



# Language acquisition, perception and production

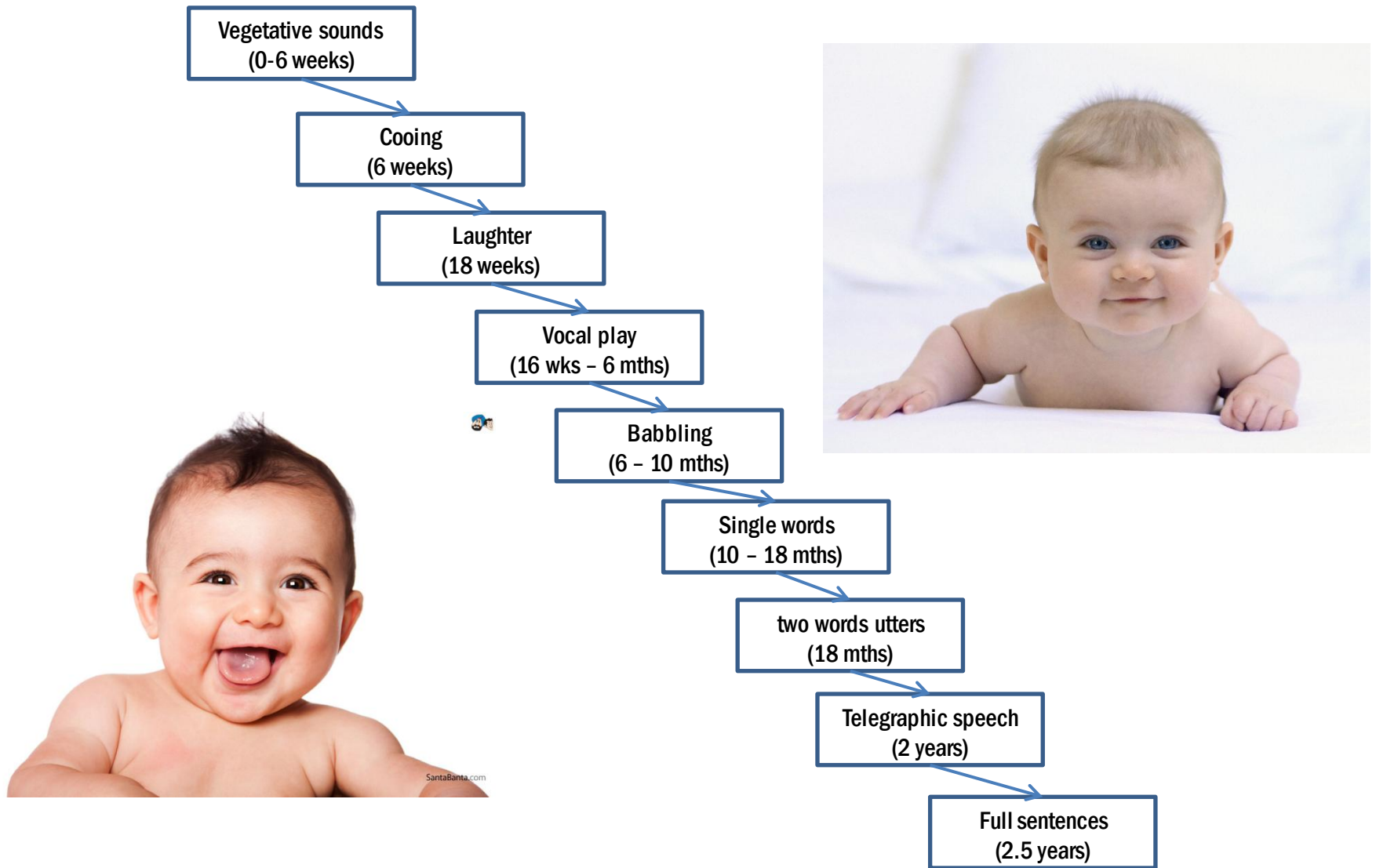
*Lecture 2 – Nature –  
nurture debate*

# Early acquisition

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- **General overview of stages in development**
- **First one hour on the Nature-Nurture debate**
  - Videos werker, genie here
- **Next hour**
  - **One study on phonological development**
    - Newport
  - **lexical / semantic development**
  - **Syntactic development**
    - Stuff about past tense debate

# Overview of stages in development



# Video

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- **Video of stages**

# Nature-nurture debate

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- What drives language acquisition?
  - Nature
    - Rationalist (Plato, Descartes)
    - Chomsky
  - Nurture
    - Empiricist (Locke)
    - Piaget
    - Connectionism

# First theories

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- **Imitation**
  - Children often do not imitate adults
  - Produce things they have never heard
- **Conditional (reinforcement)**
  - Adults correct only aspects related to meaning

# Conditioning

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**Child: My teacher holded the rabbits and we patted them**

**Adult: Did you say the teacher held the baby rabbits?**

**Child: Yes.**

**Adult: What did you say she did?**

**Child: She holded the baby rabbits and we patted them**

**Adult: Did you say she held them tightly?**

**Child: No she holded them loosely.**

# Poverty of the stimulus

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- **Chomsky (1965)**
- **Children learn a grammar**
- **But the language environment is impoverished**
  - Lots of speech errors, false starts, etc
- **They are not explicitly told which sentences are not part of the grammar**



# Motherese

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- **Child-directed speech = motherese**
- **Children prefer this speech over normal speech:**
  - **Fernald and Kuhl (1987) experiment in which type of speech played when infant turned head one way. Infant preferred to hear motherese than adult speech.**
- **In motherese new words are also highlighted (Fisher & Tokura, 1995).**
- **Function: To focus communication (Pine, 1994)**

# Universal grammar

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- **What is innate in language?**
- **Chomsky (1986)**
  - **Language is special**
    - **Doesn't depend on other cognitive functions**
  - **Poverty of the stimulus**
- **There must be innate constraints**

# Universal grammar

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- **Theory of primitives and rules of inferences that enable child to learn grammar**
- **Set of principles and parameters**
- **Language is not learned, but grows**

# Parameter setting

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- **Like switches**
- **Set based on exposure to language**
- **Place boundaries on shape of languages**

# Parameter setting

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- **Example**
  - pro-drop parameter
- **Compare**
  - English vs Spanish
- **Pro-drop parameter is set in Spanish (Italian)**

# Parameter setting

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- **Why it takes so long to learn a language?**
- **Continuity hypothesis**
  - All the parameters are available from birth, but cannot be used immediately
- **Maturation hypothesis**
  - Children do not have immediate access to all their innate knowledge, but becomes available over time

# Linguistic universals

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- **Chomsky argued that there are similarities between all languages**
  - Linguistic universals
- **Presence of noun and verb categories**
  - Even in deaf children that do not learn sign language

# Linguistic universals

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- **Word-order (Greenberg, 1963)**
- **Subject, verb, object order in 30 languages**

Subject	Object	Verb	44%
Subject	Verb	Object	35%
Verb	Subject	Object	19%
Verb	Object	Subject	2%
Object	Verb	Subject	0%
Object	Subject	Verb	0%



# Linguistic universals

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- **Correlation between word-order preference and other aspects of language**
- **Question words**
  - SVO: at beginning "Where is the ..."
  - SOV: at end
- **Prepositions**
  - SVO: before the noun "to the dog"
  - SOV: after the noun "mise ni" [store to → to the store]

# Linguistic Universals

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- **Why do they exist?**
  1. **Part of innate grammar**
  2. **Part of innate component of cognition**
  3. **Evolution puts constraints on syntax**
  4. **Strong features in the environment**

# Pidgin and Creoles

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- **Further evidence for innateness (Bickerton, 1981)**
- **Video**

# Critical Period

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- Important neurological changes throughout childhood (Pinker, 1995):
  1. Before birth, all neurons are formed and are in their proper position in the brain
  2. Head size, brain weight, and thickness of cerebral cortex continue to change after birth.
  3. Formation of synapses peaks between 9 months and 2 years, when child has 50% more synapses than adult brain.
  4. Metabolic activity in the brain peaks around 4 years and is higher than in adults.
  5. Neurons die even before birth, and reaches normal levels around age 7.

Perhaps language learning requires an immature brain that is small and has a high metabolic rate!

# Feral and Isolated children

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- **Best studied case is Genie**
- **Grew up without much social contact from 20 months to 13.5 years.**
- **Some history: Takes place around 60s-70s**
- **Lived in very poor conditions, with little exposure to language, no TV or radio**
- **Was rescued at age 13.5 when mother escaped**

# Feral and isolated children

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- Genie was put into language teaching program
- She did manage to learn phonology, words, and semantics
- However, syntactic development was slow

“I like hear music ice cream truck”

(Curtiss, 1981).

# Genetic evidence

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- **SLI = specific language impairment**
  - 5% of population
- **No brain damage**
- **Normal IQ**
- **Problems with language**

# Genetic evidence

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- **"KE" family in London, UK**
  - Problems controlling their tongue
  - Making speech sounds
  - Identifying speech sounds
  - Understanding speech
  - Judging grammaticality
- **Have problems with word-endings**
  - Inflections, past tense, plural



# "KE" family

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- **Disorder is traced to FOXP2 gene**
- **FOXP2**
  - involved in development of Broca's area
  - Involved in fine motor control of lower face and articulatory system

# Genetic evidence

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- To what extent is the disorder language-specific?
- "KE" family members with disorder have lower IQ (Vargha-Khadem et al., 1995)
- General problems with sounds (Joanisse & Seidenberg, 1998)
  - Repeating non-words (e.g., slint)
  - Recognizing common sounds between words (ball-bat)
  - Could explain problems with inflections

# General comments

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- **Question is how much is innate**
  - How specific is the innate information
- **Nature – nurture debate is no longer all-or-none**
  - What mechanisms are innate?

# Alternatives

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- **Language is learned**
  - There is sufficient information in the environment
- **Connectionism (Rumelhart & McClelland, 1986)**
  - General purpose learning mechanism for language learning
  - Simple units are sensitive to the statistical regularities of the environment

# Speech segmentation

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- Use statistical cues to segment speech
- Infants at 8 months start to use this type of information
- Saffran, Aslin, & Newport (1996) presented infants with continuous streams of sounds like “bidakupadotigolabubidaku”
- Some syllable pairs more common (e.g., bida) than others (e.g., kapu).
- After being exposed to the continuous sound stream, they tested the infants to listen to the common and new strings.
- They preferred to listen to the new strings, suggesting they had retained the probabilities between the syllables. This information can be used to segment speech into words.

# Summary

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- **What drives language learning?**
  - Genes, environment, social interaction
- **How much influence is there of each?**