INTRODUCTION TO PSYCHOLINGUISTICS

WEEK 1
BASIC CONCEPTS
What is Psycholinguistics?

Psycholinguistics is an interdisciplinary field of study in which the goals are to understand how people acquire language, how people use language to speak and understand one another, and how language is represented and processed in the brain.
The Creativity of Human Language

• Language is a system that allows people immense creativity.
• We can use language to communicate anything we can think of.
• Language is used to communicate, to interact socially, to entertain, and to inform.
Language as Distinct from Speech, Thought, and Communication

• In ordinary circumstances language is used to convey thoughts through speech. It is a special system, however, that functions independently of speech, writing, thought, and communication.
Some Characteristics of the Linguistic System

- Language is a formal system for pairing signals with meanings. This pairing can go either way.
- When people produce a sentence, they use language to encode the meaning that they wish to convey into a sequence of speech sounds. When people understand a spoken sentence, language allows them to reverse the process and decode a speaker’s speech to recover the intended meaning.
**Figure 1.1** Language is a system that connects signals (the sound wave on the right, symbolizing speech) and meanings (the light bulb on the left, symbolizing an idea). In the figure, the signal is acoustic, a speech sound. The signal could take on other forms (it could be written, it could be gestural).
• The linguistic system that enables sound and meaning to be paired contains a complex and highly organized set of principles and rules.
• The set of rules that creates sentences in a language is a language’s grammar, and the words of a language are its lexicon.
• Knowing a language involves knowing its grammar and lexicon. Knowledge of such a system will give a speaker the ability to organize ideas into words and sentences, and sentences into sequences of sounds.
This special kind of knowledge is called tacit (or implicit) knowledge, to distinguish it from explicit knowledge, such as your knowledge of a friend’s telephone number.

Tacit knowledge is represented in the brain and is put to use, in this case, in the production and comprehension of sentences, but is not consciously available to the individual who possesses it.
Descriptive vs. Prescriptive Grammar

• Prescriptive Grammar is a standardized use of language, the form of a language that is accepted in academic and business circles.

• Descriptive Grammar is the language system that underlies ordinary use.

• Compare:
  1. Me and Mary went to the movies
  2. Mary and Me went to the movies
  3. *Me went to the movies
The Universality of Human Language

• All human languages have a grammar and a lexicon. The fact that all humans have languages of similar organization and function strongly suggests that language is part of the human biological capital.

• Linguists are interested in understanding what is specific and what is universal, not only about knowledge of language but also about the mechanisms that put that knowledge of language to use.

• The majority of the world’s population is bilingual or multilingual, and most of the world’s children grow up in environments that expose them to multiple languages.
Implications for the Acquisition of Language

- Language acquisition is more similar to the acquisition of other skills that develop in early childhood, such as walking, than it is to skills that are learned later in life, such as riding a bicycle.

- The rapid, effortless, and natural acquisition of language by children is likely a result of the fact that language is a faculty of the human brain. As the brain develops, it organizes the language the child is exposed to in ways that are common to all humans.

- This picture is complicated somewhat by second language acquisition after early childhood, because learning a language as a teenager or as an adult is perceived as being very difficult, especially compared to the ease with which we learned our first language.
How Language Pairs Sound and Meaning

• In any human language, the principles and rules of the grammar organize words from the lexicon into sentences used to convey meaning. Three kinds of rule systems make up a grammar: Phonological rules, Morphological rules, and syntactic rules.

• 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.

• Example:
Linguistic Competence vs. Linguistic Performance

• A grammar and a lexicon are those components of language that allow sounds and meanings to be paired.

• **Linguistic competence** refers to the knowledge of language that is in a person’s brain (or mind), knowledge that provides a system for pairing sound and meaning.

• **Linguistic performance**, in contrast, is the use of such knowledge in the actual processing of sentences, by which we mean their production and comprehension.
Steps involved in encoding by the speaker (left to right) and decoding by the hearer (right to left).
• Exchanging ideas using speech is so commonplace that people never think about the complex cognitive processes that underlie that experience.

• Like the complex processes underlying most of the activities of living – walking, breathing, sleeping – the activities involved in the production and perception of sentences are completely unconscious.
The Speech Signal and Linguistic Perception

• The speech signal must contain enough information for the hearer to reconstruct the abstract structures that eventually convey the abstract ideas, and that reconstruction is essential to the decoding process.

• Perceiving a linguistic representation based on the stimulus of a speech signal requires the hearer to have linguistic competence.

• Knowledge of language is necessary for a person to reconstruct, and therefore perceive, the phonological representation for the speech signal, which then unlocks the sequence of words and in turn gives way to building the syntactic structure for the sentence.
Discussion

• What are the two types of linguistic creativity that give us insight into the nature of human language?

• Why are linguists interested in describing rather than prescribing grammar?

• Why might some people think that one speech style or dialect is better than another? Is this a psycholinguistic issue or a social issue? Why?

• What is the distinction between linguistic competence and linguistic performance?
References


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WEEK 2
THE NATURE OF LINGUISTIC
COMPETENCE
• Knowledge of the grammar and lexicon of a language constitutes a person’s linguistic competence.

• A solid understanding of how language is acquired, produced, and perceived is not possible without at least a basic grasp of what exists in the competence repositories.
The Speech Signal

• The human vocal tract can articulate a great many sounds, only a subset of which is used across the world’s languages.

• Speech sounds are studied from two different general perspectives: articulatory phonetics is concerned with how the vocal tract is configured when a particular speech sound is made; acoustic phonetics is the study of the characteristics of the sound wave associated with a particular speech sound.
Articulators:
A. Lips (bilabial sounds)
B. Teeth (labiodental and dental sounds)
C. Alveolar ridge (alveolar sounds)
D. Hard palate (palatal sounds)
E. Velum, soft palate (velar sounds, and nasal/oral distinction)
F. Larynx, vocal folds, glottis (glottal sounds)
G. Tongue

Cavities:
1. Pharyngeal
2. Oral
3. Nasal
• A specific human language has an inventory of speech sounds that is itself a subset of the many sounds used by all the world’s languages. The inventory of speech sounds for a given language is the language’s **phonetic inventory**.

• The classification of speech sound based on their articulatory properties (how they are produced): (1) voicing; (2) manner of articulation; (3) places of articulation
The Phonological Component

• Minimal Pairs
• Complementary Distribution
• Syllable
• Prosody
The Morphological Component

- Morpheme
- Bound vs. Free Morphemes
- Inflectional vs. Derivational Morphemes
The Syntactic Component

- Simple structure
- Complex structure
- Movement
- Pronominal Reference
Metalinguistic Awareness and the Psychological Reality of Linguistic Structure

• **Metalinguistic awareness** is the ability you have to think consciously about language and linguistic objects (sounds, words, sentences) apart from their use in ordinary communication.

• Linguistic competence constitutes knowledge of language, but that knowledge is tacit, implicit. This means that people do not have conscious access to the principles and rules that govern the combination of sounds, words, and sentences; however, they do recognize when those rules and principles have been violated.
• The ability to judge such violations constitutes an important aspect of metalinguistic skill. If you can judge when a principle or rule has been violated, you can be sure that it is mentally represented somehow.

• For example, when a person judges that the sentence “John said that Jane helped himself” is ungrammatical, it is because the person has tacit knowledge of the grammatical principle that reflexive pronouns must refer to an NP in the same clause.
• Another kind of metalinguistic skill is involved in perceiving the ambiguity of sentences.

• The perception of global structural ambiguity – that is, that a sentence can have two different meanings based on two alternative structures – illustrates the psycholinguistic information that can be obtained from metalinguistic judgments.

• Example: The man saw the boy with the binoculars
The Lexicon

- Linguistic competence includes knowledge of a lexicon, as well as knowledge of a grammar.
- The lexicon is essentially an internalized dictionary consisting of all the words a person knows and the linguistic information connected with each.
Representing the meaning of words

• A lexical entry includes information about the word’s essential meaning. This is the word’s **lexical semantics**.
  > The meaning of a word will consist of those elements required to distinguish the word from other words, the semantic information all speakers of a language are assumed to share.

• Lexical entries also contain information about a word’s selectional restrictions.
  > These are restrictions on what words can be combined with one another.
Representing the grammatical properties of words

• In addition to storing information about the meanings of words, the lexicon contains a great deal of information about the grammatical properties of words.
• Content words vs. Function words
• Words with grammatical gender in languages such as Spanish and German
• Mass Nouns vs. Count Nouns
• Intransitive verbs vs. transitive verbs
Lexical ambiguity

• Many words are multiply ambiguous
• Many ambiguous words are not only ambiguous in meaning, but in form class as well.
  – The word *bat*, for instance, can be a noun that is a flying mammal or a noun that is a piece of baseball equipment. *Bat* can also be a verb indicating the movement that a cat makes when it plays with a piece of string, and *bat* is used for a specific movement made by eyelashes.

• When people produce and understand sentences, they will encounter not only structural ambiguity, but also lexical ambiguity
References


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WEEK 3
THE BIOLOGICAL BASIS OF LANGUAGE
Criteria Determining whether a system is based in the biology of a species (Lenneberg, 1967: 371-374):

1. Its cognitive function is species specific
2. The specific properties of its cognitive function are replicated in every member of the species
3. The cognitive processes and capacities associated with this system are differentiated spontaneously with maturation
4. Certain aspects of behavior and cognitive function for this system emerge only during infancy
5. Certain social phenomena come about by spontaneous adaptation of the behavior of the growing individual to the behavior of other individuals around him
Language Is Species Specific

• If the system is species specific – that is, if it is unique to that species – the system is likely to be part of the genetic make up of members of the species.

• No other species has a communication system like the language used by humans.

• No animal has been able to learn a creative syntactic system
Language Is Universal in Humans

• All human babies are born with a brain that is genetically prepared to organize linguistic information; thus, the psychological processes involved in both acquiring and using language are at play, no matter the person.

• All human languages have universal properties. There are profound similarities among the languages of the world. Language universals embrace and unify all human languages.

• These universals result from the way the human brain organizes and processes linguistic information: language universals are a product of human neurology.
• All languages have a phonology, a morphology, a syntax, and a lexicon. All languages possess rules and principles that allow their speakers to combine meaningless phonetic or gestural segments to create meaningful words and sentences.
• All languages have an inventory of phonemes, phonotactic constraints on the way words can be formed, and phonological and morphological rules.
• All languages have a recursive syntax that generates complex sentences, and because of this every human being has the capacity for unlimited linguistic creativity.
• All languages have a lexicon, which stores information about words by distinguishing form and meaning.
Language Need Not Be Taught, Nor Can It Be Suppressed

• Language acquisition in the child is a naturally unfolding process, much like other biologically based behaviors such as walking.

>> The fact that children need to hear language in order to acquire it must not be confused with the claim that children need specific instruction to learn to speak.

• If language were more bound to the particular types of linguistic experiences a child has, there would be much greater variation in the speed and quality of language learning than is actually observed. In fact, people acquire language at about the same speed during about the same age span, no matter what kind of cultural and social situation they grow up in.
Children Everywhere Acquire Language on a Similar Developmental Schedule

• There is a remarkable commonality to the milestones of language acquisition, no matter where in the world children acquire language.

• For children everywhere there seems to be a critical period in the acquisition of their first language.
  – Most researchers agree that the optimal period for first language acquisition is before the early teen years, after which a fully complex linguistic system will not develop.
Language Development Is Triggered by the Environment

- Children will not develop language if language is not accessible in their environment or nobody is there to interact with them.
Anatomical and Physiological Correlates for Language

• The most fundamental biological fact about language is that it is stored in the brain, and, more importantly, that language function is localized in particular areas of the brain.

• The first conclusive demonstration that language was localized in the brain took place in 1861 when a French neurologist named Paul Broca presented to the Paris Anthropological Society the first case of aphasia.

• Aphasia is a language impairment linked to a brain injury.
• **Broca’s aphasia**, also known as non-fluent aphasia, is characterized by halting, effortful speech; it is associated with damage involving Broca’s area in the frontal lobe of the left hemisphere.

• **Wernicke’s aphasia**, also called fluent aphasia, is characterized by fluent meaningless strings; it is caused by damage involving Wernicke’s area.
• The speech associated with Broca’s aphasia has been characterized as *agrammatic*; it consists of primarily content words, lacking syntactic and morphological structure. In contrast, the speech of people with Wernicke’s aphasia has stretches of grammatically organized clauses and phrases, but it tends to be incoherent and meaningless.

• In conversation, it appears that people with Broca’s aphasia comprehend what is said to them, while people with Wernicke’s aphasia do not.

• People with Broca’s aphasia have more of a problem with speech production than with auditory comprehension, whereas people with Wernicke’s aphasia produce fluent and well-articulated but meaningless speech, and have problems with auditory comprehension.
Figure 3.1  Diagram of the left hemisphere of the human cerebral cortex (side view). The diagram indicates the location of the primary language areas (Broca’s and Wernicke’s areas, ‘B’ and ‘W’, and the Sylvian fissure ‘S’), as well as the approximate areas recruited for motor (M), auditory (A), and visual (V) processing.
Language lateralization

- To say that language is lateralized means that the language function is located in one of the two hemispheres of the cerebral cortex.
- For the vast majority of people, language is lateralized in the left hemisphere. However, in some people language is lateralized in the right hemisphere, and in a small percentage of people language is not lateralized at all, but seems to be represented in both hemispheres.
• The hemisphere of localization is related to handedness, **left-handed** people being more likely than **right-handed** people to have language lateralized in the right hemisphere.

• Control of the body is contralateral: the right side of the body is controlled by the left motor and sensory areas, while the left side of the body is controlled by the right motor and sensory areas. Thus, left-handed people have right-dominant motor areas, while right-handed people have left-dominant motor areas.
Figure 3.2  Schematic diagram of contralateral control. The shaded lobes represent the two hemispheres of the human brain, looked at from above. The dashed gray lines represent the direct paths from the right hemisphere to the left hand; the dotted black lines, paths from the left hemisphere to the right hand.
Reading and Writing as Cultural Artifacts

• Reading and writing are certainly species specific (as is driving a car or playing chess), but they are far from being universal in humans.

• Every known human culture has a spoken or gestural language, but the speakers of many of those languages have not invented a written form of the language.

• In cultures where there is a written language, it is rarely acquired naturally without being taught – contrary to the way children acquire spoken languages.
• The success of reading and writing instruction is hardly uniform, as any elementary school teacher can attest: some learners make great progress with relatively little effort; others require a great deal of help.

• A person who has not learned to read and write will experience severe social disadvantages in many cultures, but is not considered to have a pathological condition.

• Unlike spoken languages, written languages vary greatly in the way they are organized and represented. One class of writing systems is called phonographic and the other is logographic.
• These facts all strongly indicate that written language is a cultural phenomenon, in contrast to the biologically based spoken language.
Study Questions

1. When psycholinguists say language is biologically based, do they mean that language has no social or cultural basis?

2. How does the universality of language support the view that language is biologically based?

3. Chimpanzees and gorillas have been taught rich communication systems using symbols of various kinds. Does this falsify the claim that language is species specific? Why or why not?
4. If a child has normal hearing but fails to acquire language, the child is judged to have a pathological condition. Explain the reasoning behind such a diagnosis, making reference to the biological basis of language.

5. What is meant by the lateralization of language? How does the study of aphasia support the view that language is lateralized?

6. When language is compared to writing systems, it appears that the former flows from human biology, while the other is a product of human culture. What distinctions between language and writing lead to this conclusion?
References


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WEEK 4

THE ACQUISITION OF LANGUAGE
• Children acquire knowledge of the language or languages around them in a relatively brief time, and with little apparent effort. This could not be possible without two crucial ingredients:
  – a biologically based predisposition to acquire language,
  – and experience with language in the environment.
A Biological Predisposition for Language

• Nativist model of language acquisition
  – Language acquisition is a natural developmental process; all children progress through similar milestones on a similar schedule.
  – On the contrary, the claim is not that humans acquire language without experience. In fact, biologically based systems, for humans and other animals, require environmental input to trigger or stimulate development.
  – The developing brain provides the infant with a predisposition to acquire language; but language acquisition will not happen in a vacuum. The child must be exposed to external input to construct a grammar and a lexicon with all the properties associated with human language.
Language Acquisition Device (LAD)

• The child has been whimsically called – originally by Chomsky (1965) – a LAD, or Language Acquisition Device.

• The child, exposed to language through the environment, processes the input using biologically endowed systems for language acquisition (Universal Grammar and acquisition strategies), and the eventual outcome is a grammar and a lexicon.

• The medium for the input is not important: the same internal processes will take place if the signal consists of speech or gestures. The specific language of the input is also not important, as long as it is a human language: English, Spanish, Chinese, or any other language can be acquired by any human child.
• The speed and ease with which a child acquires language is largely attributable to Universal Grammar (UG), which is the general form of human language and is part of the child’s genetic makeup.

• Research has demonstrated the involvement of UG in language acquisition: Child grammars never violate universal principles of language. For instance, they will never contain rules that are not structure dependent. Nor will they allow the construction of sentences that violate universal constraints on movement, such as *
*What did John eat ice cream and?
Figure 4.1 Schematic diagram of the relationship between external stimuli and internal knowledge in language acquisition. Input from the environment activates internal processes that lead to the acquisition of a grammar and a lexicon, which are the output of the process of acquisition. If the input provides experience in more than one language, a grammar and lexicon will develop for each language.
A set of acquisition strategies

• Another part of the child’s biological endowment is **a set of acquisition strategies** that enable the child to take the input from the environment and construct a grammar that conforms to the organizational principles of UG.

• These strategies determine what will be the most salient and easily acquired aspects of language. For instance, children are highly sensitive to the regularities of language.

• Children anticipate morphological variations that systematically alter the form of words, so suffixes, prefixes, and infixes are easily acquired.
Characteristics of the Language in the Environment

• The primary purpose of a child’s linguistic environment is to provide information about the language the child is acquiring. Psycholinguists call this type of information **positive evidence**.

• It supplies the data that the child needs in order to set parameters and develop a grammar that is adult-like.

• Obviously, the main providers of input are the people who interact with the child: parents, caretakers, siblings, and any other children or adults engaging in routine linguistic interactions with the child.
A. Imitating their caretakers’ language
   – Do children acquire language by imitating their caretakers’ language?

B. Correcting errors
   – Do parents and other primary caregivers correct errors to help their children acquire language?

C. Infant-directed speech or motherese
   – Could this type of caregivers' talk make a difference?
Developmental Stages

• From before birth to 12 months
  – A growing body of evidence indicates that infants are attuned to human language from the moment they are born.
  – By the time they are born, then, babies have had considerable access to the general prosody (the rhythm and intonation) of the language of the environment; this is reflected in their bias for their mother’s voice over the voices of others, and in their recognition of their mother’s language as distinct from other languages.
• From 12 to 24 months
  – Infants as young as 9 months can segment individual words from a string of speech and recognize them later. However, it is not until between 12 and 18 months that children produce their first word. The first word is often indistinguishable phonologically from babble, but it is identifiable as a word because it has a consistent referent.
  – The child will spend a few months in the **one-word stage** of language also called the **holophrastic** period, because each word conveys as much meaning as an entire phrase.
  – The word *milk*, for instance, will not only be used to refer to milk, but it will also be used to request milk, to observe that the cat is drinking milk, that milk has been spilled, and so forth.
During this early one-word period, the twin phenomena of underextension and overextension are features of word use.

*Underextension* is a case in which the child will acquire a word for a particular thing and fail to extend it to other objects in the same category. For example, if a child learned the word *flower* in connection with a rose and did not extend its meaning to other kinds of flowers, this would be an example of underextension.

*Overextension* is more common, or perhaps it’s just more noticeable. Overextension is when the child will extend a word incorrectly to other similar things. For example, a child might call all four-legged animals *doggie*, or everything that is bright *light*.

This behavior is almost certainly not because children are unable to discriminate cats from dogs or light bulbs from lightning. It is because children just do not have a big enough vocabulary to use words very precisely.

When the child’s vocabulary approaches about 50 words, the child starts putting words together to form rudimentary sentences.
• The preschool years
  – When children begin combining words, the resulting rudimentary sentences reflect the structure of the child’s target language. English speaking children obey word order very strictly, with subjects preceding verbs and verbs preceding objects (e.g., *Mommy push, Pull car*).
  – Sentences can also consist of just a subject and an object (e.g., *Baby cookie*), but they always get the order right. Adjectives precede nouns (e.g., *Big doggie*), and the rare function word is correctly placed (e.g., *That kitty*).
– Bilingual children respect canonical word order, depending on the language they are speaking, and even in utterances with components from both languages.

– Bilinguals – both children and adults – sometimes switch from one to another language within the same conversation, and sometimes also within the same sentence.

– Around the age of 3 (with much individual variation), the child will begin to produce complex sentences. This is a very important linguistic development, because it means the child has developed the last capacity of the syntax – to create complex sentences out of simple ones.
Later Language Development

• As children grow older, they develop much more proficiency with language. Their processing capacity increases and their ability to produce and interpret longer and more syntactically complex sentences improves.

• Lexical learning continues at a rapid rate, and around school age, children begin using derivational morphemes and the word combinations provided by derivational morphemes.
• Discourse ability
  – Interactional Discourse
    >serves primarily a social function
  – Transactional Discourse
    >communicating information is the main purpose

• Metalinguistic awareness
  >Metalinguistic skill is the awareness of language as an object, rather than simply as a vehicle for communication.
Second Language Acquisition

• Children who are exposed to two languages simultaneously from birth are bilingual (simultaneous) acquirers. Other bilinguals acquire their two languages one after the other (sequentially).

• The study of how people learn languages after their first is called second language acquisition – even when the language being learned is the third, or fourth, or fifth.

• A great deal of research on second language acquisition is concerned with identifying the similarities and differences between how people acquire their first and second languages.
• Some crucial differences exist between learning a first and a second language.
• The *pace of acquisition* (how quickly the learner makes progress) and the *level of ultimate attainment* (how proficient the learner eventually becomes) are both much more variable with the second compared to the first language.
• The development of a second language grammar can be influenced by forms in the first language, a phenomenon known as *transfer*.
• Certain deviations from the target language grammar will persist indefinitely in second language learners, a phenomenon known as *fossilization*. 
Study Questions

1. What is the nativist claim about the nature of biologically based components in language acquisition?

2. How does Universal Grammar assist the child in acquiring language? How about acquisition principles?

3. What characteristics of the child’s linguistic environment are important for language acquisition? What aspects are not important? What evidence exists to support this?
4. There are individual differences in language acquisition among children learning the same language, as well as among children acquiring different languages. What kinds of variation would one expect to observe? What kinds of variation would one not expect to observe?

5. In general, what kinds of morphemes are acquired at an early age? What kinds are acquired at a later age?
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WEEK 5
THE SPEAKER: PRODUCING SPEECH
PART 1
Speech Information Processing Activities

- The processes that underlie the production and comprehension of speech are information processing activities.
- The speaker’s job is to encode an idea into an utterance.
- The utterance carries information the hearer will use to decode the speech signal, by building the linguistic representations that will lead to recovering the intended message.
• The speaker knows what she intends to say; his/her task is to formulate the message into a set of words with a structural organization appropriate to convey that meaning, then to transform the structured message into intelligible speech.

• The hearer must reconstruct the intended meaning from the speech produced by the speaker, starting with the information available in the signal.
The information processing operations performed **rapidly** and **unconsciously** by the speaker and the hearer, as well as the mental representations constructed by those operations.

It is worth emphasizing that a hearer’s successful recovery of a speaker’s intention when uttering a sentence involves **shared knowledge** that goes well beyond knowledge of language and well beyond the basic meaning of a sentence.
A Model for Language Production

- The production of a sentence begins with the speaker’s intention to communicate an idea or some item of information (*preverbal message*).

- Turning an idea into a linguistic representation involves mental operations that require consulting both the lexicon and the grammar shared by the speaker and hearer.

- The mental representation must be transformed into a speech signal that will be produced fluently, at an appropriate rate, with a suitable prosody.
*Diagram of some processing operations, ordered left to right, performed by the speaker when producing the sentence The girl pets the dog.

Production begins with an idea for a message (the light bulb on the far left) triggering a process of lexical selection. The capsule-like figures represent lexical items for the words girl, dog, and pet, activated based on the intended meaning for the message; these include basic lexical semantic and morphosyntactic information (top half) and phonological form information (bottom half). The tree diagram in the center represents the sentence’s syntactic form. The phonetic transcription to the right represents the sentence’s eventual phonological form, sent on to the articulatory system, which produces the corresponding speech signal.
Speech Production

Speech production requires at least three kinds of mental operations (Griffin & Ferreira, 2006)

1. you have to think of something to say. The processes that accomplish that are called conceptualization.

2. Once you have something to say, you must figure out a good way to express that idea given the tools that your language provides. >> Formulation

3. you need to actually move your muscles to make a sound wave that a listener can perceive >> Articulation
Figure 2.1 A schematic of Levelt and colleagues’ speech production model (Levelt et al., 1999, p. 3)
Speech Errors

• We can use speech errors to inform our understanding of speech production processes because speech errors are not random.

• *Slips of the tongue* occur in systematic patterns, and those patterns can be related back to aspects of the speech production process.

• Other types of speech errors may reflect breakdowns in other components of the speech production system.

• *Speech error* provides information about how different components of the production system work.
Production In Bilinguals & Second Language Learners

• When a bilingual is speaking in a **unilingual mode** (only one language), only one of the grammars is consulted to build structural representations, and the active language’s lexical entries are activated.

• When in a **bilingual mode** (when the bilingual’s two languages are being used in the same conversation), access to both grammars and lexical items from both languages must be possible (Grosjean 2001).
The steps for production continue to be the same in both the unilingual and the bilingual mode of production, and for monolingual and bilingual speakers: lexical items are selected; a syntactic structure is built; a phonological representation is generated.

However, knowledge of two languages has at least two important consequences for language production: (1) it permits intentional switching from one language to the other, and (2) it triggers occasional unintentional slips into a language not active in the conversation.
Code Switching

• Code-switching is switching between two codes (two languages, or two distinct dialects of the same language) within the same discourse. A switch can take place between sentences (intersentential code-switching). A switch can also occur within the same sentence (intrasentential code-switching), at clause boundaries, or at smaller phrasal boundaries.

• Code-switching is a discourse style that is most typical in bilinguals who are highly proficient speakers of both languages (Poplack 1980), which is not surprising: producing utterances that alternate between two languages requires sustained activation of the grammars and lexicons of each language, and of the rules that govern grammatical switching.
Example

... they tell me ‘How’d you quit, Mary?’ I don’t quit I ... I just stopped. I mean it wasn’t an effort that I made\(^a\) que voy a dejar de fumar por que me hace daño o this or that uh-uh. It’s just that I used to pull butts out of the waste paper basket yeah. I used to go look in the ... \(^b\) se me acaban los cigarros en la noche. I’d get desperate\(^c\) y ahí voy al basurero a buscar, a sacar, you know.

\(^a\) ‘that I’m going to quit smoking because it’s harmful to me or’
\(^b\) ‘I run out of cigarettes at night’
\(^c\) ‘and so I go to the trash to look for, to get some out’
Code-switching Generally Serves a Communicative Function:

• to emphasize something just said,
• to quote something or someone, or to modify a statement further,
• to include or exclude an interlocutor, or to signal power relations between interlocutors.
• In some bilingual speech communities, the default communication style when in a bilingual mode involves frequent alternation between two languages
• **Borrowing** is also a feature of bilingual language use, and it is sometimes difficult to distinguish from code-switching.

• One difference between the two is the degree of integration of the guest word in the host language. A borrowed word (also called a *loan*) typically undergoes both orthographic and phonological adaptation into the host language.

• Loans are sometimes translated into an equivalent word in the host language.

• Bilinguals often borrow to fill lexical gaps in one of their languages.

• Loanwords sometimes become established in the language, and even monolinguals will begin to use them.
Study Questions

1. How can the study of speech errors demonstrate that speech consists of segmented words and phonemes before it is produced? Why is this interesting?

2. What are some of the similarities and differences between monolingual and bilingual models of production?

3. How does the study of speech errors demonstrate that speech is represented at various processing levels before it is actually produced?

4. What characteristics of speech errors demonstrate that they are not random, but honor linguistic classifications and constraints?
References


INTRODUCTION TO PSYCHOLINGUISTICS

WEEK 6

THE SPEAKER: PRODUCING SPEECH

PART 2 – PLANNING SPEECH
• Producing a sentence involves a series of distinct operations and representations: lexical, syntactic, morphological, and phonological.
Accessing the lexicon

• The process of language production begins with an idea that is encoded into a semantic representation. This sets in motion a process called **lexical retrieval**.

• A word can be retrieved using two different kinds of information: meaning or sound.
  – The speaker retrieves words based on the meaning to be communicated and has the task of selecting a word that will be appropriate for the desired message.
– The word must also be of the appropriate grammatical class (noun, verb, etc.) and must be compatible with the structure that is being constructed.

• Important psycholinguistic questions concern the organization of the lexicon and how it is accessed for both production and comprehension.
Factors affecting the speed of conversational speech:

• 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)
• Utterance length (longer utterances have shorter segment durations than shorter ones)
• On average, though, people produce 100 to 300 words per minute (Yuan, Liberman, and Cieri 2006), which, at the slower end, is between 1 and 5 words (or 10 to 15 phonetic elements) per second.
• Clearly, the process of accessing words is extremely rapid.
• Adults with a high school education know around 40,000 words.
• If one adds to that total another 40,000 proper names of people and places, the adult lexicon is estimated to contain around 80,000 words.
• If each word a person uses must be retrieved from a bank of 80,000 in less than half a second, it is obvious that the processes employed in lexical retrieval must be extremely efficient, and these processes are affected by the way the lexicon is organized.
One way the lexicon is organized is by frequency of use

- During production, more common words are retrieved more rapidly: for example, it is easier and faster to retrieve the word *knife* than the word *dagger*.

- Studies of pauses and hesitations in speech have shown that hesitations often occur before low-frequency words (Levelt 1983).
• Words are also organized by their meaning, so close associates are stored near one another.
  – Speech errors can give some insight into this meaning-based organization.
  – It is extremely common for a word retrieval error to result in the selection of a semantically and structurally similar word.
  – In each of the examples in the next slide, the speaker has erroneously selected a word that is of the same grammatical class (nouns) and that shares many aspects of meaning with the intended word.
Example:

1. I just feel like whipped cream and mushrooms.
   {I just feel like whipped cream and strawberries.}
2. All I want is something for my elbows.
   {All I want is something for my shoulders.}
3. Put the oven on at a very low speed.
   {Put the oven on at a very low temperature.}
4. I hate ... I mean, I love dancing with you!
Another phenomenon in lexical retrieval that has fascinated psycholinguists for decades is the tip-of-the-tongue phenomenon (Brown and McNeill 1966; Aitchison 2003).

A tip-of-the-tongue state occurs when the speaker knows the word needed but cannot quite retrieve it.

Typically, people have access to the meaning-based part of the lexical representation, but experience a tip-of-the-tongue state when they fail to find a fully specified form-based representation.
Building simple sentence structure

• Levelt (1989) refers to the creation of sentence structure during sentence planning as grammatical encoding.

• For this the speaker must consult the internalized grammar to construct structures that will convey the intended meaning.

• Again, speech errors provide information about some of the characteristics of the representations that are constructed.
Example:

1. I left the briefcase in my cigar.  
   {I left the cigar in my briefcase.}
2. ... rubber pipe and lead hose ...  
   {... rubber hose and lead pipe ...}

• These examples illustrate a common type of error, **exchange errors**; the exchange units here are two words.

• Word exchange errors never occur between content words and function words and are usually limited to words of the same grammatical class, **nouns** in the case of the examples above.
• An exchange error can involve units larger than individual words.
  – Such errors provide evidence that sentences are organized structurally during language production.

• Exchange errors also demonstrate the existence of a level of representation where bound morphemes are represented separately from their stems.
Building complex structure

• One of the tasks of the grammar is to combine simple sentences into complex, multi-clausal sentences.
• It turns out that this function of the grammar has a number of important psycholinguistic ramifications.
• Ferreira (1991) compared speech initiation times associated with sentences with a simple subject NP, to sentences with complex subjects, and found that speech initiation times for sentences with complex subjects were significantly longer than for sentences with simple subjects.
• This finding indicates that planning complex sentence structure recruits more computational resources than does planning simple structures.
Preparing a Phonological Representation

• The mental representation of a sentence that serves as input to the systems responsible for articulation (speech) is phonological.

• There is an entire class of speech errors involving units of analysis that are smaller than phrases or words or morphemes, and these errors shed further light on the nature of the phonological representations built during language production.
• Speech errors involving phonological segments never create phonemes that are not part of the phonemic inventory of the speaker’s language, nor do they create words that violate the phonotactic or phonological rules of the speaker’s language.

• A speaker might slip and say ‘tips of the slung’, but never ‘*tlips of the sung’, because in the latter a sequence has been created that violates phonotactic constraints for English (Fromkin 1973).

• Consonants and vowels never substitute for one another, and substitutions and exchanges take place only between elements that are phonologically similar.
Study Questions

1. How can the study of speech errors demonstrate that speech consists of segmented words and phonemes before it is produced? Why is this interesting?

2. What are some of the similarities and differences between monolingual and bilingual models of production?

3. How does the study of speech errors demonstrate that speech is represented at various processing levels before it is actually produced?

4. What characteristics of speech errors demonstrate that they are not random, but honor linguistic classifications and constraints?
References


INTRODUCTION TO PSYCHOLINGUISTICS

WEEK 7

THE HEARER: SPEECH PERCEPTION AND LEXICAL ACCESS -1
The hearer’s task is almost the mirror image of the speaker’s task.

• First, using information from the acoustic signal, the hearer reconstructs a phonological representation.

• The hearer enters the lexicon using that phonological representation to retrieve the lexical items that match. This permits the hearer to recover the semantic and structural details of the words in the message.

• The next step is to reconstruct the structural organization of the words, to create a syntactic representation – necessary for recovering the meaning of the sentence.
Perceiving Speech

• The hearer plays the role of the inspector
• The phonetic “eggs” have been mangled and mixed together by articulatory processes.
• It is the hearer’s task to identify from the resulting mess of the speech signal what the original phonetic elements were.
Three features of the speech signal that the speech perception system must deal with:

- The signal is continuous
- It transmits information in parallel
- It is highly variable (adjustable).
The signal is continuous:
- there are no spaces between consonants and vowels, or even between words. A central objective for the mechanisms involved in speech perception is to segment a continuous signal into discrete units: phonemes, syllables, and, ultimately, words.

It transmits information in parallel:
- Because of coarticulation (the spreading of phonetic features to neighboring segments), the speech signal is characterized by the parallel transmission of information about phonetic segments.
It is highly variable (lack of invariance)

- The abstract mental representation of a phonological element does not vary. However, a speech sound may vary greatly each time it is actually produced.
- Many factors contribute to the fact that the same consonant or vowel, the same syllable, and even the same word are never pronounced exactly the same.
- Since the hearer is also a speaker, he can compensate for much of the variability produced by speaker characteristics, like speech rate and shouting.
- The hearer also adapts rapidly to abnormal situations.
- For example, speech with a non-native-like accent, and sometimes speech produced by young children, can be difficult to decode, but this difficulty is overcome relatively quickly.
Those factors are:

• First, there is variability among speakers
  – there is individual variation in every aspect of our physique, which includes the organs involved in speech production. As a consequence, many aspects of the signal are intrinsically different for different speakers, including fundamental frequency and the spectral properties of consonants and vowels.

• Second, there is variability within speakers
  – People sometimes speak fast, and other times slowly; they sometimes speak with chewing gum in their mouths; they mumble; they shout; they speak while being overcome with feelings of sadness or joy.
• A third factor that makes the signal variable is ambient noise
  – Rarely do we speak to each other in noise-free environments. Other voices and other sounds (like music or traffic) can alter the speech signal dramatically.

• A fourth factor affecting variability in the signal is the context
  – The articulation of phonemes is affected by the phonemes around them. Sentence, context, and neighboring words can also affect the pronunciation of individual lexical items.
Bottom-up and top-down information

• Psycholinguistic processes are, at their core, information processing routines;
• we can ask to what extent these processes are triggered automatically based only on the acoustic signal (bottom-up)
• or are aided by contextual information, either in the communication situation or within the sentence being processed (top-down).
Example:

- Suppose a friend walks up to you and says “Cat food,” clearly and distinctly. You will, effortlessly, be able to decode the acoustic signal and retrieve the uttered words from your lexicon. In this situation, **bottom-up** information guides your processing: details of the acoustic signal help you build a phonological representation. Once you have retrieved the words, you might think that your friend saying *Cat food out of the blue* is a bit odd – or not.
Example:

• you and your roommate have a cat, and you are headed to the supermarket. Your roommate hollers from the kitchen (where the dishwasher is running noisily), “Fluffy’s bowl is empty! Be sure to buy some cat food!”

• The acoustic information that reaches your ear is highly degraded; maybe you catch ‘Fluffy’, ‘bowl’, ‘buy’. You guess that ‘cat food’ is somewhere in the sentence.

• You have understood this version of cat food (which you didn’t even really hear) by using top-down information.
• When bottom-up information inadequately specifies a word or phrase, top-down information can allow the hearer to select among a range of possibilities.
• If bottom-up information is adequate, however, top-down information will not be necessary.
Suprasegmental information in the signal

• Suprasegmental information (sound phenomena as accent which may stretch over more than one segment) is signaled in speech with variations in *duration*, *pitch*, and *amplitude* (loudness).

• Information like this helps the hearer segment the signal into words, and can even affect lexical searches directly.
• In English, *lexical stress* serves to distinguish words from each other, for example, compare ‘*trusty*’ [‘trʌsti] and *trustee* [trʌˈstiː]. Not surprisingly, English speakers are attentive to *stress patterns* during lexical access.

• In Mandarin Chinese, *tone* is lexically specified and so to recover words from the speech signal, Mandarin speakers are attentive not only to segmental information but also to suprasegmental information.
1. What are the sources of variability in speech? How does speech perception overcome acoustic variability to create a mental percept?

2. What are some ways that speech perception in a second language differs from speech perception in the native language of a monolingual?

3. What are some of the differences between languages in the way that suprasegmental information is used during speech perception?
References


Accessing the Lexicon

• The speaker enters the lexicon using information about meaning so she can retrieve the phonological structure of the appropriate words to convey the meaning she is constructing for a sentence.

• The hearer’s (or reader’s) task is the opposite. He uses a phonological representation (decoded using information from the acoustic signal) to retrieve information about meaning.
• The hearer looks for a lexical entry whose phonological representation matches the one he has heard.

• When there is a match, a word is retrieved, and information about the word’s meaning and structural requirements is then available.
Lexical Decision Task

• A technique widely used to investigate lexical access is the lexical decision task.
• Participants are briefly shown a string of letters and asked to push one button if the letters constitute a word in their language, and a different button if they do not.
• In a lexical decision experiment, participants will see equal amounts of words and non-words, and within the many words they will see throughout the experiment, a subset of those is of interest to the investigator: those words contain a contrast being investigated in the experiment.
Table 6.1  Word list for simulated lexical decision task. For each string, write Y if it is a word of English, N if it is not.

<table>
<thead>
<tr>
<th>CLOCK</th>
<th>DOCTOR</th>
<th>ZNER</th>
<th>FLOOP</th>
<th>SKERN</th>
<th>NURSE</th>
<th>TABLE</th>
<th>FABLE</th>
<th>BANK</th>
<th>TLAT</th>
<th>URN</th>
<th>MROCK</th>
<th>MOTHER</th>
<th>PLIM</th>
<th>HUT</th>
<th>BAT</th>
</tr>
</thead>
</table>
To simulate how a lexical decision task works, consider the 16 letter strings in Table 6.1, and write Y or N next to each one, to indicate for each whether it is a word of English. Try to write your responses as quickly as possible.

You probably wrote N next to six of the letter strings, and might have even noticed that you responded to three of them very quickly – TLAT, ZNER, and MROCK – and to the other three somewhat more slowly – SKERN, PLIM, and FLOOP.

All six strings are non-words in English, but the first three violate the phonotactic constraints of the language.
• Impossible non-words, like TLAT, ZNER, and MROCK, are rejected very rapidly in a lexical decision task.
  – It is as if the lexical retrieval system were carrying out a phonological screening of sorts, not bothering to look in the lexicon when the string is not a possible word in the language.
• In contrast, possible non-words, like SKERN, PLIM, and FLOOP, take longer to reject, as if the retrieval system conducted an exhaustive, ultimately unsuccessful, search for their entries in the lexicon.
Lexical Ambiguity

- Another property of words that has been used to study lexical retrieval is **lexical ambiguity**.
- Lexically ambiguous words are words that have more than one meaning. Some research has examined whether such words have more than one lexical entry, and whether having more than one lexical entry can lead to retrieval advantages.
- Some lexically ambiguous words have multiple meanings that are completely unrelated; such ambiguous words are called **homonyms**.
• Other ambiguous words have meanings that appear to have a systematic relationship to each other (e.g., the noun ‘eye’ refers to an organ used for vision, or to the opening in a needle, or the aperture of a camera); these words are polysemous.

• Rodd, Gaskell, and Marslen-Wilson (2002) compared these two types of ambiguity in a series of lexical decision experiments, and found that ambiguous words with related senses (polysemous words like eye) are retrieved faster than ambiguous words with unrelated senses (homonyms like punch).
• Homonyms have multiple meanings that compete against each other, resulting in delayed recognition.

• In contrast, the semantic relationships between the multiple senses of polysemous words facilitate their retrieval.
Lexical Access in Sentence Comprehension

- Lexical frequency
  - Early research on the effects of word frequency in sentence processing used a procedure called the phoneme monitoring task (Foss 1969).
  - Participants listen to a pre-recorded sentence over headphones and are told to push a button when they hear a word beginning with a particular phoneme.
  - The time is measured between the onset of the phoneme in the recording and the moment the participant pushes the button.
– This reaction time reflects PEOPLE’S ABILITY TO PERCEIVE AND RESPOND TO THE TARGET PHONEME, with an important added feature: the reaction time will vary depending on the cognitive effort involved in processing the sentence at the moment the phoneme was heard.

– Phoneme monitoring exploits a very general psychological principle known as resource sharing. If you are engaged in a complex cognitive activity, your motor responses will be delayed.

– For instance, if you are doing something difficult like multiplication problems in your head, it will take you slightly longer to push a button in response to a stimulus (like a light or a tone) than it would if you were not doing the multiplication problems.

– See (4a) and (4b) on Page 198 for details
• Foss reports that participants were slower to respond to ‘bassoon’ following the low frequency ‘itinerant’ than the high frequency ‘traveling’.

• Low-frequency words increase sentence processing complexity.
Lexical ambiguity

- How ambiguity is dealt with in sentence processing is of central concern in psycholinguistics, because ambiguity is rampant in human language.
- A phoneme monitoring experiment by Cairns and Kamerman (1976) compared sentences with ambiguous and unambiguous words.
- Participants were asked to listen for [d] while listening to recordings of one of the following sentences:
  a) Frank took the pipe down from the rack in the store.
  b) Frank took the cigar down from the rack in the store.
• Both ‘pipe’ and ‘cigar’ are high-frequency words, but only ‘pipe’ is ambiguous.

• Cairns and Kamerman report that phoneme monitoring reaction times were longer following the ambiguous ‘pipe’ than following the unambiguous ‘cigar’, indicating that the ambiguous word required additional processing resources.

• When processing sentences, all meanings of an ambiguous word need to be considered.
To sum up

• Low frequency words increase processing cost, because they take longer to retrieve.

• Ambiguous words increase processing cost, because incorporating a word into a sentence requires selecting a context-appropriate meaning.
Study Questions

1. What is the difference between bottom-up and top-down processing? When do psycholinguists think that top-down processing is used by the hearer? Is this a conscious decision on the part of the hearer?

2. How does the frequency and ambiguity of lexical items affect subjects’ performance on a lexical decision task? Do these variables have the same effect when words are processed in sentences?
References

