Neurobehavioral Evaluation I

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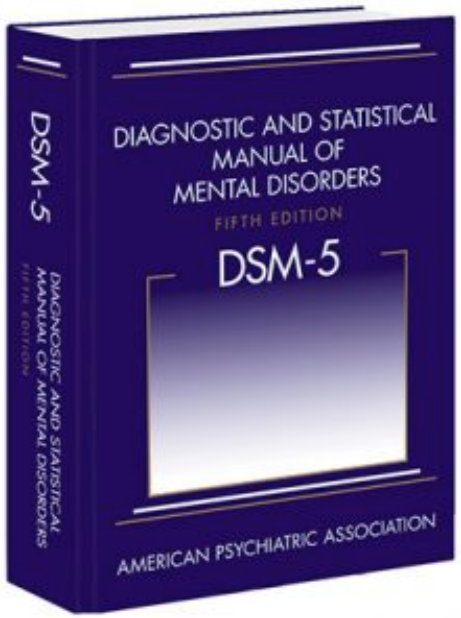
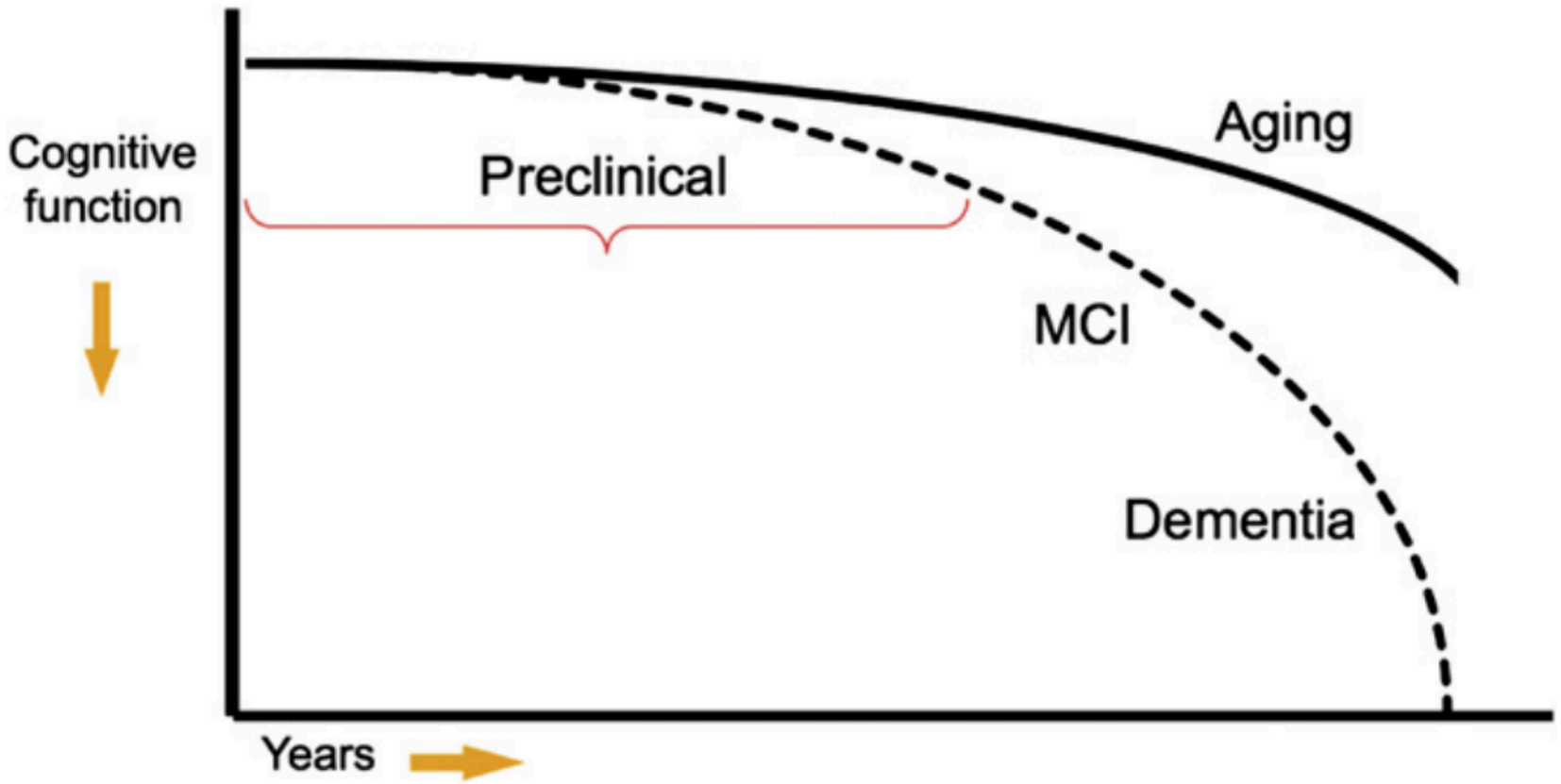
Neurobehavioral evaluation

- How to evaluate all neurobehavioral domains (history and cognitive testing)
  - Attention
  - Perceptual-motor function
  - Language
  - Learning and memory
  - Executive function
  - Social cognitive



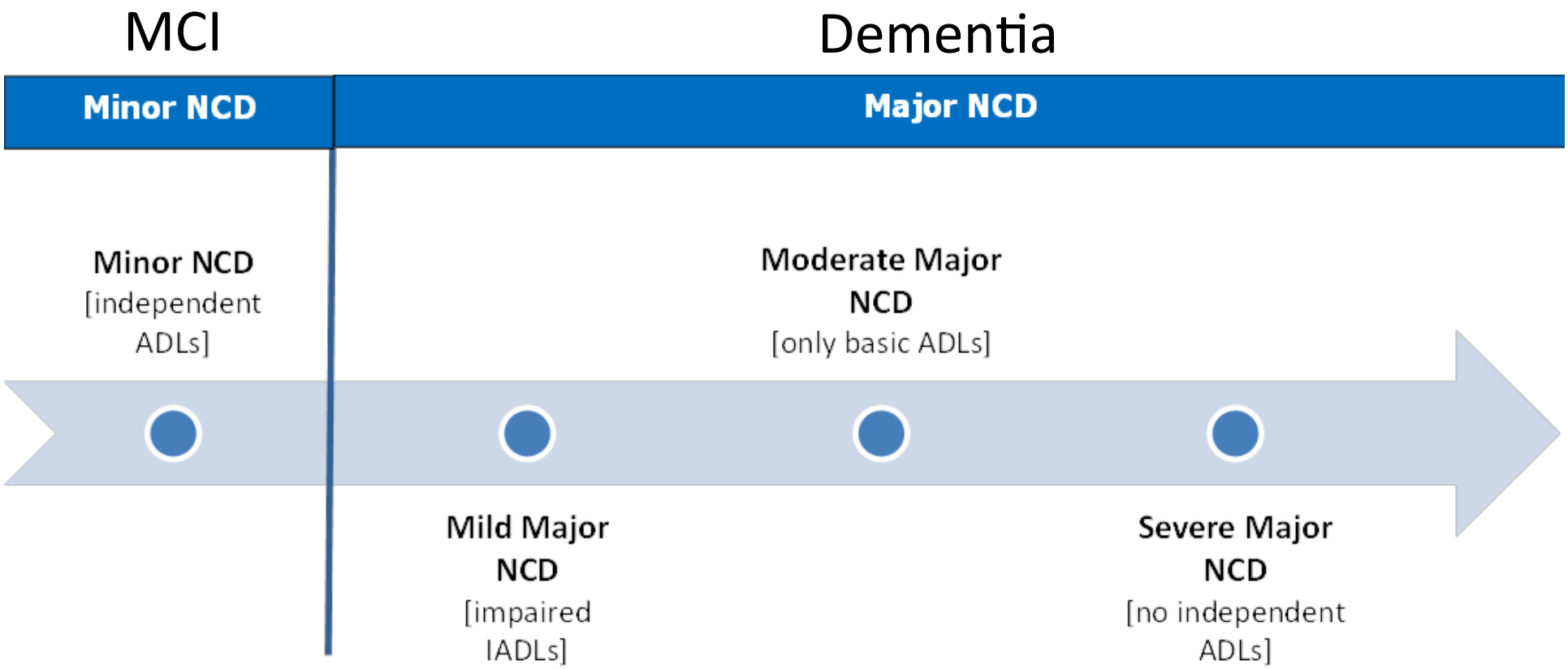
The continuum of dementia



MCI = Mild cognitive impairment

Adapt from Sperling RA et al. Alzheimers Dement 2011;7(3):280-92.

Normal aging vs Mild cognitive impairment vs Dementia



NCD = Neurocognitive disorders

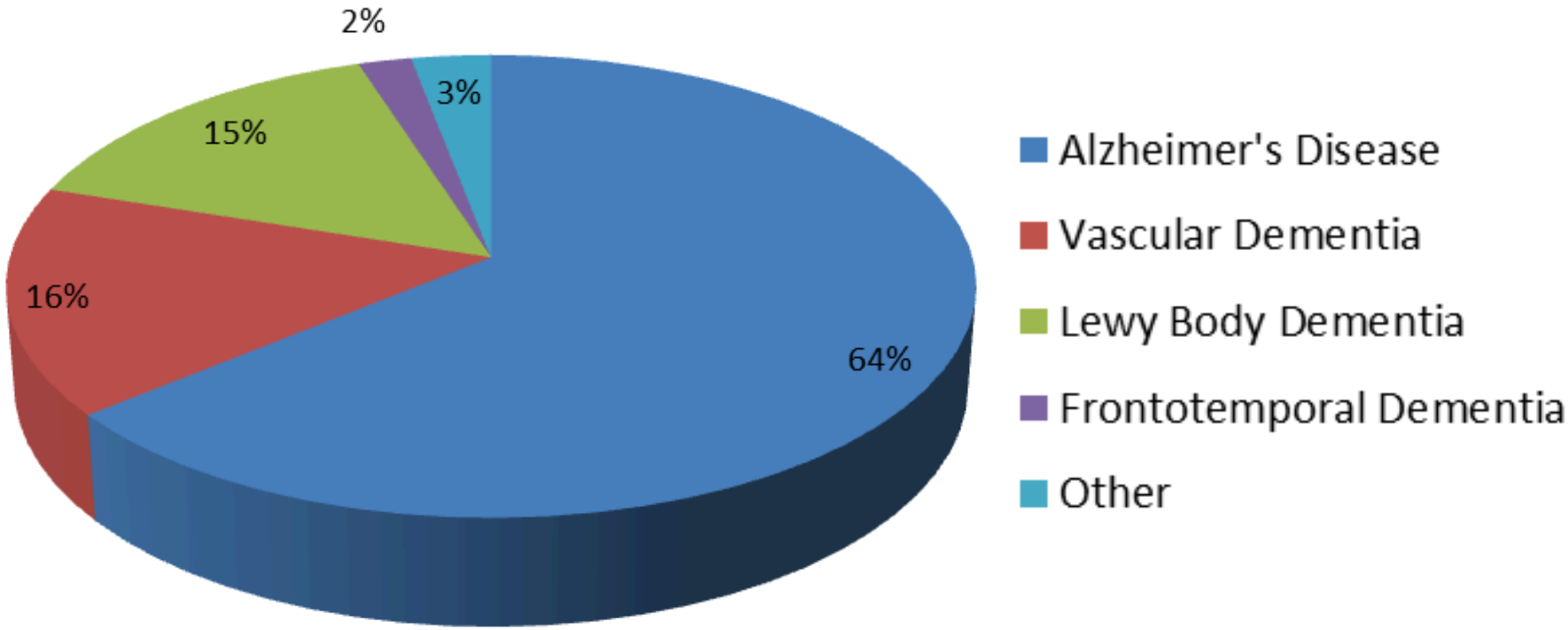
http://seniorsfirstbc.ca/for-professionals/dementia/

Severity/staging of Dementia

- **Mild**
  - Difficulties with complex instrumental ADLs
  - Depression,…
- **Moderate**
  - Difficulties with iADLs, may need some assistance with basic ADL
  - Mild behavioural and psychological symptoms (BPSD)
- **Severe**
  - Difficulties with basic ADLs (need considerable assistance)
  - Severe behavioural and psychological symptoms (BPSD)
- **Terminal**
  - bed bound, require constant care

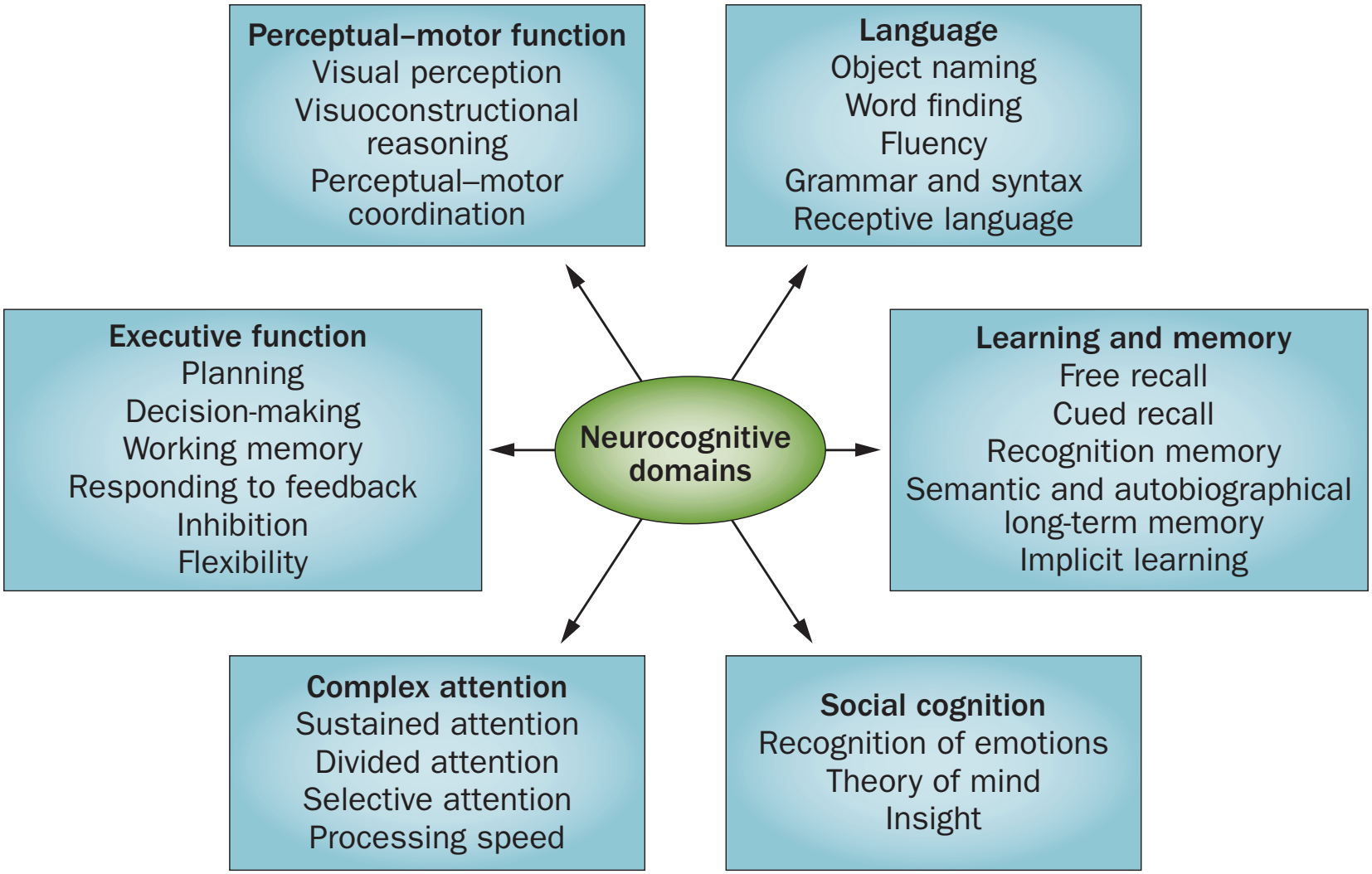
กิจวัตรประจำวัน (ADL) (++)
• ความสามารถในการทำกิจวัตรประจำวันชั้นสูง (Instrumental activities of daily livings) เช่น การซักผ้า การปรุงอาหาร การล้างจาน การใช้โทรศัพท์ การจ่ายตลาด สื่อสาร การบริหารเงิน การบริหารยา เป็นต้น
• ความสามารถในการทำกิจวัตรประจำวันขั้นพื้นฐาน (Basic activities of daily livings) เช่น การลุกจากเตียง การขับถ่าย การใช้ห้องน้ำ การอาบน้ำ การล้างหน้า การแต่งตัว การแปรงฟัน การขึ้นลงบันได การรับประทานอาหาร เป็นต้น

Types of Dementia by Percentage

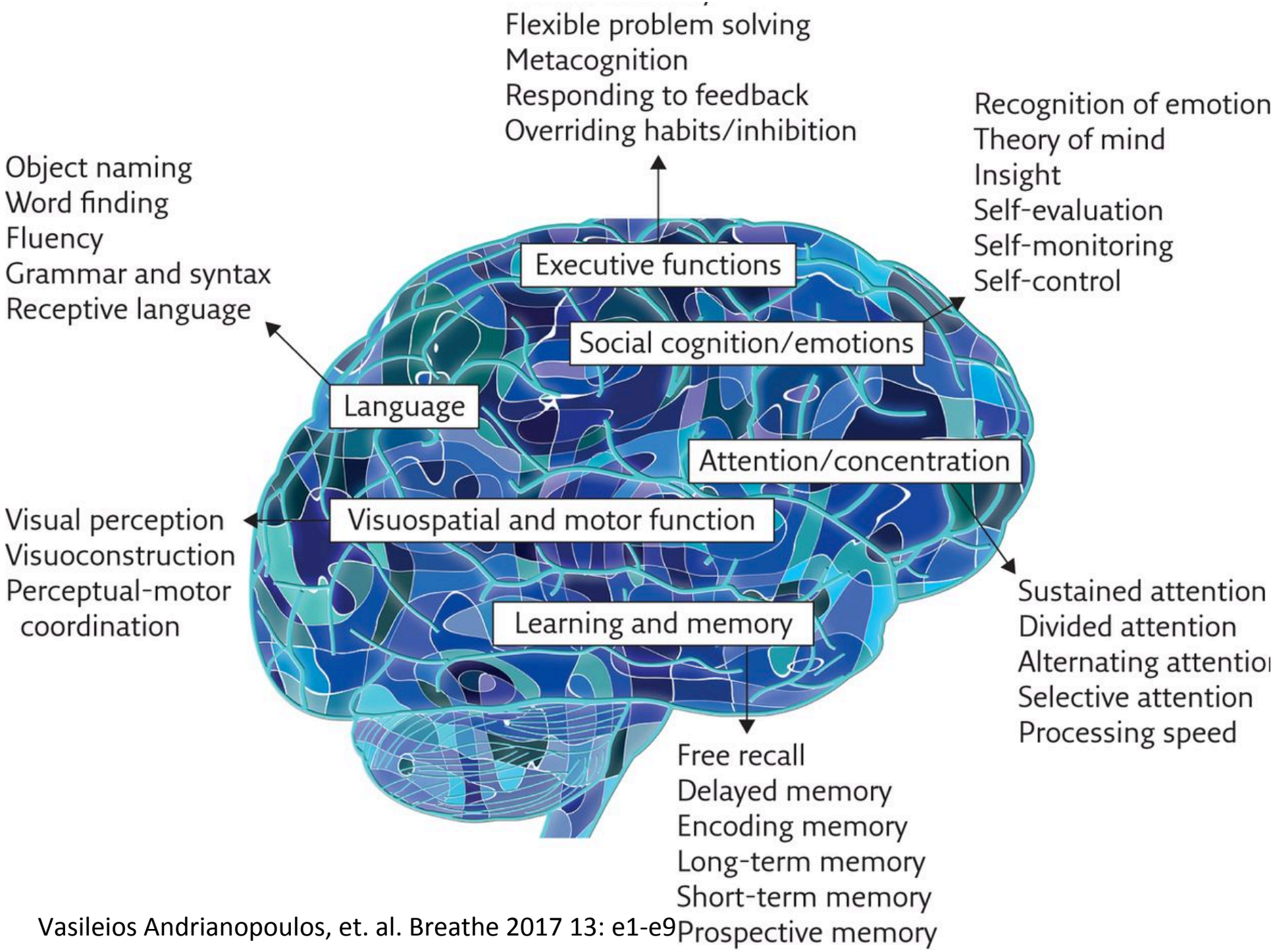


http://seniorsfirstbc.ca/for-professionals/dementia/

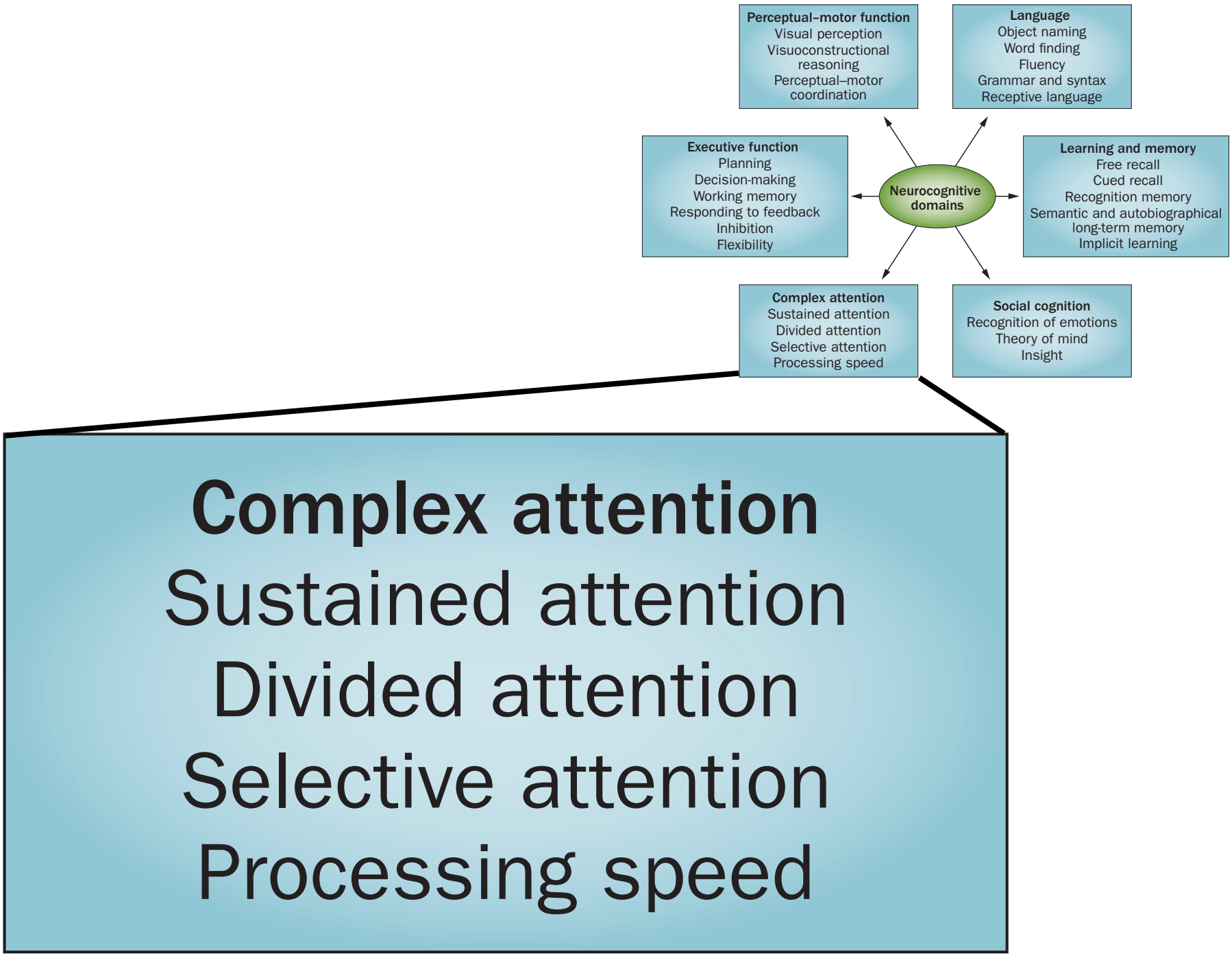
DSM 5 neurocognitive domains



Sachdev, P. S. et al. Nat. Rev. Neurol. 10, 634–642 (2014)



Vasileios Andrianopoulos, et. al. Breathe 2017 13: e1-e9


Perceptual–motor function
Visual perception
Visuoconstructional 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
Neurocognitive domains
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
Complex attention
Sustained attention
Divided attention
Selective attention
Processing speed

Focused attention:

Pay close attention to a particular stimulus - auditory, visual or tactile.

Sustained attention (vigilance):

Maintaining focus over time.

Selective attention:

Choosing to focus on one stimulus over another, free of distractability.

Alternating attention:

Flexibility to shift attention from one task to another with relative ease.

Divided attention:

The ability to respond simultaneously to multiple tasks.

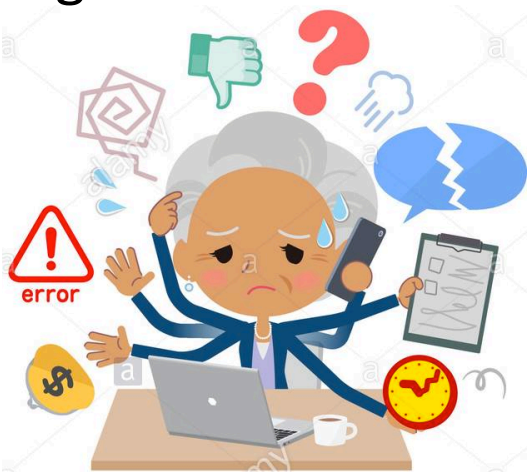
http://vaslearningcentre.com/addadhd/addadhd.html

Complex attention - symptoms

- Mild
  - Take longer to do normal tasks.
  - Begins to find errors in routine tasks; finds work needs more double-checking.
  - Thinking is easier when not competing with other things (radio, TV, other conversations, cell phone, driving).

Complex attention - symptoms

- Major:
  - Increased difficulty in environments with multiple stimuli (TV, radio, conversation)
  - Is easily distracted by competing events in the environment
  - Components to be processed must be simplified to one or a few
  - Has difficulty holding new information in mind
    - recalling phone numbers or addresses just given
    - reporting what was just said
  - Unable to perform mental calculation
  - All thinking takes longer than usual



Complex attention - Assessment

- Sustained attention: maintenance attention over time
  - Count numbers/date backward

3. **ATTENTION** (5 คะแนน) TMSE

ให้บอกวันอาทิตย์ - วันเสาร์ ย้อนหลัง ให้ครบสัปดาห์

☐ (1) ศุกร์ ☐ (1) พฤหัสบดี ☐ (1) พุธ ☐ (1) อังคาร ☐ (1) จันทร์

เริ่มจาก 100 ลบไปเรื่อยๆทีละ 7 [ ] 93 [ ] 86 [ ] 79 [ ] 72 [ ] 65

ลบถูก 4 หรือ 5 ตัว ได้ 3 คะแนน , 2 หรือ 3 ตัว ได้ 2 คะแนน , 1 ตัวได้ 1 คะแนน , 0 ตัว ไม่ได้คะแนน

  - digit span

อ่านตัวเลขต่อไปนี้ตามลำดับ (1 ตัว/วินาที) ให้ผู้ทดสอบทวนซ้ำตามลำดับ [ ] 2 1 8 5 4 MoCA

ผู้ทดสอบทวนซ้ำแบบย้อนลำดับ [ ] 7 4 2

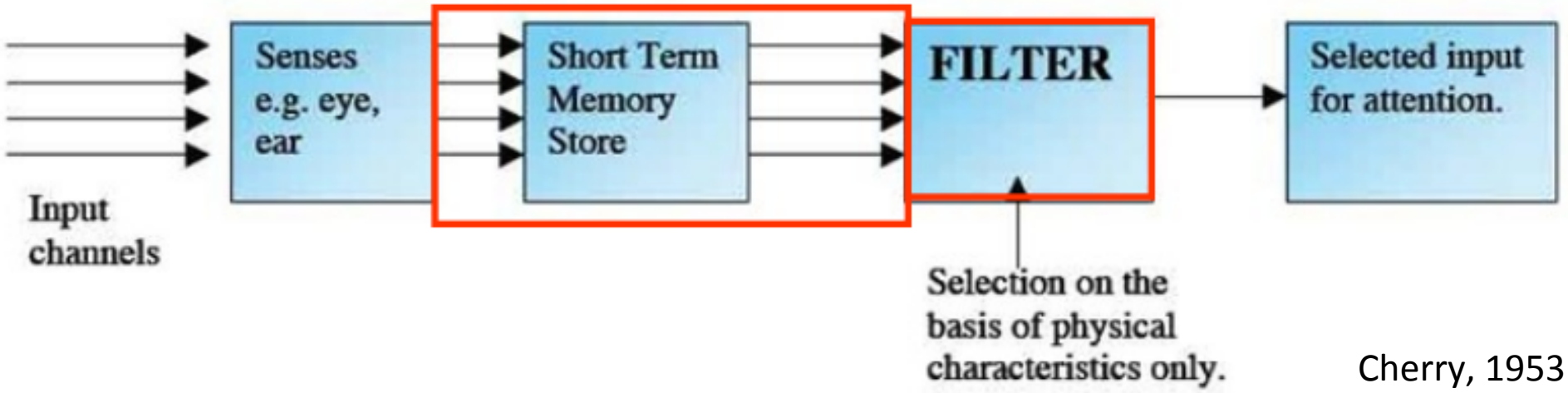
  - Pressing a button every time a tone is heard, and over a period of time (vigilance)

อ่านออกเสียงตัวเลขต่อไปนี้ แล้วให้ผู้ทดสอบเคาะโต๊ะเมื่อได้ยินเสียงอ่านเลข " 1 " (ไม่มีคะแนนถ้าผิดเกิน 2 ครั้ง) MoCA

[ ] 5 2 1 3 9 4 1 1 8 0 6 2 1 5 1 9 4 5 1 1 1 4 1 9 0 5 1 1 2

Complex attention - Assessment

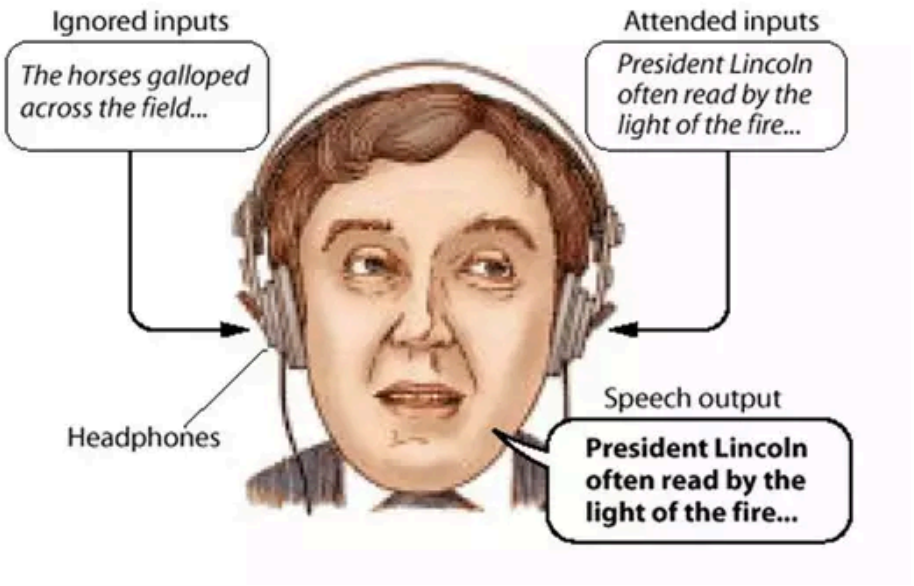
- Selective attention: maintenance of attention despite competing stimuli or distractors



Cherry, 1953

Complex attention - Assessment

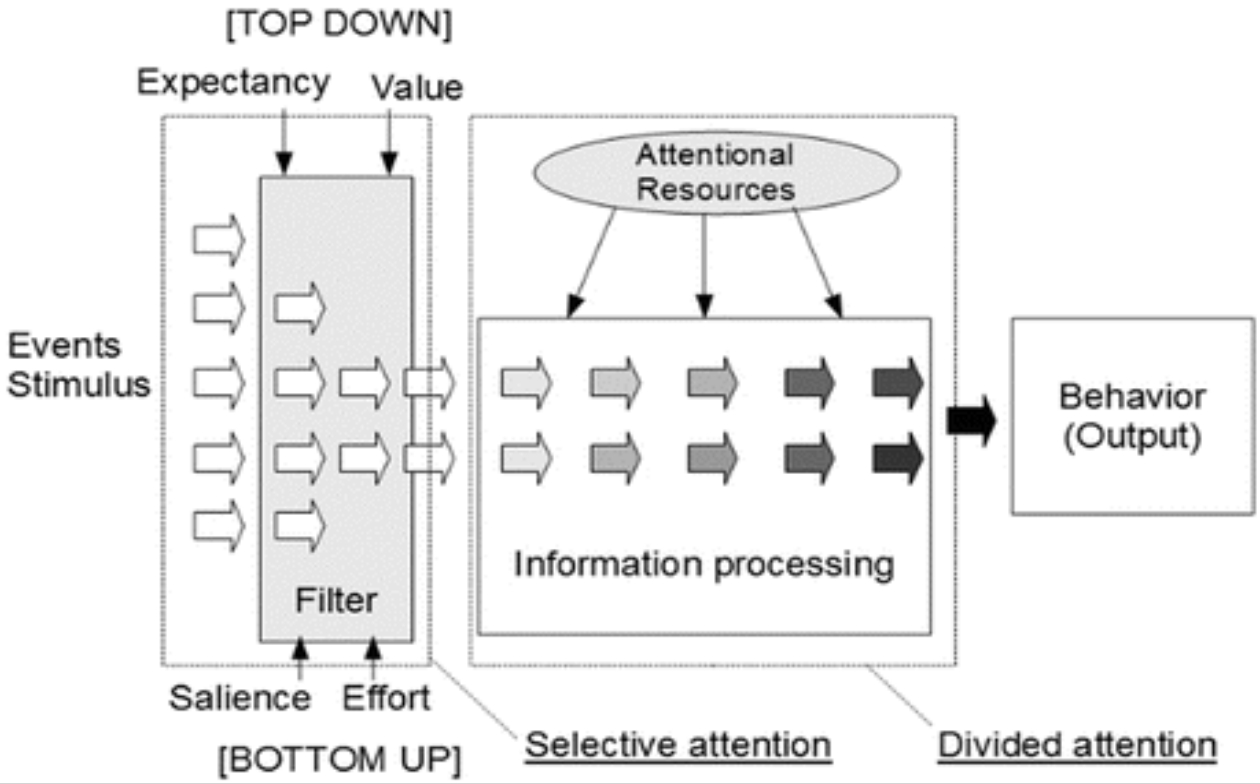
- Selective attention
  - Hearing numbers and letters read and asked to count only numbers
  - Stroop test: call colour, don't read the words



PURPLE YELLOW RED
BLACK RED GREEN
RED YELLOW ORANGE
BLUE PURPLE BLACK
RED GREEN ORANGE

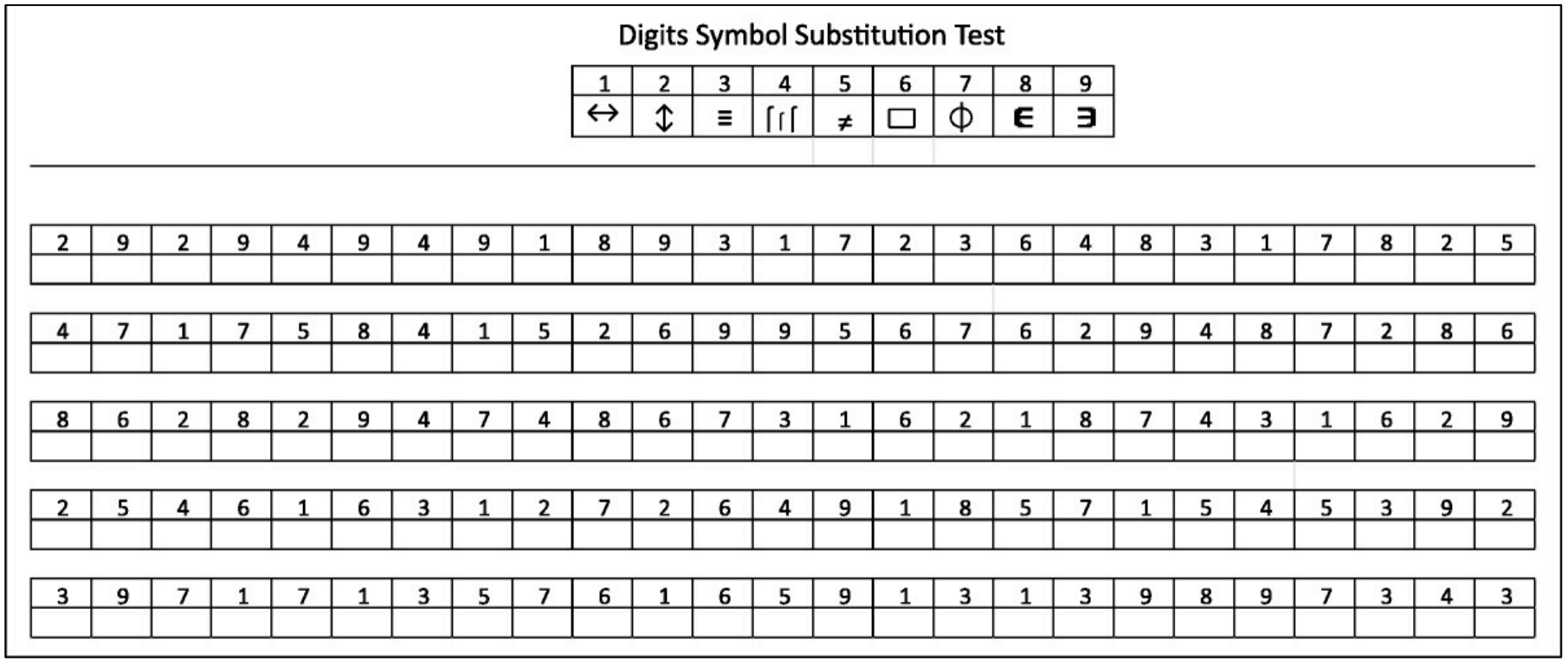
Complex attention - Assessment

- Divided attention – multitasking consciously
  - Rapidly tapping while learning a story being read



Complex attention - Assessment

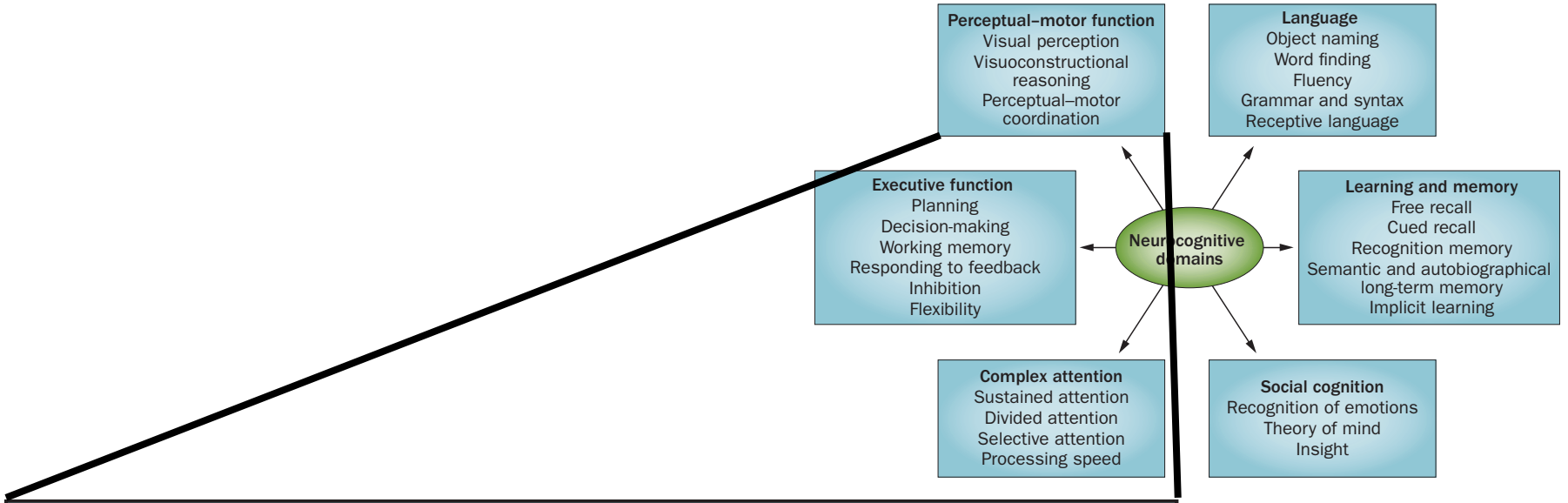
- Processing speed
  - Time to put together a design of blocks
  - Speed in responding, such as counting speed or serial 3 speed
  - Time to match symbols with numbers



Disorders presented with Attention dysfunction

Frontal subcortical circuit

- Delirium
- Vascular dementia
- Dementia with Lewy bodies
- Atypical parkinsonian disorders: PSP, CBS, Huntington,…
- Frontotemporal dementia
- Prion disease
- Normal pressure hydrocephalus
- Mood disorder
- Obstructive sleep apnea
- Other structural causes



Perceptual–motor function

Visual perception

Visuoconstructional reasoning

Perceptual–motor coordination

Gnosis

Praxis

Perceptual-motor function

- Perception = process of taking in, organizing, and interpreting sensory information
- Motor skills = ability to control the body's movements

- Perceptual-motor function = ability to interact with environment by combining the use of the senses and motor skills

Apraxia vs Agnosia

- Agnosia = inability to recognize objects by use of the senses
  - Visual agnosia = visual perception impairment (inability to recognize or interpret visual information without visual loss
- Apraxia = inability to perform coordinated movements or manipulate objects in the absence of motor or sensory impairment

Perceptual-motor function - symptoms

Mild:

Visual perception

- Need to rely more on maps or others for directions.
- Uses notes and follows others to get to a new place.
- Self lost or turned around when not concentrating on task.
- Less precise in parking.

- Needs to expend greater effort for spatial tasks such as carpentry, assembly, sewing or knitting

Praxis

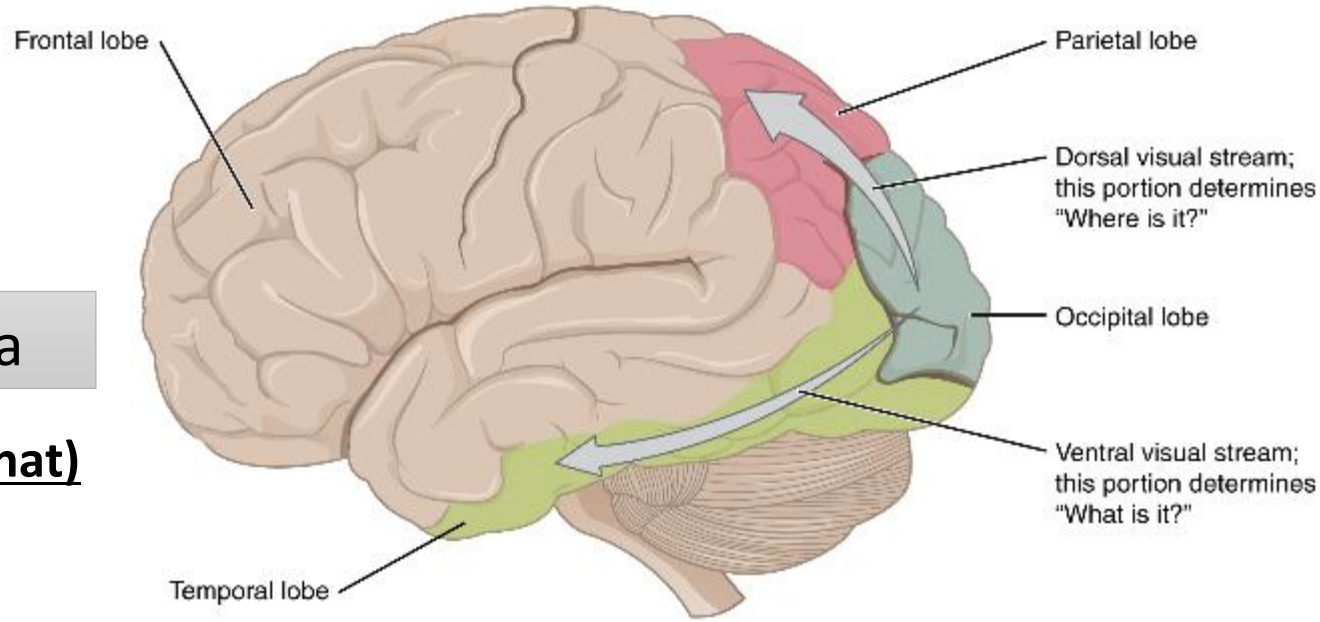
Perceptual-motor function - symptoms

- Major:
  - Significant difficulties with previously familiar activities (using tools, driving motor vehicle)
  - Difficulties with navigating in familiar environments (more confused at dusk / lowering levels of light change perceptions)

Visual perception

Apperceptive agnosia

Spatial processing (where)
Dorsal stream
Location
Movement
Spatial transformations/relations



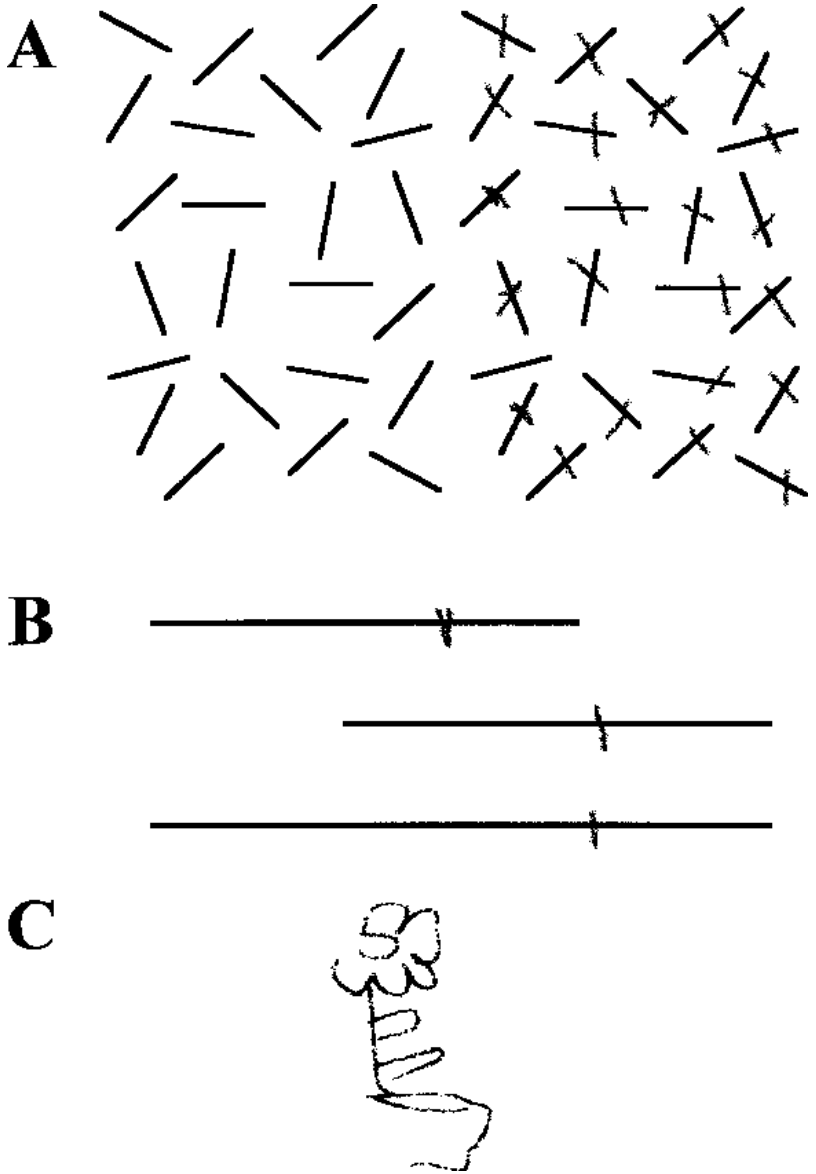
Associative agnosia

Object processing (what)
Ventral stream
Colour
Texture
Shape, size
Picture detail

Perceptual-motor - Assessments

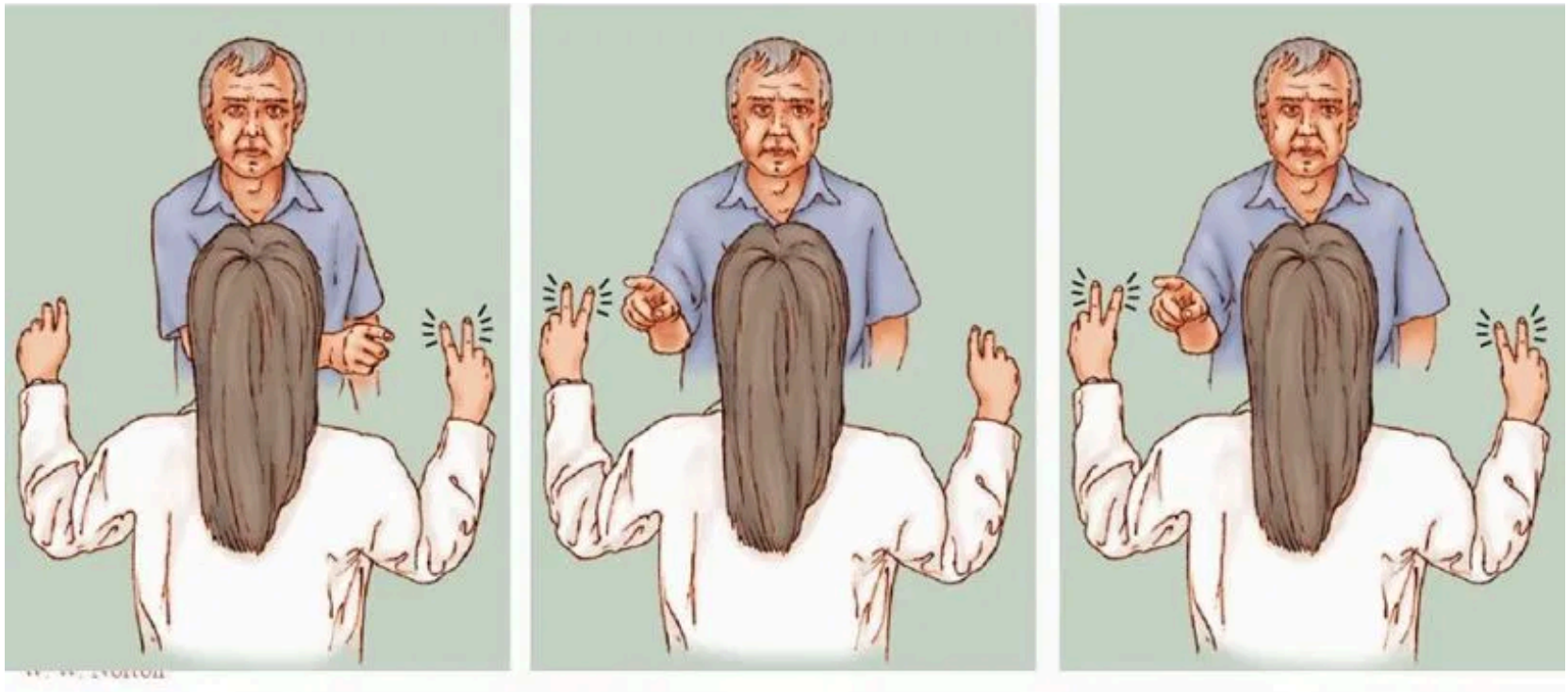
- Visual perception
  - line bisection tasks

Attentional neglect



Perceptual-motor - Assessments

- Visual perception
  - Bimanual stimulation



visual extinction

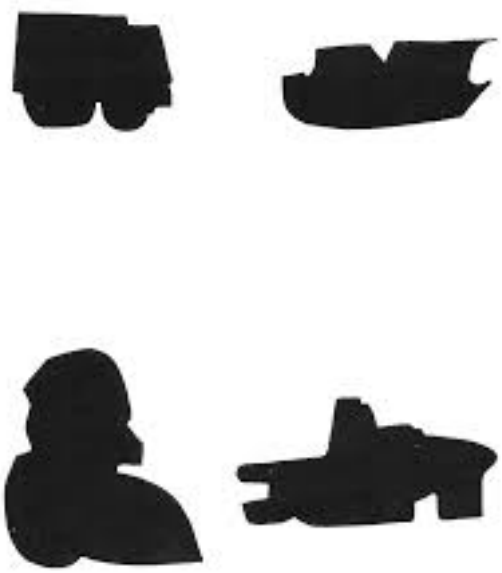
Perceptual-motor - Assessments

- Visual perception
  - Motor-free perceptual tasks
    - Facial recognition

Perceptual-motor - Assessments

- Visual perception
  - Motor-free perceptual tasks
    - Identification and/or matching of figures

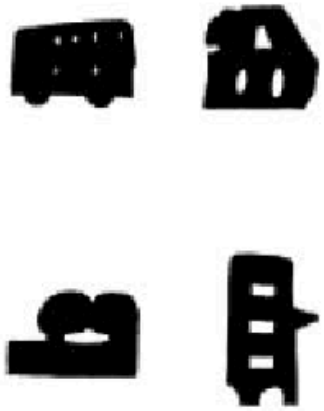
      eg. “real” or not based on dimensionality



Visual Object and Space Perception Battery (VOSP)

Object perception (Ventral)

Incomplete letters

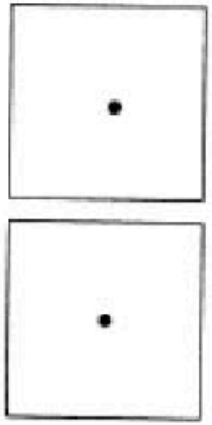


Object decision

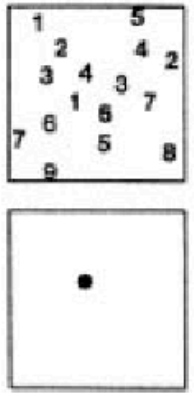
Silhouette

Progressive Silhouette

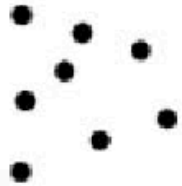
Space perception (Dorsal)



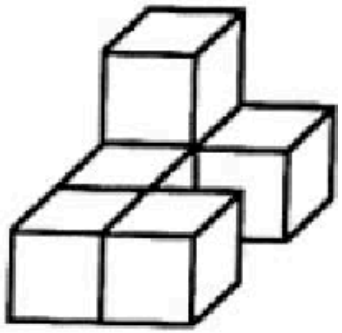
Position discrimination



Number location



Dot counting

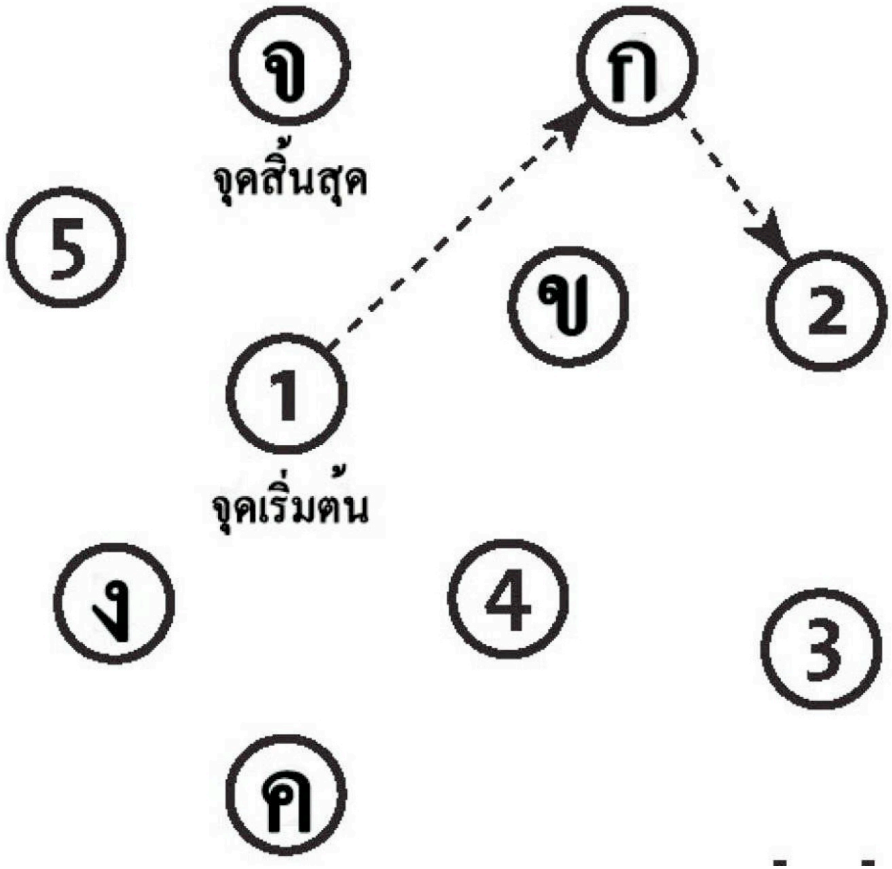


Cube analysis

Perceptual-motor - Assessments

- Visual perception

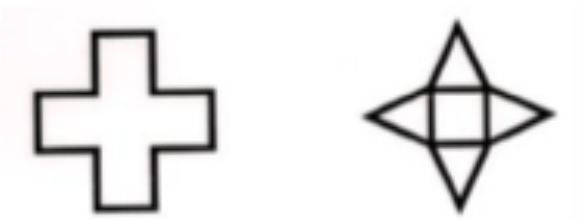
MoCA



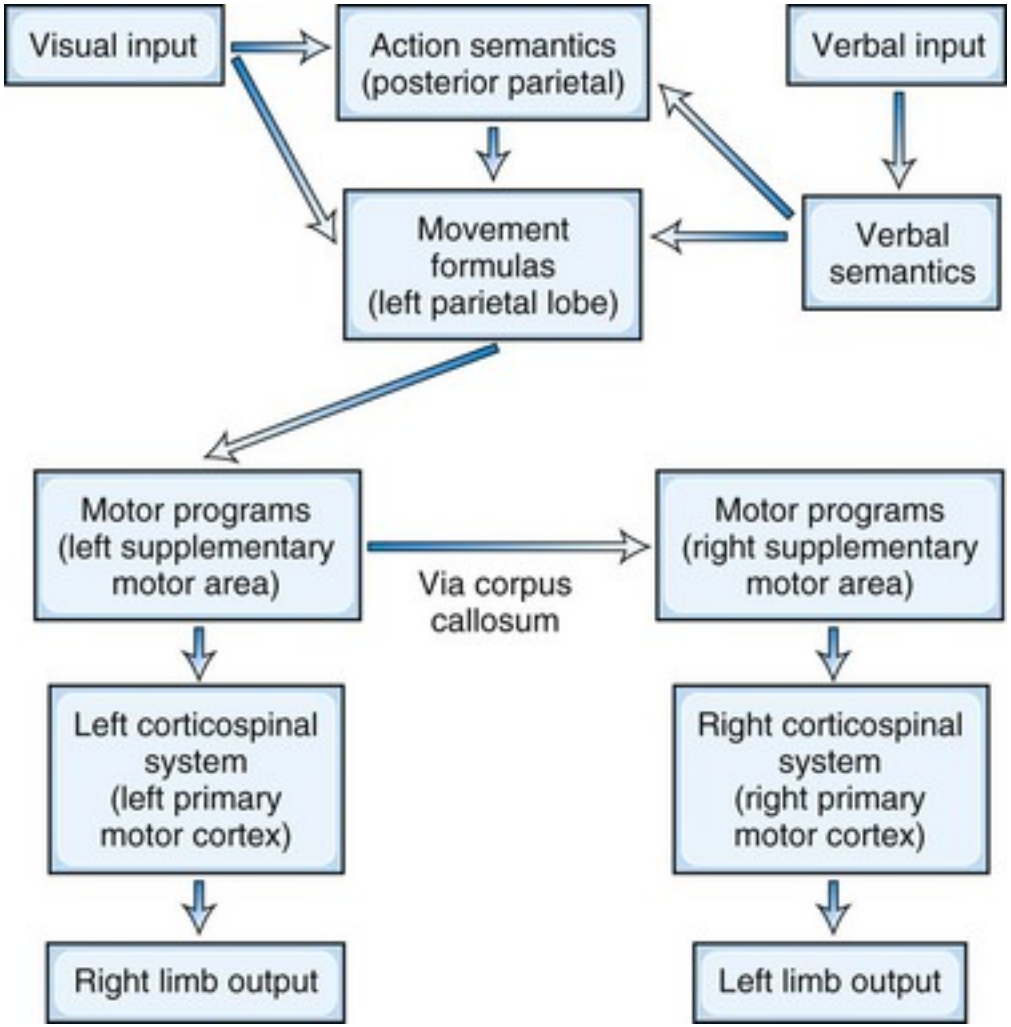
Perceptual-motor - Assessments

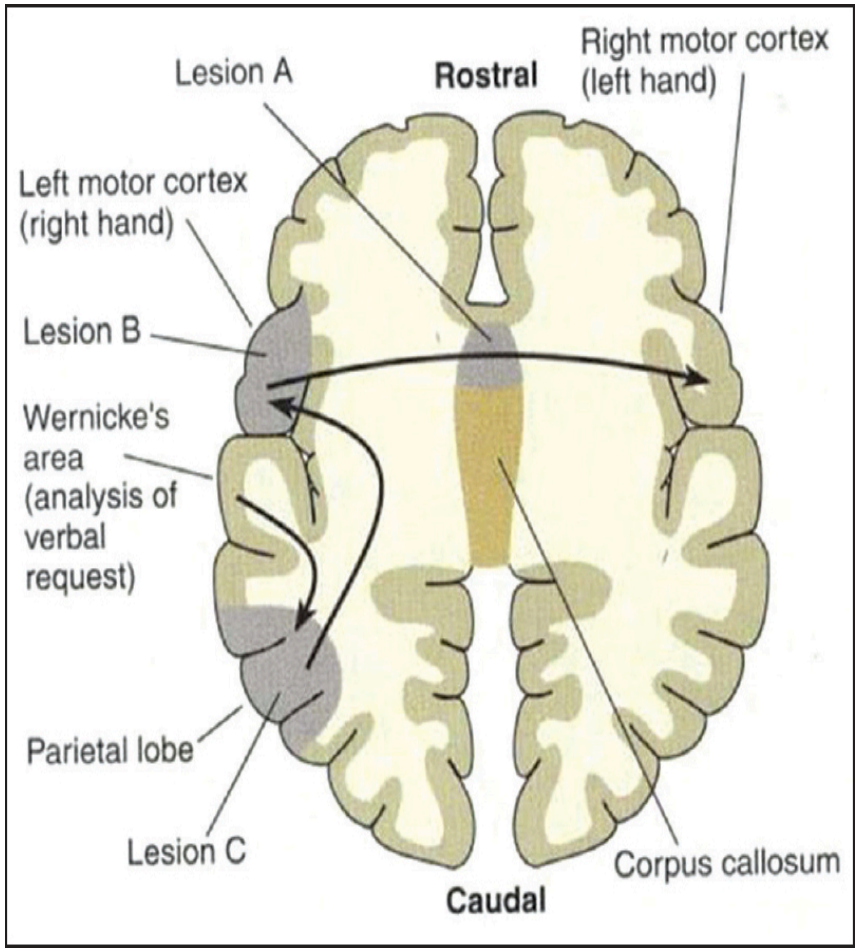
Praxis

- Ideomotor praxis
  - Copy gesture (meaningful-meaning less)
  - Pantomime actions (pretend to brush your teeth)
- Ideational/conceptual praxis
  - Multi-step actions (Pen-letter-envelop)
  - Three-step command
- Constructional praxis
- Orobuccal praxis



Praxis

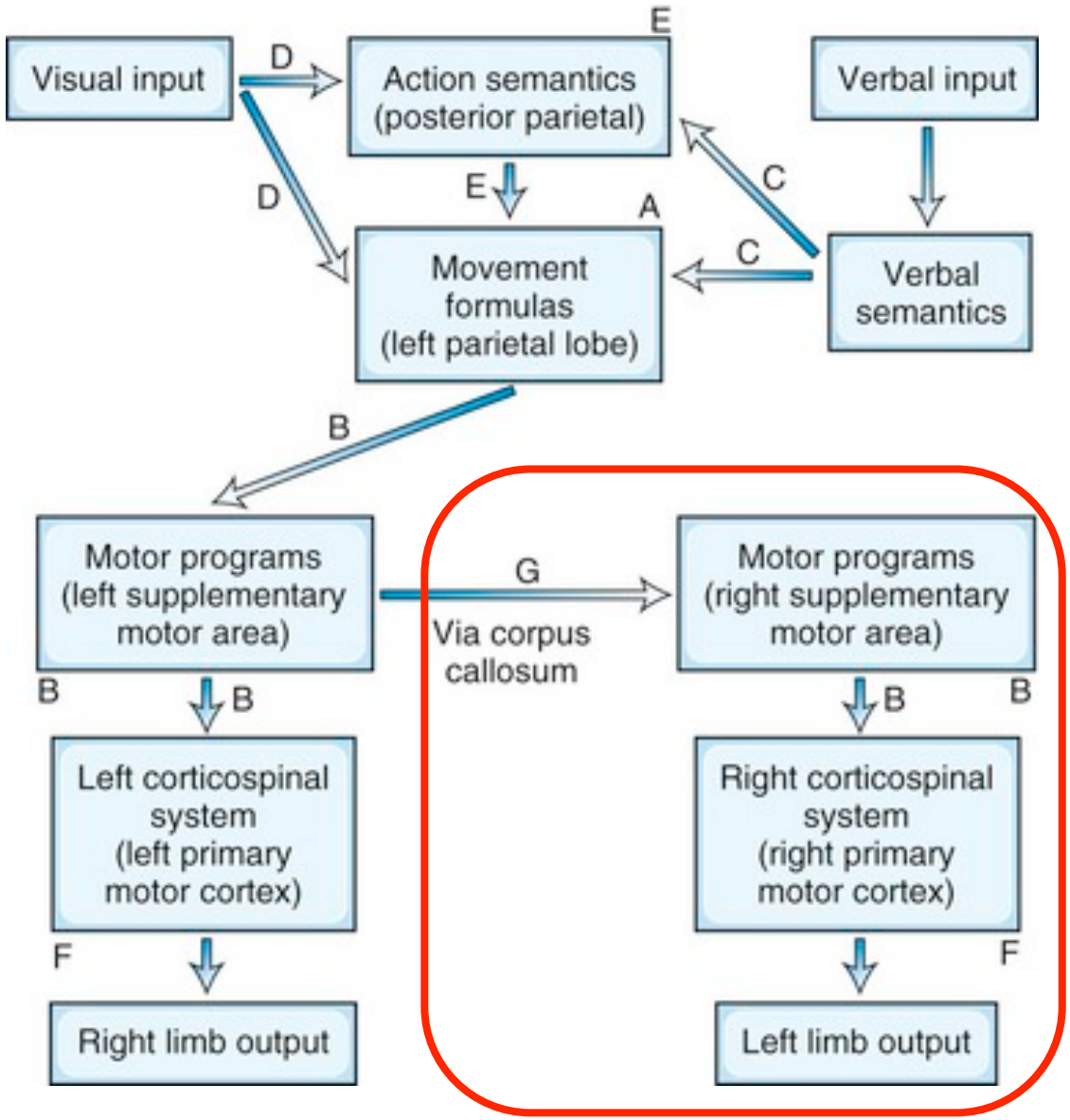




https://clinicalgate.com/limb-apraxias-and-related-disorders/

Chandra SR, et al. Indian J Psychol Med. 2015 Jan-Mar;37(1):42-7.

Lesions on the Limb Apraxia



A: Ideomoter apraxia (parietal variant)

B: Ideomotor apraxia (disconnection variant)

C: Verbal dissociation apraxia

D: Visual dissociation apraxia

E: Conceptual apraxia

F: Limb-kinetic apraxia

G: Callosal apraxia

https://clinicalgate.com/limb-apraxias-and-related-disorders/

Perceptual-motor - Assessments

- Ideational/conceptual praxis
  - Multi-step actions (Pen-letter-envelop)
  - Three-step command

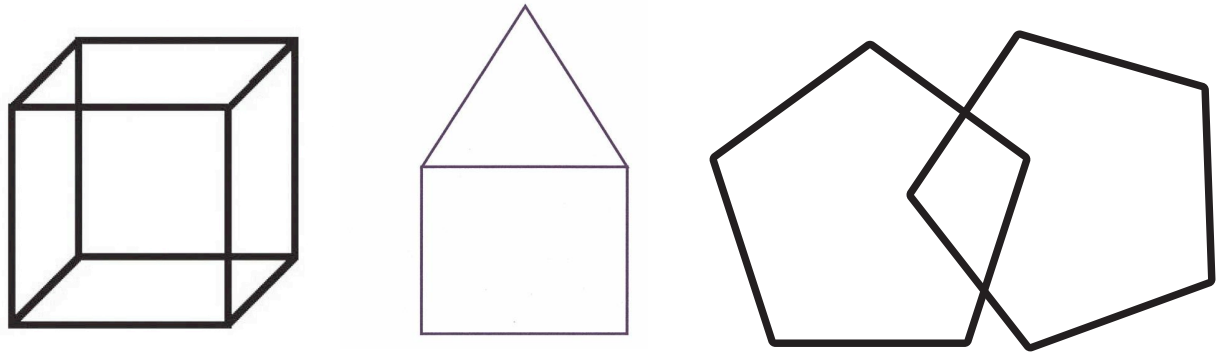
TMSE

จงทำตามคำสั่งต่อไปนี้ (มี 3 ขั้นตอนคำสั่ง) ให้ผู้ทดสอบพูดต่อกันไปให้ครบประโยคทั้ง 3 ขั้นตอน

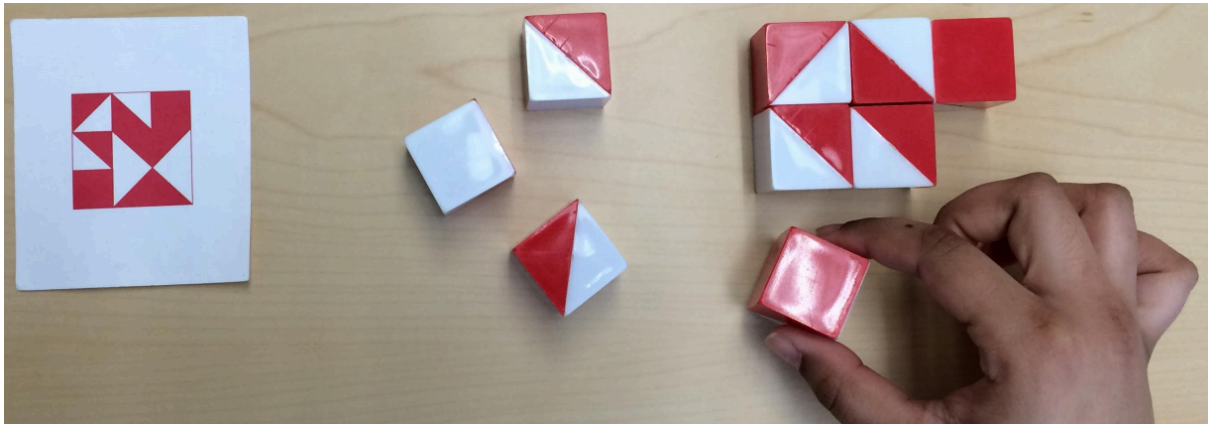
"หยิบกระดาษด้วยมือขวา พับกระดาษเป็นครึ่งแผ่น แล้วส่งกระดาษให้ผู้ตรวจ"

Perceptual-motor - Assessments

- Visuoconstructional praxis: assembly of items requiring hand-eye coordination
  - Copy figures

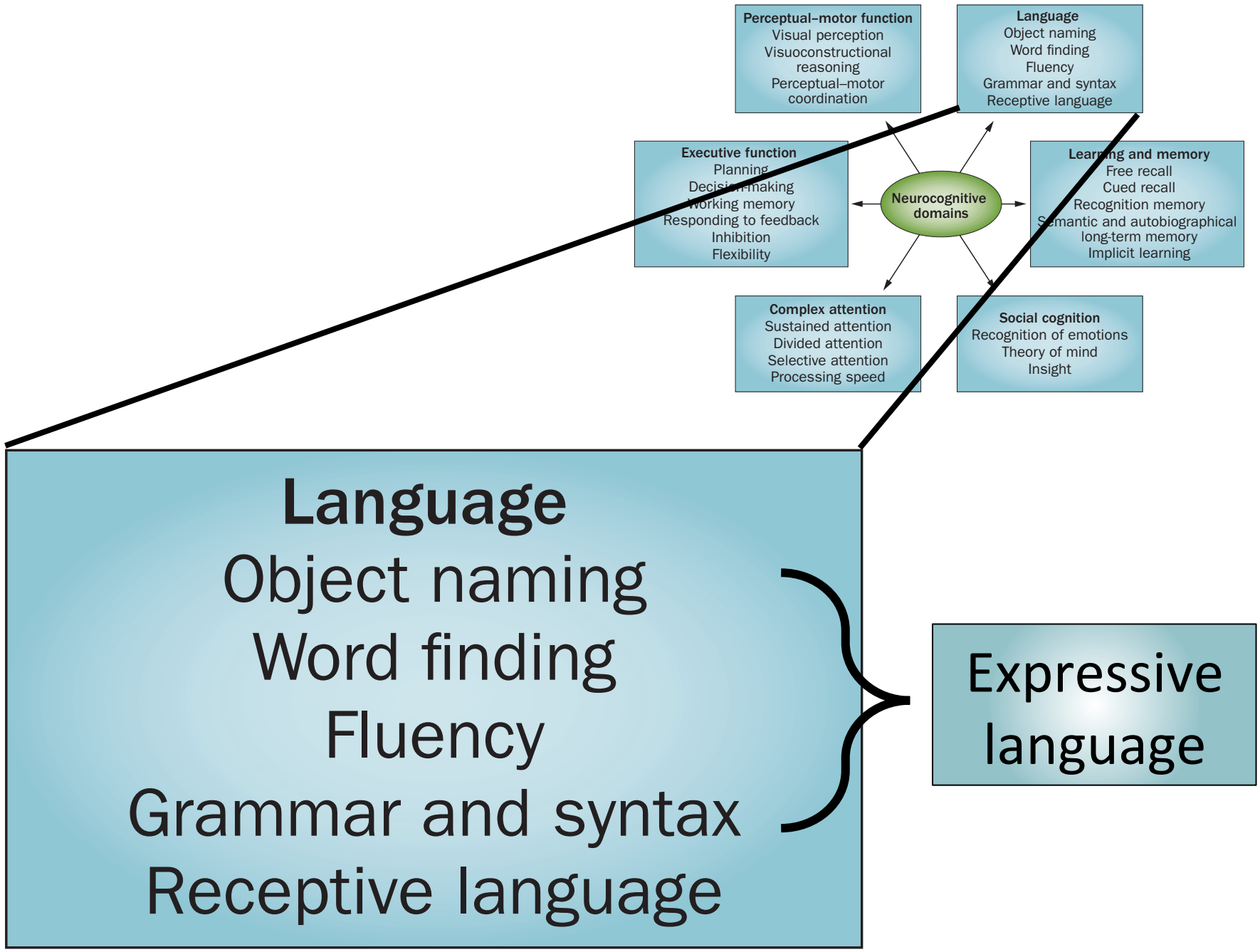


  - Block design



Dementia presented with Perceptual-motor dysfunction

- Alzheimer's disease
  - Typical
  - Visual variant: posterior cortical atrophy
- Dementia with Lewy bodies
- Corticobasal syndrome (CBS)
- Prion disease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Divided attention
Selective attention
Processing speed
Social cognition
Recognition of emotions
Theory of mind
Insight
Language
Object naming
Word finding
Fluency
Grammar and syntax
Receptive language
Expressive language

Language - Symptoms

Mild

- Word-finding difficulty
- Substitute general for specific terms/names of acquaintances
- Grammatical errors involve subtle omission or incorrect use of articles, prepositions, auxiliary verbs

Language - Symptoms

Major

- Significant difficulties with expressive or receptive language
- Uses general-use phrases such as “that thing” and “you know what I mean”
- Prefers general pronouns rather than names.
- With severe impairment, may not even recall names of closer friends and family
- Idiosyncratic word usage, grammatical errors, and spontaneity of output and economy utterances
- Stereotypy of speech, echolalia and automatic speech
- Mutism

Language - Assessments

- Expressive language
  - Confrontation naming
  - Fluency
  - Repetition
- Grammar and syntax
  - Use of articles, prepositions, auxiliary verbs
- Receptive language
  - Comprehension (single word and sentence)

Language - Assessments

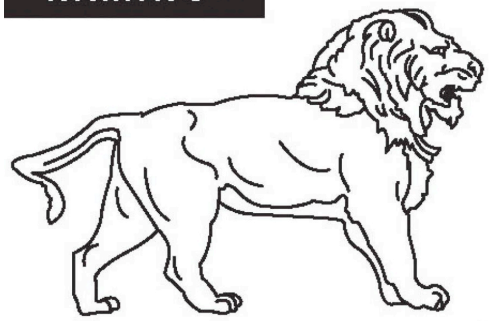
- Expressive language:
  - Confrontational naming: identification of objects or pictures

5. **LANGUAGE** (10 คะแนน) TMSE

(1) ผู้ทดสอบชี้ไปที่นาฬิกาข้อมือ แล้วถามผู้ถูกทดสอบว่าโดยทั่วไป "เราเรียกสิ่งนี้ว่าอะไร" (นาฬิกา)

(1) ผู้ทดสอบชี้ไปที่เสื้อของตนเอง แล้วถามผู้ถูกทดสอบว่าโดยทั่วไป "เราเรียกสิ่งนี้ว่าอะไร"(เสื้อ/ผ้า

NAMING MoCA



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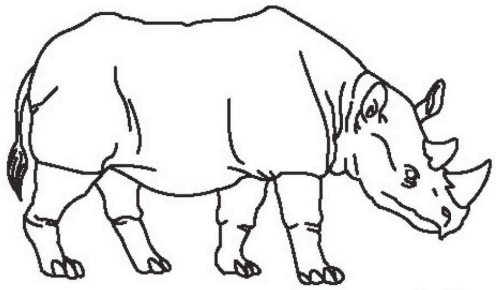

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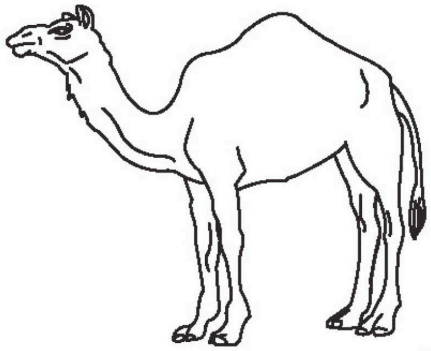

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Language - Assessments

- Expressive language:
  - Fluency: name as many items as possible in 1 minute
    - Semantic/category: e.g, animals
    - Phonemic/letter: e.g., words starting with letter “f”

MoCA

Fluency /	บอกคำที่ขึ้นต้นด้วยตัวอักษร “ ก ” ให้มากที่สุดใน 1 นาที

  - Repetition
    - Single words
    - Sentence

ฉันรู้ว่าจอมเป็นคนเดียวที่มาช่วยงานวันนี้
แมวมักซ่อนตัวอยู่หลังเก้าอี้เมื่อมีหมาอยู่ในห้อง

“ยายพาหลานไปซื้อขนมที่ตลาด”

ใครใคร่ขายไก่ไข่

Language - Assessments

- Grammar and syntax (e.g., omission or incorrect use of articles, prepositions, auxiliary verbs):
  - Errors observed during naming and fluency tests are compared with norms
  - Assess frequency of errors and compare with normal slips of the tongue.

Language - Assessments

- Receptive language:
  - Comprehension
    - Single word
      - Word definition
      - Object-pointing tasks
    - Sentence
      - performance of actions/activities according to verbal command

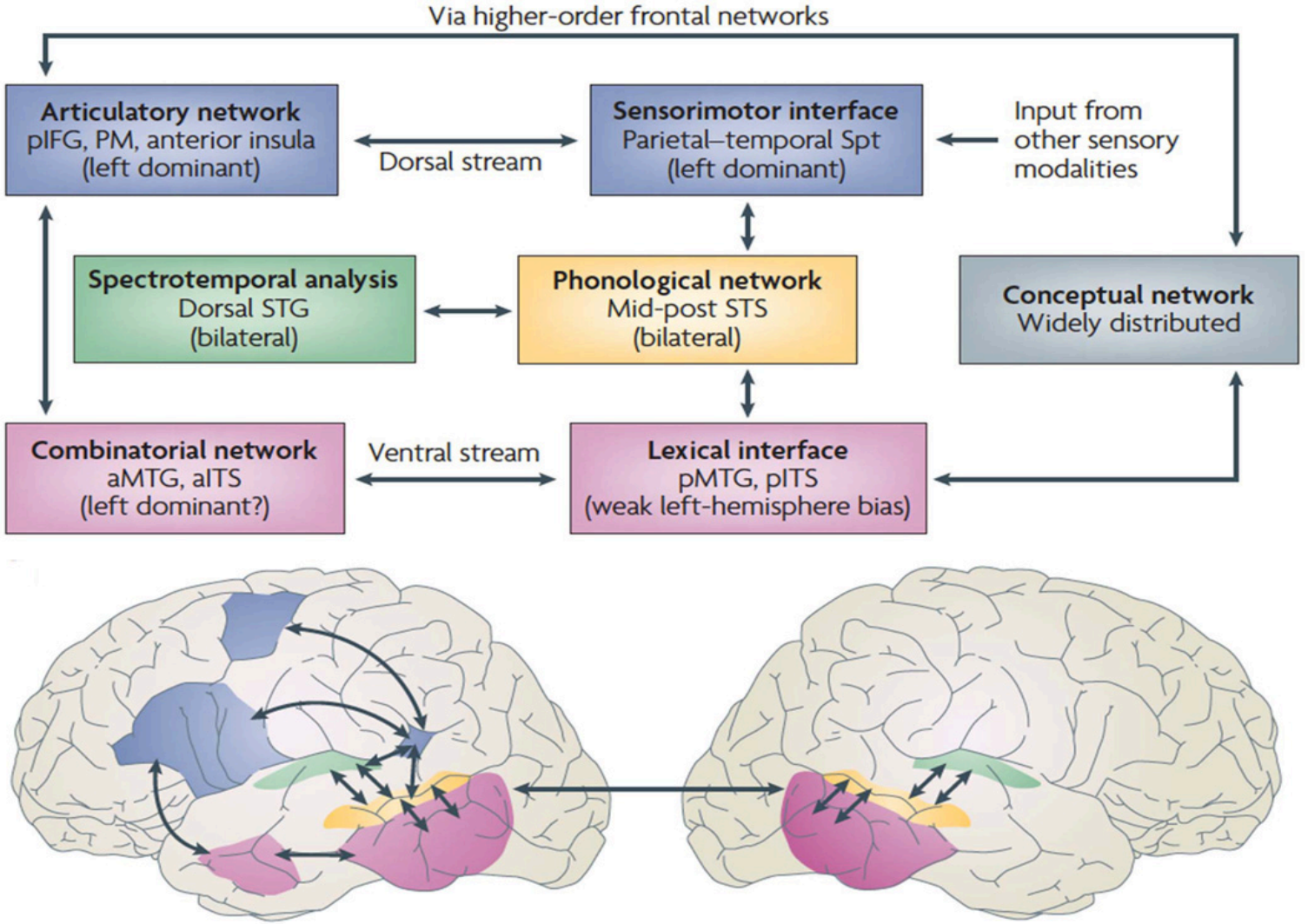
Dual stream model of speech processing

Ventral stream

Speech comprehension

Dorsal stream

Sensory-motor integration for speech production



Hickok G, Poeppel D. Nature Reviews Neuroscience. 2007;8:393–402.

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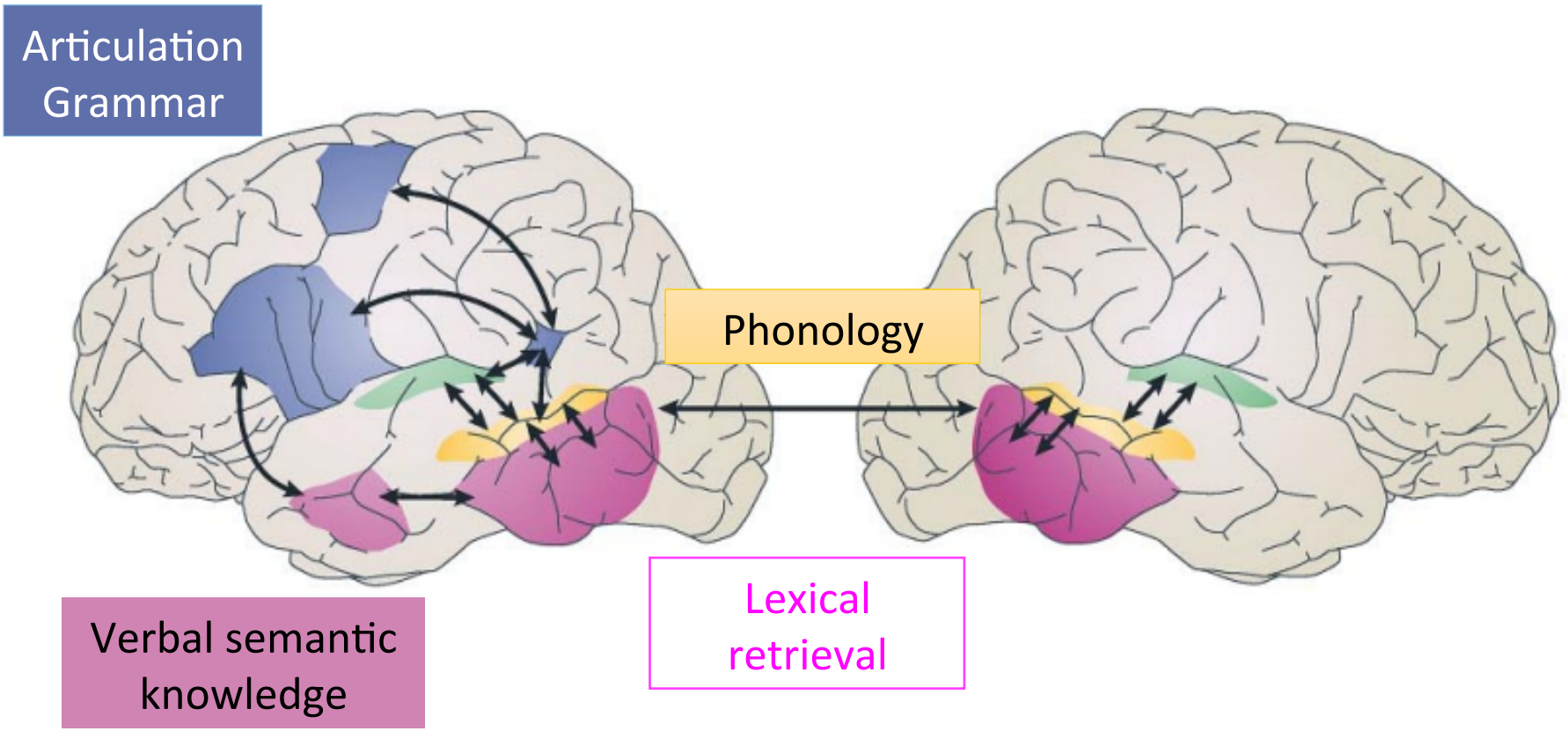

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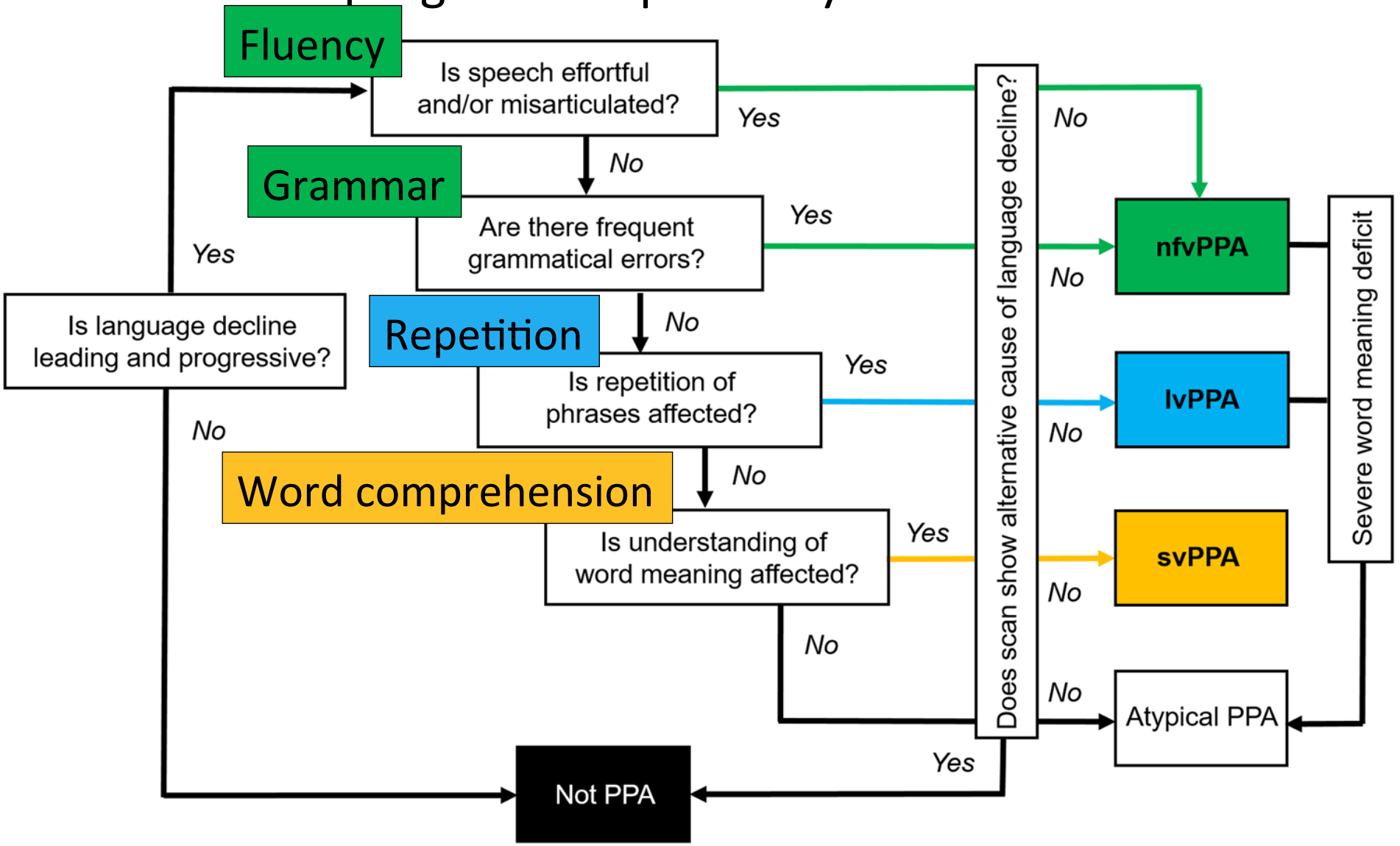
A clinical ‘roadmap’ for diagnosis of canonical primary progressive aphasia syndromes

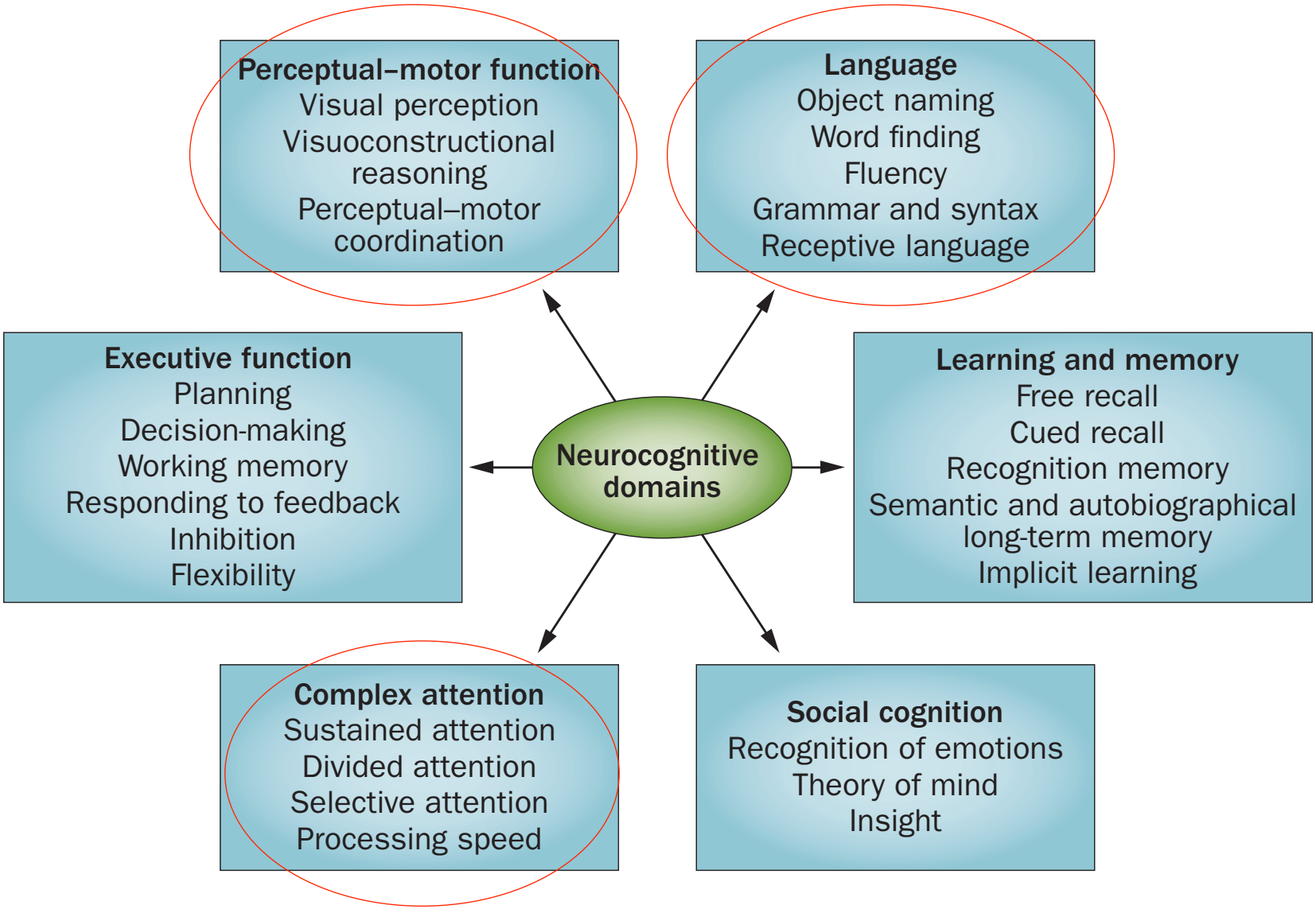


Marshall CR, et al. J Neurol. 2018 Jun;265(6):1474-1490.

Dementia presented with Language dysfunction

- Frontotemporal dementia
  - Progressive non fluent aphasia
  - Semantic dementia
- Alzheimer's disease
  - Language variant: Logopenic aphasia
- Atypical parkinsonian disorders
  - Progressive supranuclear palsy (PSP)
  - Corticobasal syndrome (CBS)

DSM 5 neurocognitive domains



Sachdev, P. S. et al. Nat. Rev. Neurol. 10, 634–642 (2014)