The 'bedside' assessment of cognition is a key element of the mental state examination used in psychiatry, yet this assessment is often neglected or reduced to a few specifics such as comments on temporo-spatial orientation. The reasons are varied, but clinicians often complain of a lack of training and practical experience in this area, as well as a difficulty in understanding the findings from the perspective of their functional neuroanatomy. This module offers an overview of how to assess cognition at the bedside or in the consulting room. In it, we define and describe the various cognitive functions and their functional anatomy, giving examples of clinical manifestations of deficits in these cognitive functions.

We also describe the most reliable and widely used tests of cognition at the bedside, giving tips and instructions on how to administer them.

**History taking**

When taking the patient's history, a useful checklist to enquire about includes:

- memory
- language
- executive function and attention
- praxis
- visuospatial function
- social behaviour.

**Assessment of memory**

Data from patients with brain lesions has demonstrated that there are different forms of memory and that different areas of the brain are involved in the encoding and storage of these memories.

A good framework divides memory into two main groups:

- **implicit (procedural) memory**
- **explicit (declarative) memory** – this can be subdivided into:
  - episodic memory
  - semantic memory
  - working memory.

Persons with disorders of **episodic memory** will present with forgetfulness for recent events.
Retrograde verbal memory can be assessed by going back over a patient’s autobiographical history.

Anterograde verbal memory can be assessed at the bedside using:

- registration and recall of the three items from the MMSE;
- registration and recall of a seven-item name and address from the ACE-R.

Semantic memory is memory for facts, word meanings, and general knowledge. Deficits can be apparent from the history in ‘empty speech’ with circumlocutions. Here, speech content is diminished and words are replaced with generics such as ‘things’.

Bedside assessment of semantic memory can be undertaken with:

- verbal fluency
- naming of line drawings
- tests of verbal knowledge
- reading of regular and irregular words.

Working memory (WM) holds and handles information for very short periods of time. Patients with WM deficits will present with attentional lapses and difficulties with concentration, and with difficulties in registering information or repeating instructions back. At the bedside this can be tested by forward and backward digit spans.

Assessment of language

The assessment of language functions needs to be systematic and will encompass:

- spontaneous speech/fluency
- comprehension
- repetition
- naming
- reading
- writing.

Fluency is the ability to produce language effortlessly or not, regardless of the actual content. It can be tested by conversing with the patient or by asking them to describe a recent event, a holiday, or an object.

Testing of comprehension is best approached in a graded manner, starting with simple instructions or questions and finishing with complex ones.

Repetition should also be tested in a graded manner. The patient should repeat the words or sentences exactly as said by the examiner.
Naming is tested by asking the patient to name particular objects. Inability to name an object does not necessarily mean that the problem is with language. It may be due to:

- visual agnosia
- semantic deficit
- nominal aphasia.

Reading skills may be influenced by educational background and by undiagnosed learning difficulties. It is best to start with a general screening task such as reading aloud and acting upon a command, for example 'close your eyes' from the MMSE. If problems are detected, a more in-depth assessment will be needed.

Writing skills - agraphias are acquired disturbances of writing caused by a disorder of language or by impairment of the motor aspects of writing.

To assess writing skills, test:

- writing on dictation of letters, words, and sentences;
- spontaneous writing;
- that the patient can read what they have written.

Assessment of visuospatial functions

Visuospatial functions allow us to know where we and other people and objects are in space, and what and who these objects and people are. Both positive and negative visual phenomena may occur.

- Positive abnormalities would be phenomena such as visual hallucinations, visual illusions and distortions, or palinopsia (the persistence of an image after the stimulus has ceased).

- Specific negative phenomena include:

  - visual (spatial) neglect: a deficit of attention where the subject is unable to look or search to the contra-lateral side to the lesion, sometimes despite having full visual fields;

  - prosopagnosia: inability to recognise familiar faces, although other characteristics of the person such as their voice, way of walking, etc, may be recognised.

Patients with visuospatial dysfunction may complain of:

- bumping into things;
- minor car accidents e.g. parking;
- difficulty in finding their way around;
- getting lost in familiar places;
- difficulty in tasks such as setting a table.
Test for visuospatial dysfunction by asking patients to copy drawings or shapes graded according to their complexity. In addition, the Clock Drawing Test is a useful measure of visuoconstructional ability as well as of executive skills.

**Assessment of attention**

**Attention** refers to the ability to focus selectively on a selected stimulus, sustaining that focus and shifting it at will. There are three main functional attentional networks:

- the arousal and alerting network
- the orienting network
- the selective attention network.

Attention can be tested at the bedside with the **serials 7’s** or **‘world’ backwards** of the MMSE. Alternatives may be used for those with poorer attention such as **months of the year backwards**, **days of the week backwards** or **serials 2’s from 20**. It could also be argued that digit span is a measure of attention.

**Unilateral neglect** refers to the inability to orientate to, perceive, respond to or report stimuli occurring in the side contralateral to the lesion, despite preserved sensorimotor functions. Sensory neglect exists as well as the more common visual neglect which differs to a visual field defect in that the problem is one of looking to the contralateral side rather than seeing.

**Assessment of executive function**

**Executive functions** are described in this module as those higher order cognitive capabilities that are called upon to formulate new plans of action and to select, schedule, and monitor appropriate sequences of action. Patients with executive dysfunction will present with impairment of their ability to carry out these tasks, and to organise themselves effectively to navigate through life. Many models of executive functions and their relationship to the frontal lobes have been proposed.

Assessment of executive function involves the testing of:

- verbal fluency
- cognitive estimation
- information (memory) retrieval
- abstract thinking and reasoning
- response inhibition
- motor sequencing and programming.

**Assessment of emotional and social behaviour**

The neural basis of emotions and social behaviour is linked to the limbic system. Its field of influence includes:

- emotion recognition
- empathy
- decision making
- theory of mind.

**Theory of mind** refers to our ability to understand the mental states of others and to use this understanding of their beliefs, desires, etc. to make sense of their behaviour. This ability develops during normal childhood.

Bedside tests of emotion recognition, empathy, and decision making have not been well described and their assessment is by either standardised formal neuropsychological evaluation or by clinical history or observation. Theory of mind can be tested using the 'Maxi task'.

**Assessment of praxis**

The different dimensions of praxis that require attention are:

- ideomotor praxis
- ideational praxis
- orobuccal praxis.

**Ideomotor praxis** is tested by asking the patient to imitate gestures made by the examiner (both meaningful and not), perform gestures on command, and mimic the use of objects.

**Ideational praxis** refers to the ability to demonstrate, by pantomiming, a complex task with multiple steps, for example, the classical task of placing a letter in an envelope, sealing it, addressing it, stamping it, and posting it. Ideational praxis occurs with diffuse brain dysfunction.

**Orobuccal praxis** allows for the ability to make movements with the lips, mouth, tongue, etc. The presence of orobuccal dyspraxia is tested by asking the person to carry out specific movements on command.

**Assessment of calculation**

This cognitive function is highly susceptible to the person’s previous arithmetic ability, which will have to be taken into consideration in order to interpret the findings.

To test calculation, ask the patient to perform mental arithmetics such as subtractions, additions, multiplications or divisions.

**Acalculia** occurs when a patient is unable to read, write, and/or comprehend numbers, and also to perform calculations (anarithmetria). It can be checked by asking the patient to write numbers from dictation, to read numbers aloud, and to copy numbers.

**Visuospatial neglect** may cause inability to read numbers with multiple digits or to perform arithmetic tests on paper due to the inability to align digits.

**The Mini Mental State Examination (MMSE)**

The MMSE is most widely used scale to screen for cognitive impairment and to rate for severity of deficits. It is a brief rating scale that takes around 10-12 minutes to administer, and includes simple questions and problems in a number of areas:

- the time and place of the test
• repeating lists of words
• arithmetic
• language use and comprehension
• copying a drawing.

The test assesses orientation, memory, language, and visuospatial function and is scored out of 30 points. Like any brief measure, it carries both advantages and disadvantages.

Addenbrooke's Cognitive Examination (ACE-R)

The ACE-R is a more comprehensive screening measure that also incorporates the MMSE and expands upon it.

References


Extended cognition theorists argue that cognitive processes constitutively depend on resources that are neither organically composed, nor located inside the bodily boundaries of the agent, provided certain conditions on the integration of those processes into the agent's cognitive architecture are met. Methods: Two hundred three HIV+ individuals completed the Montreal Cognitive Assessment, computerized cognitive tasks and a questionnaire eliciting cognitive symptoms. Rasch measurement theory was applied to determine whether patient-reported and performance items could be combined to measure cognition as a unidimensional latent construct. Please type a message to the paper's authors to explain your need for the paper. Paper: Quantifying cognition at the bedside: a novel approach combining cognitive symptoms and signs in HIV. To: Marie-Josée Brouillette, Lesley K Fellows, Lisa Palladini, Lois Finch, Réjean Thomas, Nancy E Mayo. From (Name)