

به نام خدا

# CLINICAL NEUROSCIENCE OF LANGUAGE (267-432)







## HANDBOOK OF THE NEUROSCIENCE OF LANGUAGE



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Introducing Handbook of the Neuroscience of Language Saman Bahmaei samanb2010@gmail.com





## A. Language in Special Populations and in **Various Disease Processes**



# A Contraction of the contraction

#### **Chapter 26: Acute Aphasias**

- 5 stages of aphasia:
- 1. Immediate stage: 0-2 hours after stroke
- 2. Acute stage: 2-48 hours
- 3. Subacute stage: 2 days- 2 weeks
- 4. Intermediate stage: 2 weeks to 6 months
- 5. Chronic stage: more than 6 months

This chapter discusses acute communication disorders.



Parts of this chapter (pages 271-276):

#### Clinical, pathophysiological, and neuropsychological variables in introduction

Approaches to classifying acute aphasias (Kertesz 1979, Wallesch et al 1992, Laska et al 2001, Godefroy et al 2002, Pederson et al 2004) [All of the studies agree that classification of acute aphasias both by cluster analysis, does not result in meaningful predictions of the chronic syndrome. All syndromes of the acute stage were found compatible with complete language recovery (according to the tests used).]

Non-stable syndromes of acute aphasia (Acute conduction aphasia, Acute transcortical motor aphasia, Acute paraphasia, Pure motor aphasia: apraxia of speech)





Can patients with dementia have aphasia? It can be attributed to non-linguistic factors (i.e. related to memory, attention, etc.)

5 types of dementia: 1- subcortical 2- vascular 3- cortical 4- frontotemporal 5semantic

In this chapter, disorders of language that are associated with dementia are discussed. The focus is on several aspects of language representation and processing, including **phonologic**, **lexical**, **semantic**, **grammatical**, and **discourse** levels of language functioning. Each of these language components appears to be disproportionately compromised in particular neurodegenerative diseases.

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Parts of this chapter (pages 279-285):

Phonology and speech errors in dementia

Lexical retrieval and naming difficulty in dementia

Semantic memory difficulty in dementia

Grammatical deficits in dementia

Discourse deficit in dementia

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#### **Chapter 28: Frontal Lobes and Language**

In this chapter there is examined how conventional constructs associated with executive function such as working memory, inhibition, flexibility and general problem solving **impact upon communicative competence**. In addition, very recent advances in social neurosciences are examined, including theory of mind, emotion and social knowledge, and how these might impact upon the ability to communicate effectively.

Communication is a process in which one speaker makes his or her thoughts and intentions known to another in an effective and socially acceptable manner. While language is an important tool in this process, there are clearly other cognitive and affective processes involved. Nowhere is this more apparent than in communication patterns following frontal lobe damage (FLD). **People with frontal lobe injuries can have perfectly intact language skills**, that is to say, they are able to name objects, construct grammatically acceptable propositional speech and understand the literal meaning of conversations in which they engage. But despite this, **their communication skills are frequently aberrant**.



NBML Brain Mapo

It has been a conundrum as to how to measure these problems and how to explain their occurrence. Fortunately, contemporary linguistic theories, especially those with a social focus have been used to document communication breakdown and the 1980s and 1990s saw a great deal of work in this regard. In particular, an examination of **pragmatic inferences**, that is the inferred meanings that arise when language is used in context, has been revealing. Theories that address how discourse unfolds have also been useful to reveal problems in language production. With the advent of sensitive measures of these deficits we are in a better position to be able to study and explain them. Added to this, recent advances in neurosciences provide some exciting new possibilities. This chapter provides an overview of how problems in inference and discourse management manifest after frontal lobe lesions and some possible explanations for this.



Parts of this chapter (pages 289-295):

**Pragmatic inference** 

Social cognition (Theory of mind, Emotion processing, Social knowledge)

**Discourse production (Polite utterances, Narratives, Conversations, Neuropsychological underpinnings of disordered discourse production)** 





#### Chapter 29: The Torque Defines the Four Quadrants of the Human Language Circuit and the Nuclear Symptoms of Schizophrenia Identify their Component Functions.

In all populations a fraction of individuals in the third or fourth decades of life begins to hear voices when there is no one to account for that experience, or becomes convinced that a conspiracy is afoot when none such exists. Others develop swings of mood into depression on the one hand and elation on the other. Such states are regarded as illnesses, schizophrenia in the first case, manic-depressive disorder in the second.



The core nuclear symptoms of schizophrenia according to Kurt Schneider are as follows:

- *1. Thought echo or commentary*
- 2. Voices commenting
- 3. Passivity (delusions of control)
- 4. Thought insertion
- 5. Thought withdrawal
- 6. Thought broadcast
- 7. Primary delusions

All of them are shortly explained in page 299



Parts of this chapter (pages 300-305):

**Bi-hemispheric theory of language** 

**Principles of connectivity of hetero-modal association cortex** 

Anomalies of anatomical asymmetry and schizophrenia

The central paradox and its resolution

How do the nuclear symptoms arise?

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#### **Chapter 30: Stuttering and Disfluency**

Stuttering is a disturbance of speech motor production that occurs in all cultures, is referenced in all languages, and afflicts people throughout the world. As neuroscience investigations into the dynamics of speech motor control has expanded, there is increased focus upon those who speak abnormally.

The focus of this chapter is on a sector of children as well as adults with an often overlooked problem – those with intact language yet unable to talk. These people, known as stutterers, know what they want to say but are unable to do so.



Parts of this chapter (pages 310-316):

#### **Definition and clinical characteristics of dysfluency**

The psychology of stuttering

**Theories of stuttering** 

Animal modeling of stuttering





#### Chapter 31: Mesial Temporal Lobe Epilepsy: A Model for Understanding the Relationship Between Language and Memory

What is the role of medial temporal structures in language?

While the hippocampus is traditionally considered a structure exclusively involved in memory, people with hippocampal damage do show language deficits. Mesial temporal lobe epilepsy (MTLE) provides a unique case study from which to examine the relationship between memory and language.

While the pathology of MTLE is limited to the medial temporal lobe, these patients show language deficits in naming, fluency, and comprehension.





Though MTLE can clearly affect language indirectly, there are cogent reasons to propose a direct role for the medial temporal lobe in language processing. Through the analysis of deficits seen in patients with MTLE and integrating this with current knowledge of hippocampal functioning, **this chapter attempts to unravel the complex relationship between language, memory, and the medial temporal lobe.** 

**Naming** is the most frequently reported subjective complaint of patients with epilepsy and the vast majority of neuropsychological studies report that a naming deficit is prevalent in temporal lobe seizure patients when seizures emanate from the language-dominant hemisphere.





**Do MTLE patients show language abnormalities?** 

What specific evidence is there showing medial temporal lobe involvement in language?

Are there anatomical connections that allow the medial temporal lobe to influence language?

What might the medial temporal lobe contribute to language processing?

What account for the language deficits in MTLE?







frontal lobe

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thalamus



In the 1970s the discovery of aphasia in patients with strokes apparently limited to the basal ganglia and the thalamus was greeted with considerable excitement. In the 1990s however, newer studies revealed that such cases of aphasia were, in fact mainly due to clandestine dysfunctions of the overlying cortex.

In the meantime expanded knowledge in both the neuropathology of Parkinson's and Huntington's diseases and in the basic neurophysiology of the basal ganglia suggests that the only true subcortical aphasia is due to thalamic stroke (and contributions of thalamic lesions to aphasia is indirect). The neuroscience of the thalamus cannot yet provide us a cogent explanation for the linguistic manifestations of thalamic stroke, and clinical studies continue to contribute to our emerging understanding of thalamic function.



Parts of this chapter (pages 329-338)

Distribution of pathology in subcortical stroke and degenerative disorders associated with language impairment (The case of stroke, The case of Parkinson disease, The case of Huntington disease)

**Emerging neuroscience of the basal ganglia** 

Mechanisms of non-thalamic subcortical aphasia

Summary: non-thalamic subcortical aphasia

**Emerging neuroscience of the thalamus** 

Mechanisms of thalamic aphasia

Summary: thalamic aphasia





#### Chapter 33: Language and Communication Disorders in Multilinguals

A multilingual individual is a person capable of communicating verbally in more than one language. Multilingual individuals differ among themselves according to a number of parameters that may each play a role in shaping any given aphasic patient's recovery pattern (parallel, differential, successive, selective, antagonistic, alternative antagonism and blending (see box 33.1 in page 342)). Although these matters are also relevant to developmental disorders, the focus of this chapter is only on acquired disorders.





Parts of this chapter (pages 342-347)

Language impairments

Implicit and explicit memory [implicit linguistic competence and explicit linguistic knowledge]

Pathological language mixing and switching

**Experimental studies** 

Assessment of language disorders in multilingual speakers

Multilingual aphasia rehabilitation





#### **Chapter 34: Language and Communication in Aging**

Age-related language changes have been explained as language-specific or related to cognitive abilities such as memory and attention, and have been attributed to areas of the brain that undergo substantial age-related changes.

scientists agree that not all older individuals have language or communication problems. Thus, it is not aging per se that brings about the difficulties with communication that have been reported. However, older adults themselves report difficulties listening to speech in noisy situations and finding specific words they are searching for.







Parts of this chapter (pages 351-356):

Language changes in healthy aging (lexical retrieval, language comprehension, oral language narrative production, written language)

Aging and bilingualism

Distinguishing language in healthy aging from that in mild cognitive impairment[MCI] and AD[Alzheimer Disease] (Lexical retrieval in MCI and AD, Comprehension in MCI and AD, Spontaneous speech and conversation)

Explanations for language changes in healthy aging

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### **B.** Language and Communication in **Developmental Disorders**





#### Chapter 35: Acquired Epileptiform Aphasia or Landau–Kleffner Syndrome: Clinical and Linguistic Aspects

The acquisition of language is usually a simple and effortless process. About 7% of the children show, however, a specific language impairment (SLI), with comparatively normal abilities in other areas.

This chapter focuses on a specific developmental disorder, the syndrome of acquired aphasia and epilepsy, also referred to as the Landau–Kleffner (LK) Syndrome. Children affected by LK syndrome, who already developed age-appropriate language, show a subacute regression of language, up to a total loss and flanked, in the majority of cases, by epilepsy. In the majority of the affected children the aphasic disturbance persists throughout their lives. The clinical and neurolinguistic aspects of the syndrome are discussed and related to other, more pervasive developmental disorders, such as autistic regression with or without epilepsy.

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Parts of this chapter (pages 361-365):

Neuropsychological assessment and language examination of a patient in introduction

Language regression and epilepsy (Clinical features of LK syndrome and AEA [acquired epileptiform aphasia]

The nature of the language deficit

The spectrum of regressive language disorders and epilepsy

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#### Chapter 36: Language and Communication in Williams Syndrome

In the 1960s, clinical descriptions of the rare genetic condition Williams Syndrome (WS) captured the attention of geneticists, linguists, and cognitive scientists alike.

The cognitive profile in this genetic condition is usually described as strikingly uneven, where language is relatively proficient but visuospatial processing is impaired. Some argue that this profile demonstrates the independence of language from the rest of cognition, supporting a **genetically prespecified language faculty**. Others have

challenged this view, pointing to the contribution of interactions between genes and the environment over development. The underlying assumption of such theoretical models is that developmental disorders provide us with a unique opportunity to directly link genes, the brain, and behavioral outcomes.

This chapter aims to integrate key findings from different research areas into a coherent model of why and how language emerges as a relative strength in WS.



Parts of this chapter (pages 368-374):

Language in WS: the evidence

Theoretical approaches to the neurocognitive study of WS

Characterizing language and communication in WS

Language in WS: connecting the dots

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#### Chapter 37: Language and Communication Disorders in Autism and Asperger Syndrome

Autism is a developmental disorder diagnosed by observing characteristic abnormalities in social interaction, communication, and repertoires of interests that emerge early in the development and persist throughout life. The condition is sometimes referred to as autistic spectrum disorders (ASD) – a label that is meant to emphasize the continuity between the different nosological categories and between clinical and preclinical condition.

Asperger syndrome is a condition similar to autism in the severity of social and communication deficits, but is not associated with mental retardation and language delays.





Research on language and communication in autism and Asperger syndrome has often **revealed delays and deficits in the acquisition of phonology, lexical semantics, and grammar.** However, the most persistent linguistic deficit concerns pragmatic skills, the ability to produce utterances that are contextually adequate and to interpret speakers' intended meanings.

Whereas researchers once focused on language abnormalities and their determinants as shown in the general population of children diagnosed with ASD, **there now appears to be a shift of attention to account for the high within-group variability in autism.** 





Parts of this chapter (pages 378-384):

Language deficits in Autism (Phonology, morphology, and syntax, Lexical semantics, Pragmatics, Prosody, Reading)

**Explaining language and communication deficits in ASD [autistic spectrum** disorders]







### **C. Recovery from, Treatment and Rehabilitation** of Language and Communication Disorders







The tissue damage caused by a stroke is typically stable after the acute stage. The fact that most patients affected by aphasia actually show a variable degree of recovery over time indicates that the brain has the potential to compensate the consequence of localized damage. Better recovery can be expected when the lesion is of limited size and the severity of the language impairment is mild. The impact of other factors, such as age, gender or handedness is less established. The mechanisms responsible for recovery are probably multiple, and play a different role according to the time after onset. In the early stage recovery may simply reflect the fact that the acute effect of a lesion reflects not only permanent damage, but also reversible dysfunction. In later stages, recovery may reflect the ability of the brain to reorganize to support a specific function (its "plasticity").



Parts of this chapter (pages 389-394):

Can we predict the potential for recovery?

Soundly established factors affecting recovery (Lesion size, Lesion site, Clinical picture, Time post-onset)

Factors that may affect spontaneous recovery (Etiology, Handedness, Hemispheric Asymmetries, Age, Education, Multilingualism, Mood, motivation and social support)

Why spontaneous recovery?



#### **Chapter 39: Therapeutic Approaches in Aphasia Rehabilitation**

This chapter discusses the main therapeutic approaches as they relate to the stages of recovery: activation therapy at the acute stage, impairment-specific treatment at the post-acute stage, social participation and consolidation at the chronic stage of recovery.





Parts of this chapter (pages 398-405):

How to approach aphasia therapy

A stage-oriented framework: fitting therapeutic approach to the stage of recovery (Activation therapy, Impairment-specific therapy, Social participation and consolidation)

Specific neuropsychological and psycholinguistic approaches to the treatment of lexical and syntactic disorders (Therapy of lexical disorders in aphasia, Therapy of syntactic disorders)

Efficiency studies of aphasia therapy

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Investigations of the effect of pharmacological treatment to reduce language decline in cases of progressive aphasia due to neurodegenerative disease are still in its infancy. This chapter aims to review the recent developments in the pharmacological treatment of aphasia and how this may augment language therapy.







Parts of this chapter (pages 407-413):

Stroke: how does it cause language deficits? (Do Neurons Die Immediately?, The Ischemic Penumbra Defined by the DWI/PWI Mismatch, The Diffusion/Perfusion Mismatch in Aphasia, Restoring Language Function by Reperfusion, The Potential for Neuroprotection)

Subacuate (and chronic) stroke: enhancing neural transmission and neuroplasticity

Summary: the state of play of pharmacological intervention in aphasia

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#### Chapter 41: Recovery and Treatment of Acquired Reading and Spelling Disorders

In this chapter, acquired reading and spelling disorders are described with reference to a dual-route model of lexical processing. selected cases of treatment of cognitive reading and writing syndromes – deep, surface and phonological dyslexia and deep, surface and phonological dysgraphia are reported. This is followed by a critical evaluation of the methodology.





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Schematic representation of the structure of the dual-route model of the lexical-semantic system. Introducing Handbook of the Neuroscience of Language

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Parts of this chapter (pages 418-423):

Illustrative cases (Letter-by-Letter Dyslexia (or

Pure Alexia), Deep dyslexia, surface dyslexia, Phonological dyslexia, Deep dysgraphia, Surface (or Lexical) Dysgraphia, Phonological dysgraphia)

Limits of the syndrome-based approach

**Suggested treatment of the lexical components** 







Technology is changing every aspect of our lives. It is therefore not surprising that it should and inevitably will affect all aspects of rehabilitation. In practice this means the use of computer systems for rehabilitation since it is the system as a whole rather than the individual devices that has the effect. Using technology enables the delivery of controlled and targeted treatment, often without the therapist's actual presence. This engages the client as an active partner in the process which can also have beneficial effects on morale and well-being. In addition, new technology enables people with communication disorders to live more fulfilling lives by giving them means by which the negative effects of their impairment are minimized. **This chapter gives an overview of these exciting possibilities.** 





- **Provision of therapy**
- **Computer-based treatment and language**
- **Diagnosis and assessment**
- **Outcome measurement and audit**
- **Alternative communication**
- Support for everyday life







## **Thanks for your attention**



