall.

Tick ☐ each item recalled freely (Free Recall, score /5). For any item not recalled, read the three choices and ask 'Which one is correct?' — tick ☐ if correct (Cued Recall, score /5).

Item	Free recall	Cued recall (read aloud — only if not freely recalled)	Correct	Cued
First name	☐	*Peter / Mark / John*	**Peter**	☐
Surname	☐	*Smith / Jones / Davis*	**Davis**	☐
Number	☐	*32 / 34 / 36*	**32**	☐
Street	☐	*Church / Long / King Street*	**Long St**	☐
Suburb	☐	*York / Beverley / Brookton*	**Brookton**	☐

Free

SCORE / 5

Cued

The MoCA is a useful screening tool for cognitive impairment. It does not include a specific task to assess language comprehension. As a result, it is possible to complete the MoCA and score poorly without recognising the impact of receptive aphasia. Therefore, performing a brief comprehension task using the 3-4 stage verbal comprehension command before administering the MoCA can be helpful.

Additional tasks for assessing constructional skills and visual memory through a delayed recall task can be incorporated into the MoCA. The MoCA can also be expanded — using examples described elsewhere in this text or similar tasks from Addenbrooke's test — to evaluate nominal aphasia and visual object agnosia further. Finally, more tests for executive functioning and praxis can also be included in the MoCA.

Video illustration for the MoCA: https://www.youtube.com/watch?v=XjrnsIXoSCg

For a summary of the cognitive domains that the MoCA measures, see Table 10 below.

Table 10: Cognitive domains involved in the tasks of the MoCA

COGNITIVE DOMAIN		TASK
Executive functions		Alternating numbers and letters Planning on copying the 3D cube and clock drawing Serial 7s Similarity between words Fluency (naming words beginning with the letter F)
Praxis		Copying the 3D cube and clock drawing
Gnosis		Copying the 3D cube and clock drawing Recognising the animal pictures
Language	Naming	Naming the animal pictures
	Repetition	Repeating the phrases
Verbal Memory	Working Memory	Repetition of the list of words (not scored)
		Digit repetition forwards and backwards
	Short-term Memory	Recall of the 5 words Cued recall of 5 words Orientation
Attention		Digit repetition Tap task, also called vigilance task

The Midland Cognitive Assessment (MICA) is a proposed brief assessment tool that includes tasks covering all six elements of cognition. It remains a work in progress, and feedback to the authors would be greatly appreciated. See Table 11 below for a summary of the assessed cognitive domains. The test is available on the following pages, and a printable version for bedside use can be accessed at:

franshugo.com => Health Professionals. The MICA also offers an alternative version to reduce learning effects when administered multiple times.

Table 11: Cognitive domains involved in the tasks of the MICA

COGNITIVE DOMAIN		TASK
Language	Comprehension	Language comprehension
	Spontaneous	Spoken language
	Naming	Picture naming
Verbal memory	Working	Working memory verbal trial I
	Short-term	Working memory verbal trial II
		Orientation
		Delayed recall of 10 words
		Cued recall
Visual memory	Short-term	Short-term memory visual
Gnosis		Picture naming
		Line drawing
Attention		Vigilance task
Executive		Animal naming task
		Luria alternating hand movements
		Serial order reversal task
		Design fluency
Praxis		Rotating a pen
		Line drawing

MICA (Midland Cognitive Assessment) Patient: _____ Date: _____
Handedness: _____ Age: ___ Educational Level: _____ Assessment completed by: _____

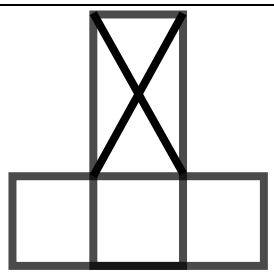
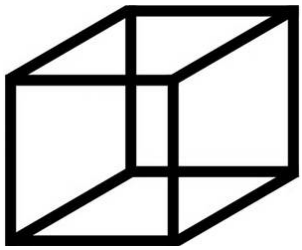
The MICA is a collection of cognitive tasks for the assessment of cognitive domains and is not intended to deliver a global cognitive score. For full instructions, see the accompanying booklet "Bedside Cognitive Assessment." Some tasks have a numerical raw score, which is converted to a clinical estimate. Other tasks require clinical judgment for scoring. Tasks are scored as: N = Normal, E = Equivocal, I = Impaired. Instructions to the patient are in **bold**.

"We are now going to do some test of your memory and thinking. Some of the tests will be easy and others difficult. Just try your best. Any questions?"

WORKING MEMORY VERBAL TRIAL 1 **"I am going to read you a list of 10-words, remember these words. Please repeat each word after I have said it, so that I can be sure that you heard it correctly. You can remember the words in any order."** CARROT BOAT LION EYE JUG CAT SOUP LEG HOUSE TICKET **"What were those words?"** N > 5, E = 4-5, I < 4.	__/10 N E I
SHORT-TERM MEMORY VERBAL TRIAL 2 Read, asking for repetition after every word. LION CARROT BOAT CAT EYE JUG HOUSE SOUP LEG TICKET **"What were those words?"** N > 6, E = 5-6, I < 5.	__/10 N E I
SHORT-TERM MEMORY VERBAL TRIAL 3 Read, asking for repetition after every word. SOUP TICKET BOAT JUG EYE CAT HOUSE LION LEG CARROT **"What were those words?" "Now remember the words because I will ask you later for them."** N > 7, E = 6-7, I < 6.	__/10 N E I

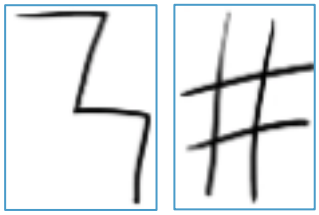
VISUOSPATIAL & PRAXIS LINE DRAWING **"Copy these drawings."** Provide a sheet of paper. Do not warn about delayed recall. Score each drawing: 3 = no mistakes, 2 = few omissions, 1 = poor, 0 = no drawing. N > 7, E = 7, I < 7

☜----------**Fold here so that the patient cannot see the above**----------☞


___/9 N E I

ATTENTION VIGILANCE TASK **"I will read you a long series of letters. Whenever you hear the letter A, tap your hand like this."** Indicate tapping movement. **A L T A A D A R S N A G A A A K P A T C A A P A L R** N = no mistakes, E = one mistake and I = > 1 mistake. A mistake is an omission or inclusion.	N E I
EXECUTIVE ANIMAL NAMING TASK: **"I will give you one minute to name as many animals as possible."** The patient can name mammals, birds, reptiles, or fish. Repetitions are not scored. Scoring: N > 14; E = 12-14; I = < 12	N E I
EXECUTIVE LURIA ALTERNATING HAND MOVEMENTS: **"Place both hands on the table as I do. Observe me because I want you to do the same. Can you see that I am making a fist with one hand? Now I swap my hands over. Can you do that as fast as you can?"** N = 3 cycles without any mistakes; E = 1-2 cycles; and I for being unable to complete the task. 	N E I
EXECUTIVE MONTHS OF THE YEAR BACKWARDS: **"Say the months of the year backwards starting with January."** Stop the person when they reach July or make 2 or more mistakes: December November October September August July. N = no errors; E = 1 error; I > 1 error	N E I
SHORT-TERM MEMORY VERBAL DATE [ ] MONTH [ ] YEAR [ ] DAY [ ] PLACE [ ] CITY [ ] Date can be +/- one day, the rest must be exact. N = > 5, E = 5, I < 5	___/6 N E I

PRAXIS ROTATING A PEN: **"Take this pen and rotate it with your fingers as fast as you can."** Test both hands. N = no errors; E = some difficulty; I = clear difficulty. 	**(R)** **N** **E** **I**	**(L)** **N** **E** **I**
SHORT-TERM MEMORY VERBAL **"What were the words I asked you to remember?"** CARROT BOAT LION EYE JUG CAT SOUP LEG HOUSE TICKET N >5, E = 5, I < 5		**__/10** **N** **E** **I**
CUED RECALL "**I will now read a list of words. Some of the words are from the list I asked you to remember, and some are new. Say yes if you recognise the word and no if it was not in the list I asked you to memorise. If you don't know the answer, just guess."** The instructions may be repeated if it is forgotten. Give a mark for each word correctly identified **(in bold** for the memory list and not bold for new words). **CARROT** ONION BUG **JUG** SHIP **BOAT LION** GOAT SPY **EYE SOUP** BUTTER BAT ARM **CAT LEG** MOUSE **TICKET HOUSE** BUCKET N > 16, E = 14-16, I < 14		**__/20** **N** **E** **I**
SHORT-TERM MEMORY VISUAL **"Earlier, you copied three pictures. Can you remember it? Can you draw it here?"** Provide a blank sheet of paper. For each drawing: 3 = no mistakes, 2 = few omissions, 1 = poor recall, 0 = a failure to recall anything. N > 5, E = 5, I < 5		**___/9** **N** **E** **I**
ANOMIA & AGNOSIA PICTURE NAMING **"Name the following pictures."** If unable, ask the patient to describe what the object is used for. This is to distinguish anomia from agnosia. Anomia is an inability to name the picture and agnosia an inability to describe the picture. N = all correct; E = 1 error, I >1 error 		**Anomia N E I** **Agnosia N E I**
EXECUTIVE DESIGN FLUENCY **"You have one minute to draw anything using four lines. The drawings must be different, and I must be able to count the lines. I will give you two examples."** Draw the following examples on a blank sheet of paper. Count the lines out loud while you are drawing the examples. **"Do you have any questions? Your minute starts now."** N > 7 drawings; E = 5-7 drawings; I < 5 drawings 		**N** **E** **I**
SPOKEN LANGUAGE Estimate spoken language ability by evaluating speech. It should be clear, fluent, and understandable. N = normal speech, E = equivocal, I definite impairment		**N** **E** **I**

SCORING SUMMARY

Cognitive Domain	Tasks	Outcome	Cognitive Domain	Tasks	Outcome
Attention & Concentration	Vigilance		Visual Short-Term Memory	Picture Recall	
Verbal Working Memory	Word List Trial 1		Language	Picture Naming	
Verbal Short-Term Memory	Word List Trial 2			Spoken Language	
	Word List Trial 3		Gnosis	Line Drawing	
	Word List Delayed Recall			Picture Recognition	
	Recognition Memory		Executive Functions	Animal Naming	
	Orientation			Luria Hand Movements	
Praxis	Line Drawing			Months Backwards	
	Rotating a Pen			Design Fluency	

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