Theories of Language Comprehension: India and Beyond

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Western Theories of Language Comprehension: Psycholinguistics

Western Theories of Language Comprehension: Psycholinguistics

PSYCHOLINGUISTICS:

- Introduction
- Its emergence and development
- Why is language exclusive to humans?
- Current research areas and methodologies

- **Some preliminary concepts**:

(i) Biological Basis of Language

(ii) Speech Production Vs. Speech Comprehension

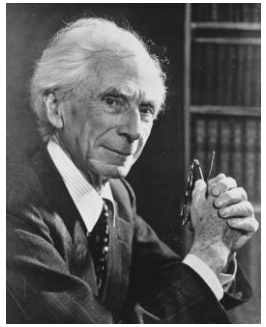
(iii) Speech Comprehension among: Children Vs. Adults, Neurologically healthy Vs. People With Developmental Disorders

(iv) Spoken Vs. Written Language

Introduction to ‘Language’

Human language is creative.

“No matter how eloquently a dog may bark, he cannot tell you his parents were poor but honest…”



Bertrand Russel (1872-1970)

(British philosopher, logician, public intellectual)

Introduction to Psycholinguistics

Psycholinguistics:

- **Interdisciplinary field** of linguistics and experimental cognitive psychology.
- **Goal**: to understand how people acquire, use and comprehend language.
- **Modern area of research**: to study how language is represented and processed in the mind/ brain.
- **Related areas of study**: Developmental psychology, cognitive psychology, neurolinguistics, speech science, etc.

Extra:
- The first book 'Cognitive Psychology' was written by Ulric Neisser in 1967.
- Neurolinguistics started in the 19th C with the finding that aphasia is a result of brain damage.

Psycholinguistics: Goal

Linguistic Competence

Language in the human brain/ mind (Innateness)

Linguistics describes Linguistic Competence.

Linguistic Performance

Linguistic Performance: ***Use*** of the innate language for actual use

Psycholinguistics: Describes Linguistic Performance

Psycholinguistics: Areas of Research

Mia went to the college first then to the theatre. However, she couldn't make it in time. Because her professor wanted to have a meeting in between. She missed the first half.

Language pairs SOUNDS and MEANING by following:

(i) **Phonological Rules**: Sound patterns of the language, to create words. [Coded in the language with rhythm and intonation of speech]

(ii) **Morphological Rules**: Help in creating derivative words. [Coded in the language with spaces, pauses…]

(iii) **Syntactic Rules**: Help in creating structured sentences (relationship between words and phrases in sentences). [Only a psychological reality]

(iv) **Pragmatic Rules**: Help in creating a structured paragraph/ discourse (relationship between two or more sentences) [Sometimes coded in the language, sometimes psychological]

Psycholinguistics: Areas of Research

It is a fundamental concept in Psycholinguistics that **the meaning of a sentence is a function of the meaning of individual words** and how those words are organized structurally.

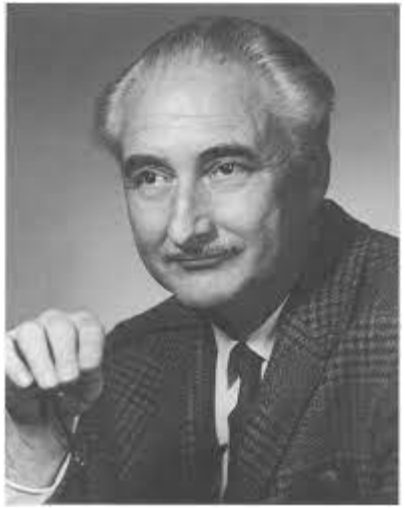
Thus, to understand human mechanism of language processing, we have to understand **Word processing** mechanisms first, then **Sentence** and **Discourse Processing** mechanisms.

Psycholinguistics: Emergence and Development

1951: Meeting of the Social Science Research Council at Cornell University, formed a committee on Linguistics and Psychology, with the chairperson Charles Osgood.

Inception of the field 'Psycholinguistics' (Methods in psychology can be used explore and explain linguistic structures.)

1953: The second seminar was held at Indiana Univ. by Linguistic Institute. The first book by Charles Osgood and Thomas Sebeok was discussed. It is later published in 1954: '***Psycholinguistics: A Survey of Theory and Research Problems'.***



Charles Osgood (1916-1991) [American psychologist, Prof at the University of Illinois]

Not everyone was fond of the term. One of the participants at the first conference, Roger Brown, complained that a "psycholinguist" sounded more like a *deranged polyglot* than a psychologist interested in language.

Psycholinguistics: Emergence and Development

1957: BF Skinner wrote '*Verbal Behavior*'.

Speech act is considered as a response to different environmental stimuli= Behaviorism.

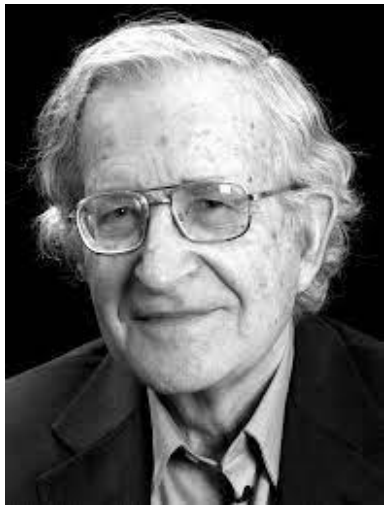
Proposed Conditioning Theory.

1959: Noam Chomsky (1928-)(American linguist) Wrote a review of '*Verbal Behavior*'. Proposed the idea of 'set of rules in the mind' should be the topic of study.

1962: '*Journal of Verbal Learning and Verbal Behaviour*' started.

1965: Chomsky wrote the book **'Aspects of The Theory of Syntax'.** Proposed the concept of 'Transformational' or 'Generative Grammar'

innate ability



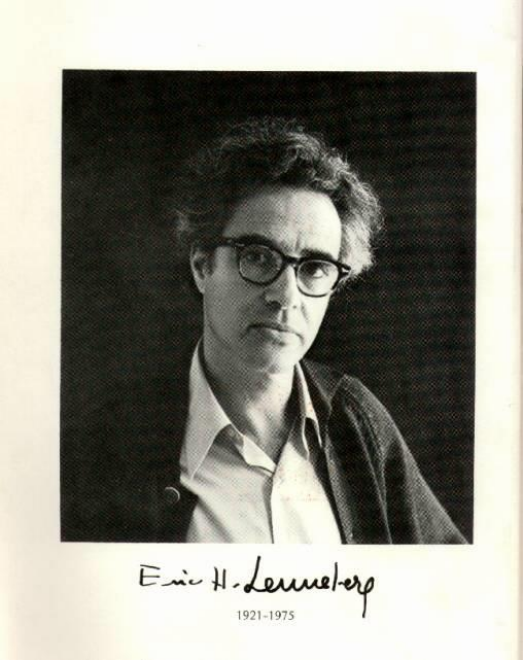
Psycholinguistics: Emergence and Development

1967: Eric Lenneberg (linguist and neurologist) published the book 'The Biological Foundations of Language'.

He argued that language was an example of biologically controlled behavior, comparable to walking or sexual behavior.

Just as normal children all over the world sit, stand, and walk at around the same time, similarly, at a certain stage in an individual's development, language is scheduled to emerge, provided that the surrounding environment is normal.

(He drew evidence from aphasia, studies of delayed language development for example, mental retardation, and the available neurophysiological information.)



Psycholinguistics: Emergence and Development

1965: George Miller (1920-2012) (American psychologist) Developed experimental methods and mathematical models to analyse speech and language. He was aware of the implications of Chomskyan ideas on psychology.

Earlier in 1956, he authored *'The Magical Number Seven, Plus Or Minus Two'*. (Introduced the idea of *'chunking'*.)

By 1986, he entered into Cognitive Science

Psycholinguistics: Emergence and Development

European Connection

The emergence of psycholinguistics can also be found in **Philosophy** as argued by some scholars.

427-347 BC: **Plato:** brain as the seat of intelligence. In his *Theory of Concepts,* he explains our 'innate' concepts come from our mysterious contact with the world of ideal forms.

His student, **Aristotle** (384-322 BC) considered heart as the seat of memory.

Plato's view is based on 'Cephalocentrism' proposed by Pythagoras, that soul resides in the brain and is immortal. Aristotle's view comes from the ancient Egyptian belief that heart is the house of thought and soul. It is also known as 'Cardiocentric Hypothesis'.

Psycholinguistics: Emergence and Development

European Connection

1879: **Wilhelm Wundt** established the first laboratory for psychological research at The University of Leipzig. He believed that it was possible to investigate mental events such as sensations, feelings, and images by using procedures as rigorous as those used in the natural sciences.

Moreover, Wundt believed that the study of language could provide important insights into the nature of the mind.

In 1900: He wrote '*Die Sprache*' (The Speech/ Language).

He is called 'Master Psycholinguist.'

He regarded sentence, not a word, as the primary unit of language.

He explained the speech production as the transformation of a complete thought process into sequentially organized speech segments.

Wilhelm Wundt (1832-1920)
German Physiologist and Philosopher

Psycholinguistics: Emergence and Development

European Connection

1901: **Berthold Delbrück** (German linguist) noted that linguists should work independent of psychologist. (In 1933, Leonard Bloomfield [An American Linguist] in his '*Language*' states: "we can pursue the study of language without reference to any one psychological doctrine…")

1916: Book '*Structure*' by **Ferdinand De Saussure** (French Linguist). Introduced the dichotomy of a language for the first time, i.e. the Concepts of *Langue* (abstract rules and conventions) and *Parole* (actual usage of an individual speaker).

1921: **Ludwig Wittgenstein** (Austrian-British Philosopher) wrote *Logisch-Philosophische Abhandlung* (Logical-Philosophical Treatise, a 75-page book). It deals with the relationship between language and reality. He aims to define the limits of science.

Psycholinguistics: Emergence and Development

Emergence and Development in the World

"There were flourishing traditions in Mesopotamia, China, the Arabic speaking world, ancient Greece, and, perhaps most notably, India, in the study of grammar, broadly construed. In some of these traditions, but not all, the link between the study of language and the study of logic was strong…" (p.2)

- 'Handbook of Psycholinguistics', Ed.II,

Traxler and Gernsbacher, 2006, Elsevier

Psycholinguistics: Emergence and Development

Research Methods

Psycholinguistics: Emergence and Development

Pre-19th century: Observational Methods

Among some earliest empirical studies in psycholinguistics, **babies were brought up in isolation** to discover what language they start speaking:

- ✓ by the Egyptian Pharaoh Psamtik (Psammetichus) (7th BC) who found that they spoke Phrygian (mentioned in the '*Histories*' [Vol II] written by a Greek historian Herodotus),
- ✓ by a German king Frederick II (1194-1250 AD) where all infants died (as recorded by the monk Salimbene di Adam in his '*Chronicles*'),
- ✓ by King James IV of Scotland (1473-1513 AD) where he discovered that children spoke Hebrew (later, it is believed that such a study was never conducted) (Two children were raised by a mute woman alone on an island),
- ✓ by Akbar the Great (1542-1605 AD) where he failed to discover 'man's natural language', but children had learned some kind of sign language. (Wanted to prove that children will not learn to speak if they are kept in isolation.)

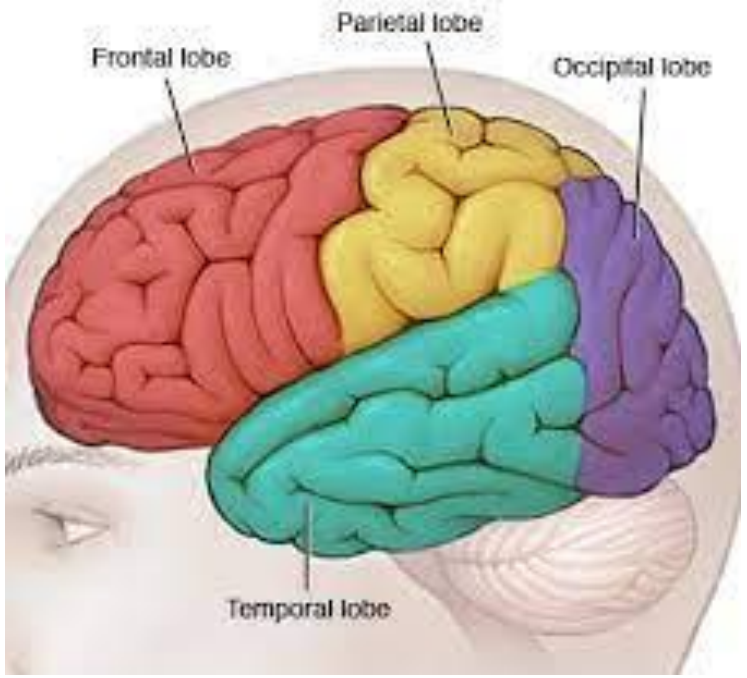
Psycholinguistics: Emergence and Development

19th century: Observational Methods

The first systematic study of the language-brain relationship was conducted in the 19th Century.

1847- First-time use of an observational study of a man called **Phineas Gage.** His language abilities were intact even if his front, left part of the brain was damaged. Researchers argued that this part of the brain is not the most used part in language skills.

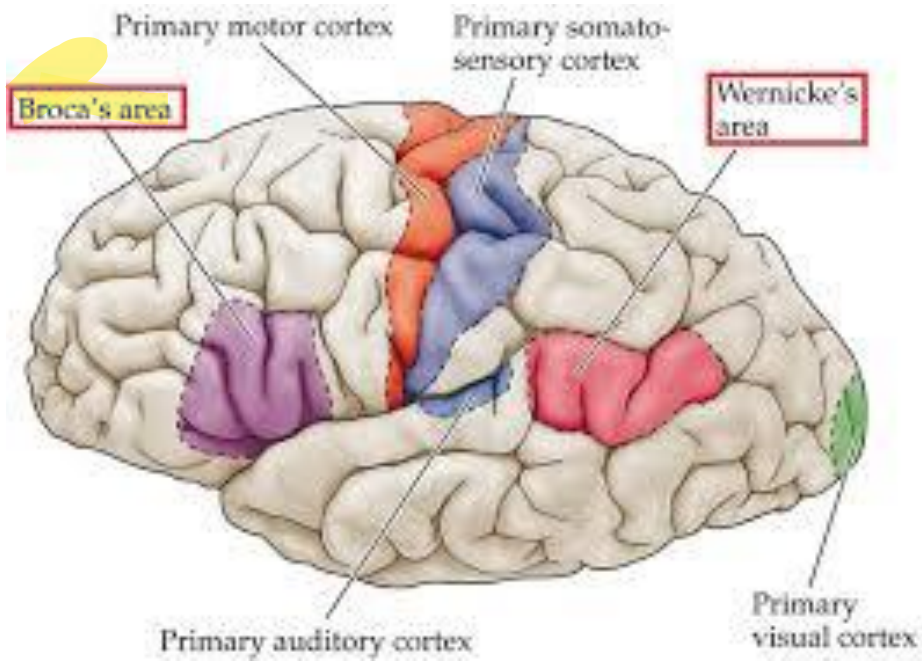
Skull is preserved in the Warren Anatomical Museum, Boston



Psycholinguistics: Emergence and Development

19th century: Observational Methods

- 1867- **Paul Broca** (a French surgeon) has noticed the post-mortem report of two patients who had had severe speech defects having remarkable damage to their left frontal part of the brain. This area of the brain is crucially involved in the language. Today, this part is known as **Broca's area**.
- **Broca's Aphasia** that consists of content words but lack syntactic and morphological structure is known as 'agrammatism'. This was the first conclusive demonstration of localization of the language in the brain.

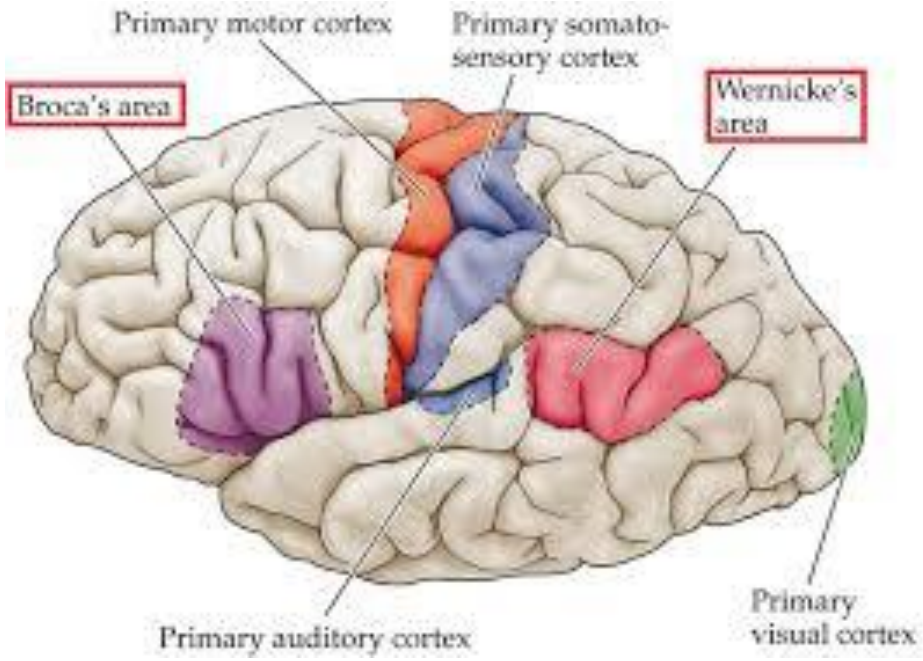


Paul Broca

Psycholinguistics: Emergence and Development

19th century: Observational Methods

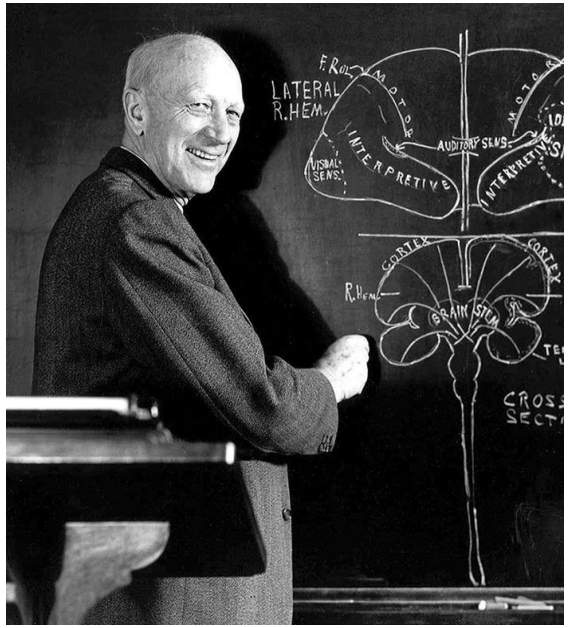
- 1877- **Carl Wernicke** (a German neurologist) had reported a different kind of aphasia, simply known as '**Wernicke's aphasia**' of the patients that have grammatically fluent but incomprehensible or meaningless speech. (Converse to Agrammatism)
- The part in the temporal lobe (just above the ear) that is responsible for language development is known as **Wernicke's area**.



Carl Wernicke

Psycholinguistics: Emergence and Development

20th century: Experimental Research



Wilder Penfield (1891-1976)
American-Canadian Neurosurgeon

1950s: The first use of experimental research.

Pioneered by two Canadian surgeons: Wilder Penfield and Lamar Roberts

1959: They were motivated to remove the abnormally functioning brain cells in patients with epilepsy. They found that if a particular area in the brain is electrically stimulated, the **speech production of that patient is temporarily interfered** and the patient is briefly unable to speak.

Later, both authored a book *'Speech and Brain Mechanisms'* (1959).

Psycholinguistics: Emergence and Development

20th century: Experimental Research

1970s:

- Advancements in technology (especially due to the advents of computers in 1950s)
- Gave rise to advancements in statistics, mechanical and other allied fields…
- Different techniques have been incorporated: Neuro-imaging, computational…
- They give time-to-time information about the processing in the brain.
- Some methods are: EEG, PET, ERP, fMRI, Eye-tracking, Pen-paper Method

Psycholinguistics: Emergence and Development

Experimental Methods

EEG: 'Electroencephalograph'

In this method, electrodes are attached to the scalp at different locations. (Non-invasive Method)

Active neurons in the brain emit the **electrical activity** when they are at work. This activity is measured via electrodes.

The measures in this method are the timing, the positive or negative direction/ polarity, the amplitude of the voltage, and the general location of these observed effects, which then are mapped to the given stimuli.

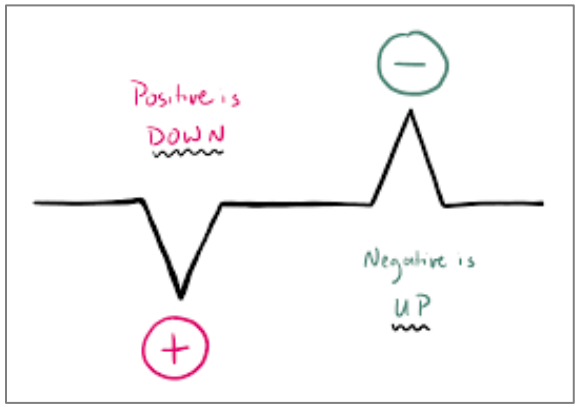
True Online Method (Gives millisecond by millisecond results)

Has a good temporal resolution, but poor spatial resolution.

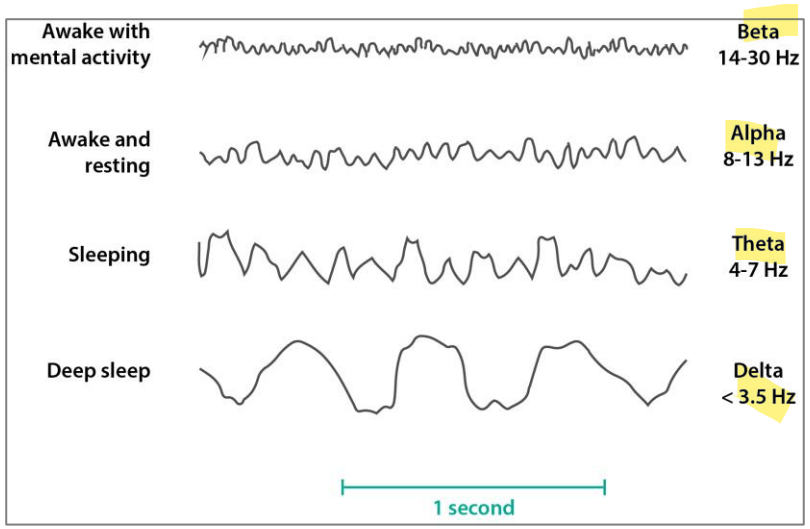
Psycholinguistics: Emergence and Development

Experimental Methods

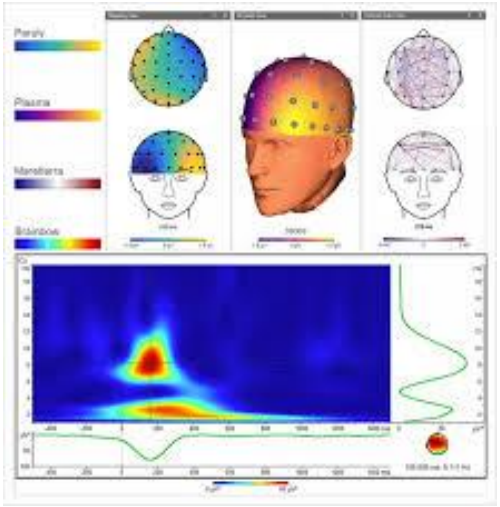
EEG: ‘Electroencephalograph’



Positive and Negative Polarity



Amplitude (Size or intensity) and Frequency (Speed or quantity) of Voltage



Timings and Location in brain

Psycholinguistics: Emergence and Development

Experimental Methods

ERP: 'Event-Related brain Potentials'

In this method, electrodes are attached to the scalp similar to EEG. **Potentials or changes in the electrical patterns (positive or negative polarity)** incurred due to different types of *linguistic contrasts* are measured. (Non-invasive Method)

For the last twenty years, researchers have been using ERP method to study both syntax and semantic aspects of language.

True Online Method (Gives millisecond by millisecond results)

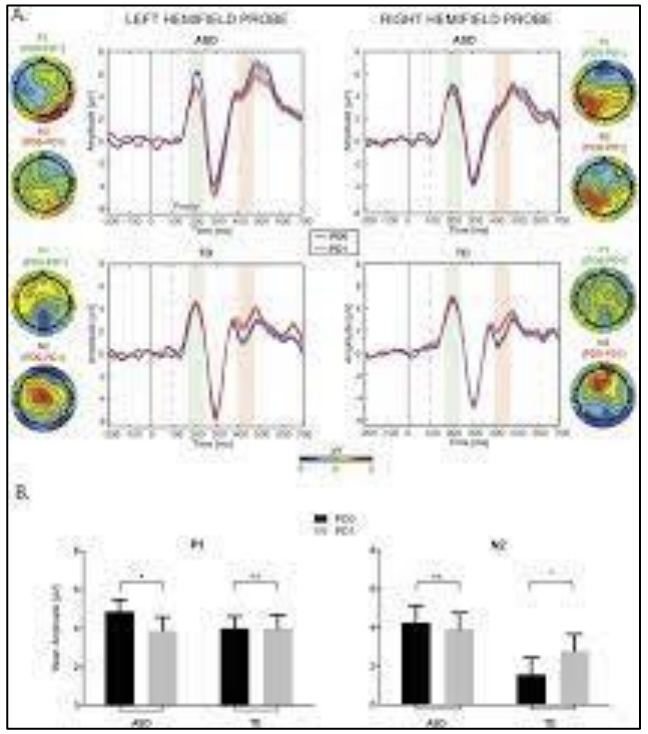
Has a good temporal resolution , but poor spatial resolution.

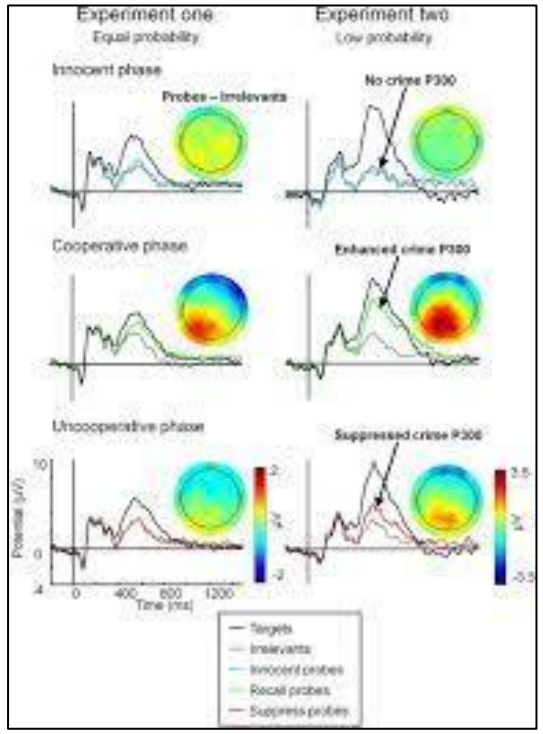
Psycholinguistics: Emergence and Development

Experimental Methods

ERP: ‘Event-Related brain Potentials’

Data output of contrastive stimuli:





Psycholinguistics: Emergence and Development

Experimental Methods

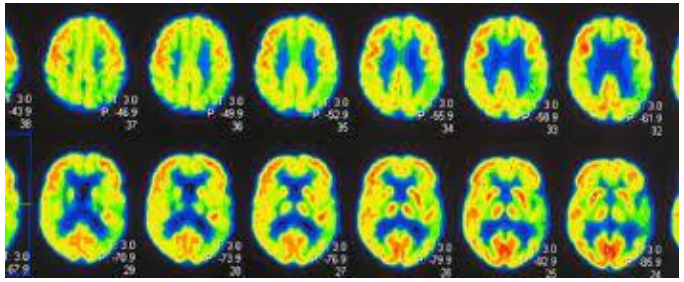
PET: 'Positron Emission Tomography'

Based on the **blood flow in the brain.** When a performer processes a difficult task in language, the activities of the brain are captured. (Non-invasive Method)

Glucose is injected in the body. While performing cognitive tasks, brain uses most of the energy. Hence, glucose ends up showing up in the particular brain regions. If the glucose has isotopes that are radioactive, their emission can be detected in the brain. It is transformed in the images by using tracers.

True Online Method (Gives millisecond by millisecond results)

Has a good spatial resolution.



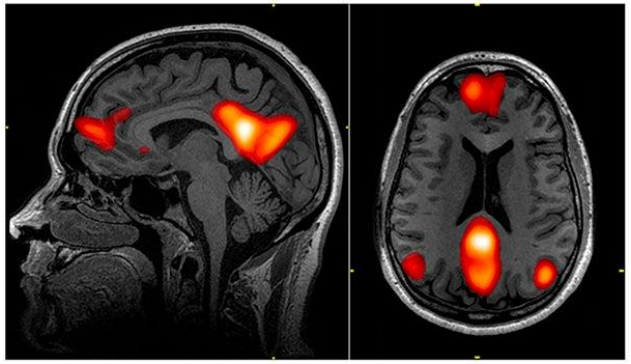
Psycholinguistics: Emergence and Development

Experimental Methods

fMRI: 'Functional Magnetic Resonance Imaging'.

It employs powerful electromagnets to affect **hydrogen atoms** inside the human brain. The atomic nuclei of hydrogen atoms are able to absorb radio frequency energy when placed in a magnetic field. (Non-invasive Method)

Different contrasts between the brain tissues can form based on the properties of their hydrogen atom while performing cognitive tasks. Thus **cross-sectional images** (or slices) of the brain are obtained. They provide the topographical details of the several areas in the brain that are specialized for different aspects of language.



True Online Method (Gives millisecond by millisecond results)

Has a good spatial resolution.

Psycholinguistics: Emergence and Development

Experimental Methods

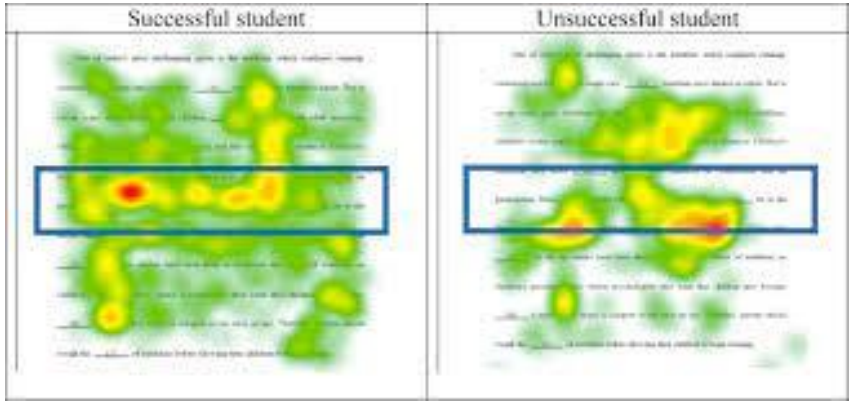
Eye-tracking Method:

"The eye is the window into the brain."

The **Eye-Mind Hypothesis:** "Human brain processes the word eyes fixate on." (Just and Carpenter, 1980)

Eye Movement behavior can be used to infer cognitive processes.

Online Method (Oculomotor activities are mapped time-to-time, but Cognitive processing in the brain is inferred later.)



Psycholinguistics: Emergence and Development

Experimental Methods

Eye-tracking Method: Different Eye Movements across the text:

1. **Saccades**: *Linear eye-movement* across the text. (For English, left to right)
2. **Backtracking/ Regressions**: Sometimes, reader goes back to re-read the word/ sentence… *Going back and re-reading* is known as Regression. Indicates failure in comprehension or requirement of more processing. Longer regressions suggest syntactic processing fails. Shorter regressions indicate lexical ambiguity.
3. **Fixations**: *Looking at a word for 100-500 milliseconds* while reading. Attention and fixation are obligatory coupled. More cognitive load leads to more fixation duration. Some variables that affect fixations are: word predictability, word frequency, length of the word, number of meanings of a word, period of language acquisition, etc.
4. **Skips**: Some words are skipped (*not read/not fixated upon*) while reading. Human brain does not read each and every word. Predictable target words, short words, more frequent words, and function words are skipped more than the semantically loaded, long, compound… words.

Psycholinguistics: Emergence and Development

Experimental Methods

Eye-tracking Method:

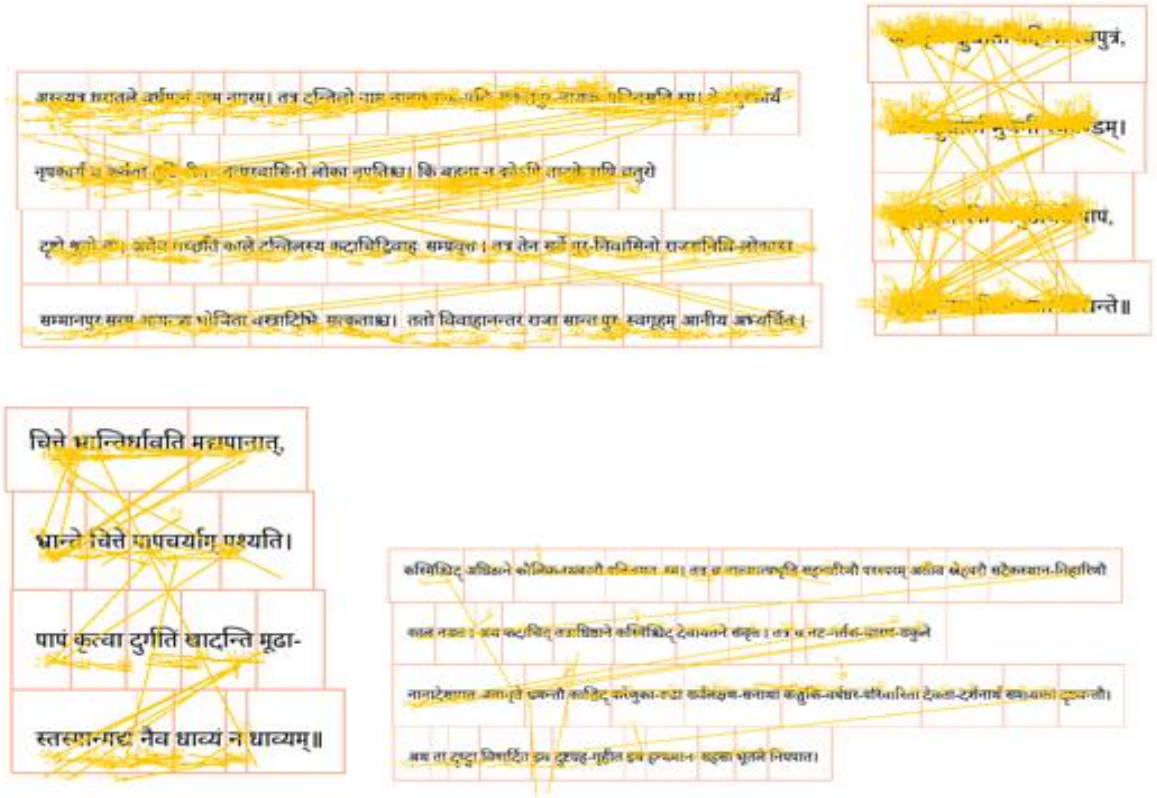
Different Eye Movements across the text:

Saccades:

(From left to right, top to bottom)

On Prose Vs. Poetry,

On Manipulated Poetry Vs. Manipulated Prose



Psycholinguistics: Emergence and Development

Experimental Methods

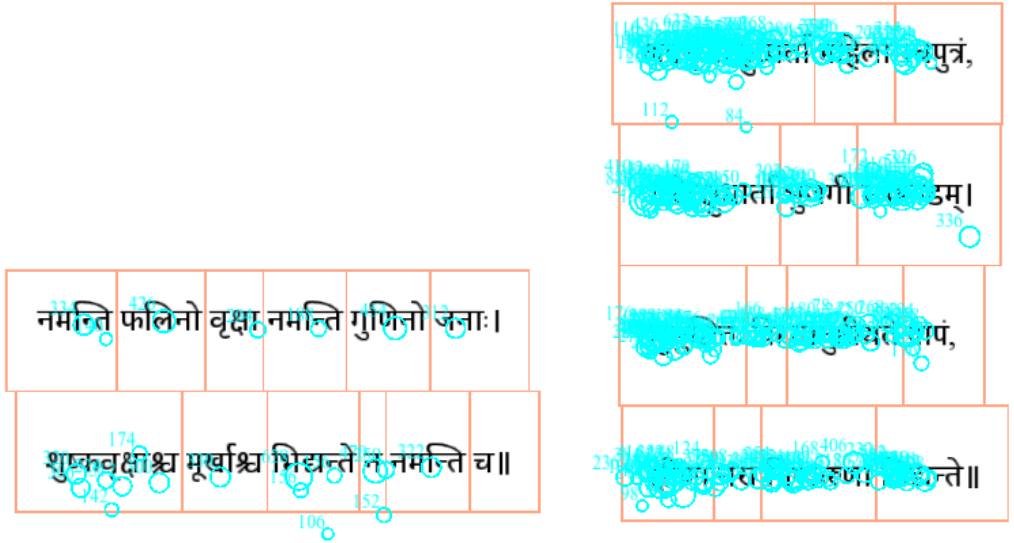
Eye-tracking Method:

Different Eye Movements across the text:

Fixations:

(From left to right)

On Original Vs. Manipulated Poetry



Psycholinguistics: Emergence and Development

Experimental Methods

Eye-tracking Method:

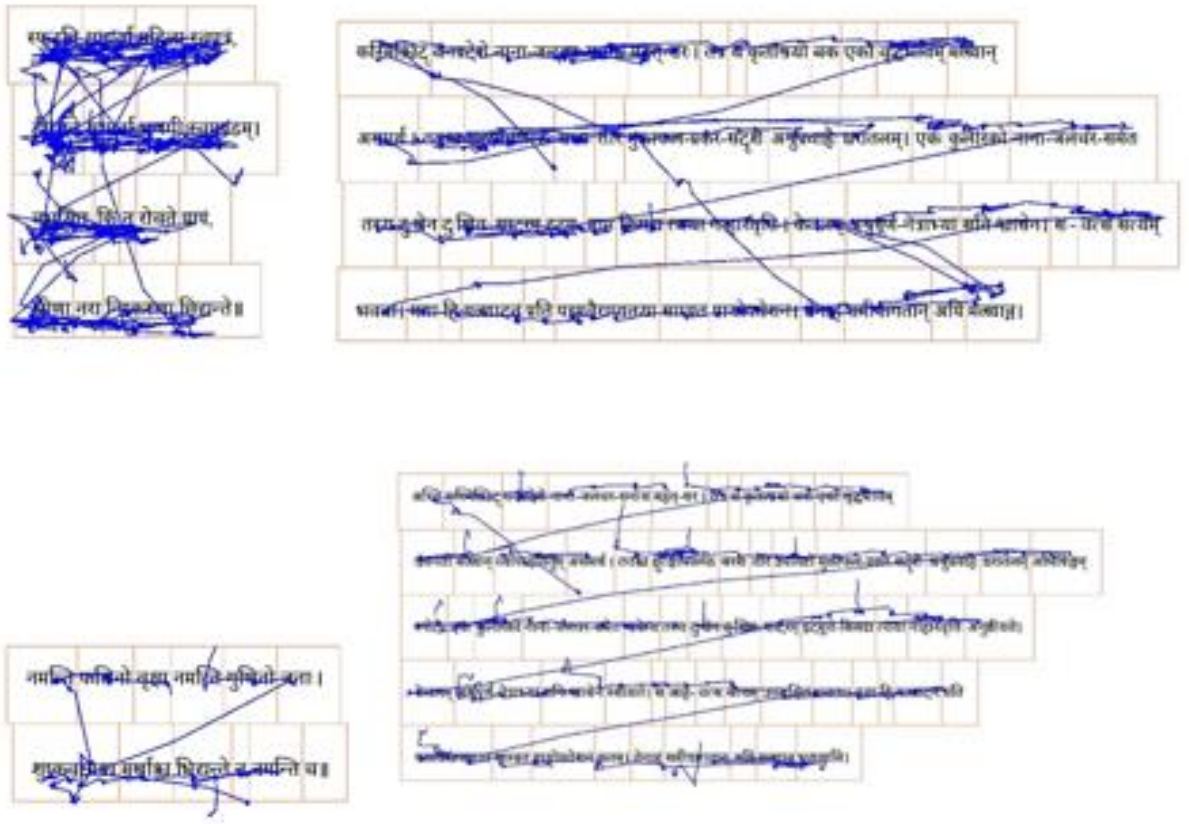
Different Eye Movements across the text:

Regressions:

(From left to right, top to bottom)

On Poetry Vs. Prose,

On Original Poetry Vs. Manipulated Prose



Psycholinguistics: Emergence and Development

Experimental Methods

Pen-Paper Method OR Paper-Pencil Questionnaire

The oldest, the most established, and widely-used method.

Tasks: Grammaticality judgment tasks, thematic role assignment tasks, object naming tasks, and so forth.

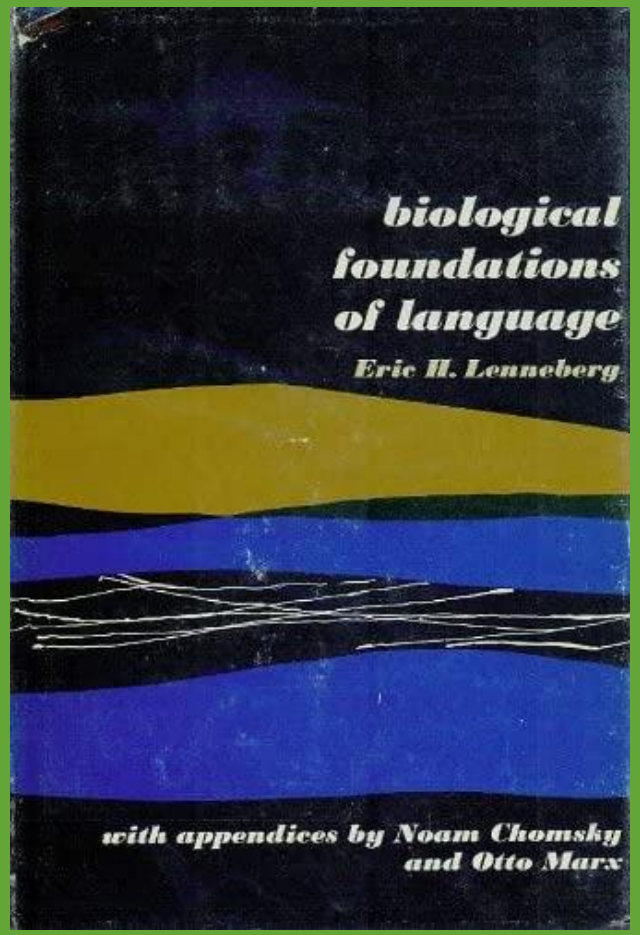
Measures: Oral feedback, recognition and reproduction of the message, ratings, correctness of the response, time measurements, and some other physiological responses such as laughter, fear, minute eye movements...

Even though, this method does not provide real-time comprehension measures, it is widely used to test already-established theories.

Offline Method (No brain activities are captured in real time. Processing is inferred after participant has performed a task, based on their responses.)

Some Preliminary Concepts

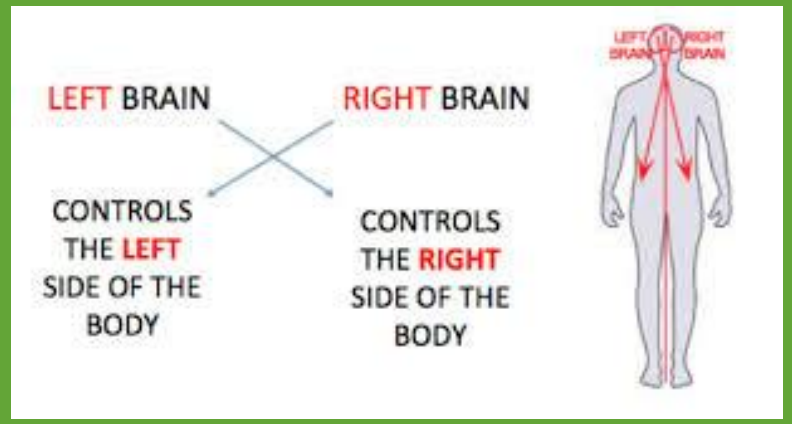
- Biological Basis of Language
- Speech Production Vs. Speech Comprehension
- Speech Comprehension among: Children Vs. Adults
- Spoken Vs. Written Language



Biological Basis of Language

Eric Lenneberg's Five Criteria:

1. **No other species** has a communication system like the language used by humans.
2. A biological system must be **universal** to all members of the species.
3. A biological systems consists of processes that are **differentiated (develop) spontaneously** as the individual matures.
4. Certain aspects of behaviour emerge only during **infancy**.
5. There is the necessity of **stimulation from and interaction with the environment**. Certain biological systems will not develop without environmental stimuli to trigger them.



- Body is **contra-lateral** = the right side of the body is controlled by the left side of the brain, and vice versa.
Mostly, left-handed people's language is lateralized in the right hemisphere.

- In cases of left brain damage, right hemisphere can process rudimentary lexical information, but it is mute in cases of phonological, morphological and syntactic form of language.

Biological Basis of Language

Anatomical and Physiological Correlates of Language

- **Phrenology=** Study of different areas of the brain as location of various abilities (such as wisdom, music, morality, language…). The field is developed by Franz Joseph Gall (18th Century, Neuroanatomist)

- **Neurolinguistics=** Language is represented in the brain. Developed by Paul Broca and Carl Wernicke (19th Century)

- **Language Lateralization**= the language function is located in one of the two hemispheres.

In the left hemisphere: for most of the population

In the right hemisphere: in some people

In both hemisphere: in a small percentage of people

Speech Production:
Encoding message

Speech Comprehension:
Decoding message

Both are mirror processes.

Speech Production Vs. Speech Comprehension

Most of the studies in psycholinguistics have been concerned with speech production because production studies are easier to do.

The product of the speech production process is something that can be directly observed while the product of the comprehension process, i.e. meaning, cannot.

"…comprehension can only be inferred on the basis of relevant behavior. Needless to say, this is very difficult."

(Steinberg and Sciarini, 2013, p. 25).

The **speed of conversational speech** varies by many factors:

- **Age** (younger people speak faster than older people),
- **Sex** (men speak faster than women),
- **Nativeness** (native speakers are faster than second language speakers),
- **Topic** (familiar topics are talked about faster than unfamiliar ones), and
- **Utterance length** (longer utterances have shorter segment durations than shorter ones).

_Fernandez, 2019 (p. 167)

Speech Production Vs. Speech Comprehension

Speech Production Model

By William Levelt, 1989

Step 1: **Preverbal Message**= Speaker's intention to communicate the idea

Step 2: **Lexical Selection**: Consulting lexicon

Step 3: **Morpho-Syntactic and Semantic coding**: Consulting grammar

Step 4: **Speech**: Linguistic representation of the idea in form of sounds (speech signal that is fluent, at an appropriate rate, and with a suitable prosody)

This process happens rapidly and unconsciously.

Speech Production Vs. Speech Comprehension

Speech Comprehension (Introduction only)

Step 1: Speech perception/ recognition from the acoustic signals

Step 2: Phonological representation

Step 3: Lexical access/ retrieval

Step 4: Structural and Semantic decoding

Step 5: Create a syntactic representation (Parsing)

Step 6: Reconstructing the structural organization of the words

‘**Critical Age Hypothesis**’: Early acquisition of language gives native-like proficiency. It is known as ‘**sensitive period**’.

The period between age two to the onset of puberty is one of extreme neural plasticity (Muller, 1996).

Speech Comprehension among: Children Vs. Adults

Regarding Speech Production/ Language Learning: Both children and adult show tremendous difference.

Children, by the age 2 years, start using **extralinguistic evidence** in case they do not know the meanings of the words: such as speaker’s attentional stance, head posture, gaze, etc. that support their word-meaning conjectures.

The 'Mental Fog' viewpoint:

'The child unquestionably perceives the world through a mental fog. But as the sun of experience rises higher and higher these boundaries are beaten back.'

-Chambers (20th C psychologist)

The meanings are necessarily hazy and vague in the early stages, and that they gradually become more precise as children learn to discriminate more finely.

Speech Comprehension among: Children Vs. Adults

'**Observability**' is the technique by which children learn word-meanings. They link the words to world events.

- ✓ The verbs that involve contact (e.g., touch, pat, rub…) are learnt faster than the other verbs.
- ✓ Attitude verbs (e.g., think, want, hope) are acquired later than the other verbs because, these verbs do not have physical correlates. For some children, even at age 4, it is difficult to understand the phrase 'Think well!'
- ✓ Whenever, children encounter a novel verb, they use the knowledge of what kinds of complements the verbs take and their underlying semantics.

(Think [verb]- Thought [object], I [subject], here [substratum], well [adverb], etc.)

- Harrigan, 2016

Writing has existed for a mere 5,000 years compared to spoken language.

The oldest known written language= **Cuneiform**

Invented by Sumerians (around the end of 4th Millennium BCE), Southern Iraq. They kept agricultural records. Clay tokens- denote concepts.

Spoken Vs. Written Language

Language (speech) has anatomical, physiological, and genetic correlates. But reading and writing do not.

Reading and writing:

- ❑ Are cultural artefacts.
- ❑ Species -specific.
- ❑ A child does not have 'innate' rules.
- ❑ Cannot be acquired naturally. Requires training for hours & hours.
- ❑ Not universal in humans.
- ❑ The success in reading and writing are not uniform.
- ❑ Not being able to read and write- does not mean the person has a pathological condition (unlike not being able to speak).

Key Takeaways:

Psycholinguistics:

- Introduction
- Its emergence and development
- Why is language exclusive to humans?:

Sapir-Whorf Hypothesis

- Current research areas and methodologies

Some preliminary concepts:

(i) Biological Basis of Language

(ii) Speech Production Vs. Speech Comprehension

(iii) Speech Comprehension among: Children Vs. Adults

(iv) Spoken Vs. Written Language,

Reading Material: (If you cannot access any link, please search it on Google with the title of the book as keywords.)

1. Fundamentals of Psycholinguistics
Authors: Eva M Fernandez and Helen Smith Cairns (Wiley and Blackwell Publication, 2011)
https://vb.ckfu.org/attachments/e7/303319d1478935761-%C7%E1%DF%CA%C7%C8-%C7%E1%E3%DE%D1%D1-%E1%DA%E1%E3-%C7%E1%E1%DB%C9-%C7%E1%E4%DD%D3%ED-fundamentals-psycholinguistics.pdf

2. **Introduction to Psycholinguistics: Understanding Language Science**
Author: Matthew J Traxler (Wiley and Blackwell Publication, 2012)
https://vulms.vu.edu.pk/Courses/ENG511/Downloads/[Matthew_J._Traxler]_Introduction_to_Psycholinguis(b-ok.xyz).pdf

3. **Psycholinguistics: Language, Mind and World (Second Edition)**
Authors: Danny Steinberg, Hiroshi Nagata, and David Aline (Routledge Publication, 2001)
https://www.pdfdrive.com/psycholinguistics-language-mind-and-world-e185267867.html

4. **An Introduction to Psycholinguistics (Second Edition)**
Authors: Danny Steinberg and Natalia Sciarini (Pearson Longman Publication, 2006)
https://vulms.vu.edu.pk/Courses/ENG511/Downloads/An_Introduction_to_Psycholinguistics.pdf

5. **The Articulate Mammal: An Introduction to Psycholinguistics (Fifth Edition)**
Author: Jean Aitchison (Routledge Publication, 2008)
http://linguistics3.pbworks.com/w/file/fetch/60648261/Articulate%20Mammal%20by%20Jean%20Aticheson.pdf

Extra :

If you have more interest:

1. ‘Research Methods in Psycholinguistics’ (https://opentextbc.ca/psyclanguage/chapter/research-methods-in-psycholinguistics/)
2. Behaviorism of BF Skinner (Wikipedia: https://en.wikipedia.org/wiki/B._F._Skinner)
3. Noam Chomsky’s work (Wikipedia: https://en.wikipedia.org/wiki/Noam_Chomsky)
4. Wernicke’s Area (Wikipedia: https://en.wikipedia.org/wiki/Wernicke%27s_area)
5. Broca’s Area (Wikipedia: https://en.wikipedia.org/wiki/Broca%27s_area)
6. The case of Phineas Gage (Wikipedia: https://en.wikipedia.org/wiki/Phineas_Gage)
7. The Magical Number Seven, Plus or Minus Two (Wikipedia: https://en.wikipedia.org/wiki/The_Magical_Number_Seven,_Plus_or_Minus_Two)
8. What is EEG and how does it work? https://www.ncbi.nlm.nih.gov/books/NBK390346/
9. Difference between EEG and ERP https://www.tutor2u.net/psychology/reference/biopsychology-studying-the-brain-electroencephalogram-event-related-potentials-electroencephalogram

Extra :

For general understanding of the field of Psycholinguistics, you may read any of the following:

1. General Information: https://www.encyclopedia.com/literature-and-arts/language-linguistics-and-literary-terms/language-and-linguistics/psycholinguistics
2. Brief Information: https://www.britannica.com/science/folk-psychology
3. Cursory Information of different topics: https://www.sciencedirect.com/topics/neuroscience/psycholinguistics
4. Definition, Description, and Links to Other Articles: https://link.springer.com/referenceworkentry/10.1007/978-0-387-79061-9_2296#Sec2_2296

Sample Questions :

Will be shared separately.