Higher Cortical Functions
Bedside Examination

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Cognitive domains

- Memory
- Language
- Visuospatial
- Praxia
- Executive functions
Neurocognitive domains

Perceptual–motor function
- Visual perception
- Visuoconstructual reasoning
- Perceptual–motor coordination

Language
- Object naming
- Word finding
- Fluency
- Grammar and syntax
- Receptive language

Executive function
- Planning
- Decision-making
- Working memory
- Responding to feedback
- Inhibition
- Flexibility

Learning and memory
- Free recall
- Cued recall
- Recognition memory
- Semantic and autobiographical
- Long-term memory
- Implicit learning

Complex attention
- Sustained attention
- Divided attention
- Selective attention
- Processing speed

Social cognition
- Recognition of emotions
- Theory of mind
- Insight
Cognitive test

- Domain specific cognitive test
- Overall cognitive test
Overall cognitive tests

- Mini-mental state examination (MMSE)
- Montreal cognitive assessment (MoCA)
- Saint Louis university mental status (SLUMS)
- Alzheimer’s disease assessment scale (ADAS)
- The Addenbrooke’s cognitive examination (ACE)
- Cambridge cognitive examination (CAMCOG)
Specific domain cognitive tests

- Memory: delayed recall, digit span
- Language: naming test, category fluency, similarity
- Visuo-perceptual: cancellation test, line bisection, face recognition
- Attention: digit span, serial 7 subtraction, stope color
- Executive function: Trail making, clock drawing, proverb explanation, tower of London
- Frontal inhibition: Luria's three-step test, go-no-go, copy alternate sequence
Memory

Long term

Explicit
  - Episodic
  - Semantic

Implicit
  - Motor skill
  - Priming

Short term

Working memory

Other short term memories???
Working memory

- Limited capacity
- Temporarily holding information available for processing
- Attention and rehearsal enhance the memory
Working memory assessment

- Digit span forward and backward
- Delay recall
Episodic memory

- Memory about space and time and what has happened
- Awareness and emotion enhance the memory
- Recognize the details of what has happened
Episodic memory assessment

- Recent events with time or place tag (when, where, what)
- Delay recall
- Head turning signs
- Momentary confabulation
Semantic memory

- Memory of general knowledge and personal information (autobiography)
- Learning and repeated exposure enhance the memory
- Retrieved when stimulated or internal thought
Semantic memory assessments

- Naming and semantic knowledge
  - objects, pictures, famous faces
- Category fluency (animals, fruit)
- General knowledge
- Personal knowledge
Procedural memory

- Memory about knowing to do things, motor skills
- Learning and practicing enhance the memory
Priming

• Memory of effect in which exposure to one stimulus influences the response to another stimulus
Priming

Word fragment
อาหาร
ข้ามไว
มัม

Word stem
เครื่องแต่งกาย
เสื้อกางเกง

Picture fragment
Classic condition

- Palovian
- Amygdala

Sensory input → Past experience → Autonomic psychological response
Language
Lichtheim’s diagram

- Concept center
- Semantic knowledge
- Broca’s area
- Wernike’s area
- Non-fluent aphasia
- Fluent aphasia
Language assessment

Naming

Verbal fluency: Alphabet, category

Comprehension: 3-step command, yes-no questions

Repetition

Reading and writing
Assess speech disorders

Fluency

Impaired

Non-fluent aphasia

Good

Fluent aphasia

Comprehension

No

Yes

Repetition

No

Yes

No

Yes

No

Yes

Global aphasia

Transcortical global aphasia

Broca's aphasia

Transcortical motor aphasia

Transcortical Sensory aphasia

Wernicke's aphasia

Conduction aphasia

Naming aphasia

Agrammatism

Paraphasia

Not recognized error

Recognized error
Praxis
Apraxia

- Disorder of skill to execute tasks
- Not caused by weakness, abnormal tone, movement disorders, akinesia, intellectual disorders
- Usually involving dominant hemisphere frontal and parietal area
Limb-kinetic apraxia

- Inability to handle tools for the purpose intended
- Anatomy
  - Supplementary motor area
  - Basal ganglia
Assess apraxia with tool

1. Give patient a tool
2. Let the patient show how to use it

If cannot hold or manipulate properly:
- Limb-kinetic

If can hold the tool properly:
- Ideational
- Conceptual

Wrong sequence or Use the tool wrong way
Ideomotor apraxia

- Impair of sensori-motor programs that generate motor control
- Timing and spatial organization of action
- Anatomy
  - Left parietal
Assess apraxia without tool

**Transitive**
- Perform imaginary activities such as combing, ironing, hammering
- Ideomotor apraxia

**Intransitive**
- Command
- Perform example
  - Meaningful gesture
  - Meaningless gesture
- Conduction apraxia
- Visuoimitation apraxia
Ideational apraxia

Sequence error

- Cannot perform purposeful task in order
  - Error preparing cups of coffee

Conceptual error

- Error of single action task
- Demonstrate inappropriate use of tools
  - Brushing teeth with spoon

Anatomy

- Left temporal
Assess apraxia with tool

- Give patient a tool
- Let the patient perform task
- Cannot hold or manipulate properly
  - Limb-kinetic
  - Wrong sequence
    - Sequence error
  - Can hold the tool properly
    - Use the tool wrong way
    - Conceptual
Type of apraxia

- Limb-kinetic (supplementary motor, basal ganglia) motor
- Ideomotor (left parietal) spatial
- Ideational (left temporal) semantic
Specific apraxia

- Construction
- Dressing
- Speech
- Gait
- Gaze
Visuospatial
Visuos-perceptual ability

- Ability to interpret visual and spatial information about objects and space
<table>
<thead>
<tr>
<th>Task</th>
<th>Apperceptive</th>
<th>Associative</th>
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<tbody>
<tr>
<td>Object description</td>
<td>Affected</td>
<td>Spared</td>
</tr>
<tr>
<td>Visual identification</td>
<td>Affected</td>
<td>Affected</td>
</tr>
<tr>
<td>Copying drawing</td>
<td>Affected</td>
<td>Spared</td>
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<tr>
<td>Object matching</td>
<td>Affected</td>
<td>Spared</td>
</tr>
<tr>
<td>Object knowledge</td>
<td>Spared</td>
<td>Affected</td>
</tr>
<tr>
<td>Tactile naming</td>
<td>Spared</td>
<td>Affected</td>
</tr>
</tbody>
</table>
Alternate hand movement
# Visuos-perceptual assessment

## Object recognition
- Description of presented objects
- Matching objects
- Copy drawing objects
- Verbal knowledge of objects
- Tactile naming

## Face recognition
- Famous face naming
- Face matching
- Face description
Attention
Attention and Awareness

Attention

Awareness

Orientation

Wakefulness
Attention assessments

- Digit span
- Day of the week
- Month of the year
- Serial 7 subtraction
- Stoop color

<table>
<thead>
<tr>
<th>Digits forwards</th>
<th>Digits backwards</th>
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<td>1—9</td>
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<td>4—8—1</td>
<td>2—8—3</td>
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<td>3—8—2—9—5—1—7—4</td>
<td>4—7—3—9—1—2—8</td>
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</tbody>
</table>

Forward score | — |
Backward score | — |
Attention assessments

• Digit span
• Day of the week
• Month of the year
• Serial 7 subtraction
• Stoop color
## Orientation assessments

<table>
<thead>
<tr>
<th>Time</th>
<th>Day of week</th>
<th>Place</th>
<th>Building</th>
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</thead>
<tbody>
<tr>
<td>Date</td>
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<tr>
<td>Season</td>
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<tr>
<td>Year</td>
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<td>Country</td>
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</tbody>
</table>
Social cognition
Behavioural symptoms
Frontal lobe syndrome

Medial frontal
Apathy

Dorsolateral frontal
Dysexecutive

Inferior frontal
Disinhibition
Inhibition

- Luria’s three-step test
- Alternate hands movement
- Go-No-GO
- Copy alternate sequence
Frontal lobe releasing signs

- Grasping reflex
- Palmomental reflex
- Glabella tap
- Snouting reflex
- Rooting reflex