

## **Cognitive and Cognitive-Linguistic Communication Disorders: Neural Bases, Deficits, Evaluation, and Treatment**

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### **Production Notes**

Credit and appreciation extended to the authors and researchers I've included in preparation for this presentation. As an "Aphasiologist", my views and concepts presented are based on accepted scientific thought and the current zeitgeist (though, of course there are always some dogmatists out there who may disagree).

This PowerPoint (PPT) and presentation is for participants in the SHAA conference and for educational purposes only. Distribution of the PPT and/or notes is not permitted.

Please participate.

Comments are great. Questions are fantastic and more than welcome. I'll answer to the best of my ability.

**NOTE: This handout will be missing a lot of punctuation.** It was taken from the actual PPT and does not convert exactly. However the information on slides is present.

### **OUTLINE**

1. Hemispheric and system specific cognitive, cognitive-linguistic, and linguistic functions
2. Association between functions of neurological systems and their possible disruptions
3. Relationship between neurological system dysfunctions to examples from common life experiences and clinical interactions
4. Activities

As we talk about cognitive and cognitive linguistic disorders, please keep this FACT in mind

"Aphasia" results from lesions primarily involving language areas.

Primary deficits in aphasia are in language production and/or reception (multimodality) and not primary deficits in attention, memory, executive system, personality, limbic system, etc.

(of course they may co-exist to a lesser degree)

Specific language deficits in CCDs should be referred to as "aphasia-like" symptoms, behaviors, or errors, etc.

### **SESSION 1: Hemispheric and system specific cognitive, cognitive-linguistic, and linguistic**

What is the difference between Cognitive and Cognitive-Linguistic functions/disorders? BTW, some may disagree with the below (but this is my presentation and these are accepted concepts)

Cognitive systems/functions do not rely language systems (is non-linguistic). Cognitive and linguistic processes integrate the two at higher levels of thought.

For example: In dementia much of Syntax (language) may remain relatively isolated and intact – given a relative

Continued –

reduction in cognitive (intellectual) abilities; conversely, in aphasia cognitive functions may be little affected in light of reduced language abilities (except in more severe aphasias)

Cognitive-Linguistic functions involve the cognitive system but have more of direct effect on language elements (typically in the high level use of Language – extralinguistics). AGAIN, we are not talking about the individual having “aphasia”!!

The specific cognitive centers and processes we’re about to examine may have great impact upon communicative behaviors; thus diagnoses of Cognitive Communication Disorders

As we go through the following information, think about the effects of each specific function and the potential impact upon communication.

As just one example: How might damage to the pre-frontal cortex, and a deficit in sustained attention affect communication?

Might a lack of sustained attention result in decreased depth of processing for incoming messages?

What communicative deficits might result?

*Let’s not discuss now, will do that later in this session.*

### **Pre-frontal lobe (cortex) IS the center of our Executive System.**

Interestingly, in Middle Ages ‘imagination’ was located in the anterior ventricle, memory in the posterior ventricle, and reason located in between. So, thought was located in fluid filled cavities (makes a lot of sense – huh?)

Functions include:

Thought – I.e., the highest levels of thought!

1 aspect: The voice in your head... or voices... that you use to think consciously (of course – the internal voice(s) do involve language (in more severe aphasia individuals report some “differences” in their internal voice (less language-like) – though still able to “think”).

Prior to the inner voice, higher levels of per-conscious thought, the language of the mind.

An aspect of thought that you perceive and experience: The voice in your head... or voices... that you use to think consciously (of course – the internal voice(s) do involve language (to some extent).

We “verbally mediate” (consciously) what we are processing and thus what we do.

We often give Pts with aphasia a non-verbal intelligence test (TONI, Raven’s..).

Even in cases when cognition is only slightly (minimally) affected, we see decline in scores from likely pre-morbid abilities (we may have self-reports of IQ – but usually don’t know exactly where they would have scored prior to stroke). Some of the decline be due to task-related internal verbal mediation

We think through the task – “there is the piece that’s missing. This isn’t the one side it has a circle rather than a square”.. etc., etc...

Prior to the inner voice, higher levels of pre-conscious thought, the language of the mind.

Language of the Mind – pre-consciously the brain receives, analyzes, evaluates, “thinks”, plans, monitors an incredible amount – far more than we can even imagine

Integration of information

Not just knowing a fact, but how different facts and concepts interact

Sorry students but – academic and clinical faculty see that some students do well memorizing terms and their individual concepts, however they can't put it all together, see how various systems, functions, and/or disorders interact – to form the big picture. Result is difficulty applying segmented knowledge to clinical settings

Morals (to whatever extent you and/or others may have them):

Associated with “judgement” and “actions” - what's the right or wrong thing to do (though some people have lack of certain morals so severe that they don't even think as an action as right or wrong – they just do without remorse)

Which do you listen to if have an Angel on one shoulder and a Devil on the other? One may have better or worse morally based suggestions. Are these impacted by religious teachings? Environment? Levels of sanity? The web??

And... ??

Pre-frontal cortex may help us maintain our moral values by evaluating and possibly refrain from IMMEDIATELY acting upon deep feelings of Emotion, Violence, and/or Lustful, Sexual desires (but to a point – with everyone having their own “point”)

Judgment

Not necessarily from just the moral perspective, but also more concrete. Should I do “X” (tighten that bolt) that might result in “Y” (bolt breaking)?

Decision making

Involves analyses of the functions above (morals and judgements)

We make decisions – sometime they end up good ones – sometimes not.

After this presentation, you can decide if you made the right decision!

Executive system important in “Directing Attention” toward what we're supposed to be attending to, sustaining that attention and/or switching/redirecting attention.

Involved in Orientation, Shifting, Focused, Alternating, and Sustained Attention

Relates to notion of Test-Operate-Test-Exit (T.O.T.E - principle that's been around a long time)

Can any of my “old” students tell us what T.O.T.E. refers to?

Typically examined neurologically based disorders.

Right pre-frontal especially involved in brain attending to new stimuli; involves pre-conscious processing of incoming stimuli, orienting, and switching attention to attention to focus on the new task at hand (or not)

Memory (are many types of memory, but there are 1 of 2 main multi-sensory areas).

Where all sensory, language/lexical, and conceptual information integrates to form “what we know”. In the frontal lobe this knowledge is readily available for processing by the executive system.

The other main multi-sensory processing area is in the parietal lobe (angular and supramarginal gyri).

Parietal and frontal areas communicate constantly.

### Personality

A lot of things impact our personalities, but the essence of our personality likely lies primarily in the pre-frontal lobe. Personalities are hard to change – either your own or that of others. \*We all have different personalities. Well, possible non-scientific exception, a “couple” who’ve together 27-30+ years, who might glob/lump into one personality; which may, or may not be annoying

Other than Pre-Frontal - What brain areas are important in cognitive function?

Keep in mind that these brain regions and cognitive processes will likely affect communication to varying degrees

### Limbic System

Structurally, includes various cortical locations and subcortical nuclei (please don’t use term – Limbic Lobe).

A primary center is the Cingulate Gyrus (medial aspects of hemispheres – deep within longitudinal fissure, running just above the corpus callosum).

Other structures included in the Limbic System. I’ll be mentioning some sexual functions below. It is important when considering particular Pts and potential complications that may cause concern for clinicians

Mammillary Bodies: Memory, internal compass, and along with other limbic structures (some below) – contributes to sexual desires, fantasies, daydreams, mental arousal, and neurovascular response of sexual function.

Amygdaloid Nucleus: Fear, anxiety, extreme anger and rage. Creates “arrest” (unable to run from grotesque monsters in a bad dream) or “flight” (including behaviors, bearing teeth, running from perceived danger).

With other structures, generates pleasure and the opposite. Also, involved in producing external discharge (from sexual pleasure)

Are other functions of the Amygdala – but let’s move on.

### Cerebellum is next:

It’s not just motor Anymore!!

Very cool trivia: 10% of the brain’s volume, it contains over 50% of the total number of neurons in the brain (ties emotion to movement).

“Cognitive functions. Although the cerebellum is most understood in terms of its contributions to motor control, it is also involved in certain cognitive functions, such as language. Thus, like the basal ganglia, the cerebellum is historically considered as part of the motor system, but its functions extend beyond motor control in ways that are not yet well understood.” James Knierim, Ph.D., Department of Neuroscience, The Johns Hopkins University  
Cerebellar involvement in various linguistic processes. Lexical retrieval, syntax, aphasia, reading, writing, and metalinguistic skills.

Cerebellar role in cognitive and behavioral–affective modulation. Cerebellar-induced syndromes: cerebellar cognitive affective syndrome and the posterior fossa syndrome. Mechanisms involved in linguistic and cognitive processing.  
Citation: De Smet, Paquier, Verhoeven, Mariën (2013), The cerebellum: Its role in language and related cognitive and affective functions, Brain and Language (Issue 3)

**Basal Ganglia** (BG nuclei) – Relays limbic information throughout brain

Involved in cortical loops: BG – pre-frontal association – cortical limbic

Through these loops, “...involved in selecting and enabling various cognitive, executive, or emotional programs that are stored in these other cortical areas.” James Knierim, Ph.D., Dept of Neuroscience, The Johns Hopkins University

### **Parietal Lobe**

Mentioned before as 1 of 2 multimodal integration areas (with pre-frontal).

“Location-Location-Location” – structurally located alongside sensory, visual, and auditory centers

Important in understanding meaning of words.

Along with Frontal lobe, helps direct attention to new stimuli.

Spatial reasoning (topographagnosia - can get lost in an apartment) – understanding maps.

Responsible for assessing facial expressions to judge emotions (facial recognition – Temporal)

And – of course primary and secondary somatosensory processing

Interesting deficits possible

#### **Nonlinguistic Deficits**

Directions – Topographagnosia.

Left side neglect (visual or attentional).

Possible - strange ideas per left side of body) usually when hemiparetic on left.

May think the limb is another person “the dead one”; “the baby”, “Burt”?

May ask to have the person taken from the room; from their bed) and more strange thoughts about the left side

Lack knowledge of their deficits; physical and behavioral. Term is “anosognosia” (also see in some Wernicke’s aphasia Pts).

Visuospatial deficits that may result in “constructional apraxia”

Kohs blocks, drawing (if drawing themselves – maybe drawing 3 limbs, with 2 on one side), etc.

### **Temporal Lobe**

Auditory Perception

Primary auditory processing and basic

analyses.. Putting the auditory picture together

Right Hem: environmental/non-verbal sounds

If damage = Auditory Agnosia

Memory - Forming visual memory

Hippocampus (within temporal lobe) – forming, storing, and organizing new memories, part of limbic system for emotion

Speech

Language Comprehension.

Left Hemisphere temporal: Basic analyses and Wernicke's for word processing – but integration into our “knowledge” happens when impulses pass into the Angular Gyrus (inf. parietal).

If signal doesn't get into Wernicke's area from primary auditory cortex, result = Pure Word Deafness (auditory verbal agnosia)

Temporal Lobe Emotional Responses.

Within this lobe – amygdala (talked about before under limbic system)

Mentioned hippocampus – also in temporal lobe. So important in forming memories – and more.

Visual Perception – associated with occipital lobe

Inferior temporal many visual memories – includes different types of categories (including faces – just below)

Facial Recognition - see all features of face but can't recognize as particular person (can be as bad as confusing a cat face with human).

### **Dementia**

“general mental deterioration due to organic or psychological factors, characterized by disorientation, impaired memory, judgment & intellect & a shallow labile affect”

Terminology of Communication Disorders, Speech-Language-Hearing, 4th Edition (1996)

Diagnosis Dementia – by Neurologist (or other Physicians)

Per Cummings & Benson: An acquired persistent impairment of intellectual function with compromise in @ least 3 of the following spheres of mental activity:

language

memory

visuospatial skills

emotion or personality

cognition

Alzheimer's Dementia: DAT, SDAT

Increase in neurofibrillary tangles. Presence of senile plaques - minute areas of tissue degeneration consisting of granular deposits & remnants of neuronal processes.

Cell loss in the hippocampal gyri & amygdala.

### **Extralinguistic Discourse Impairments**

Defined - “the aspect of communication that transcends individual phonemes, words or sentences...can be considered the glue by which people link together the bits & pieces of language to create representations of events, objects, beliefs, personalities & experiences” (Myers, 1997).

Think – EXTRALINGUISTICS

According to Meyers (and others) extralinguistic functions include:

1) Narrative Discourse

2) Generation of Alternate Meanings

3) Sensitivity to Communicative Events

4) Prosody

**NOW TIME FOR ACTIVITY**