

Savage-Rumbaugh et al (1986)

Spontaneous symbol acquisition and communicative use by pygmy chimpanzees

Kanzi
+
lexigram
keyboard



Thinking about human language

- Furious green ideas sleep peacefully
- Does the sentence make sense?
- Can the word order be changed?
- Is the sentence grammatical?
- How did you make these decisions?

Thinking about human language

- Acquiring human language
- Is the ability to use human language learned or innate?
- The nature or nurture debate



Language theories....

- The **behaviourist** theory (Skinner)
- children learn by imitation and reinforcement
- **operant conditioning...**

Language theories....

- NATURE: **Nativist theory** (Chomsky)
- children are born with an innate **Language Acquisition Device**
- the ability to learn & use language is hard wired into the human brain

Language theories....

- NURTURE: Behaviourist Theory: Skinner
- this theory emphasises performance
- a child imitates what she hears and is reinforced when correct
- gradually vocalisations are shaped and words are learned

Language theories....

- NURTURE (Skinner) PROBLEMS
- it would take too long
- Young children make errors: eg:
 - “I runned.....”, “I goed...”
- All children (even deaf) ‘babble’ in same way

Language theories....

- The **NATIVIST** theory (Chomsky)
- all humans are 'prepared' to learn language
- all normal children acquire language in similar stages
- linguistic universals exist in every language
- BUT, maybe 'critical period' (eg; Genie)

LINGUISTIC UNIVERSALS

- THREE COMPONENTS of language
- **PHONOLOGY** - SOUND PATTERNS
- **SYNTAX** - WORD PATTERNS
- **SEMANTICS** - MEANING PATTERNS

LINGUISTIC UNIVERSALS

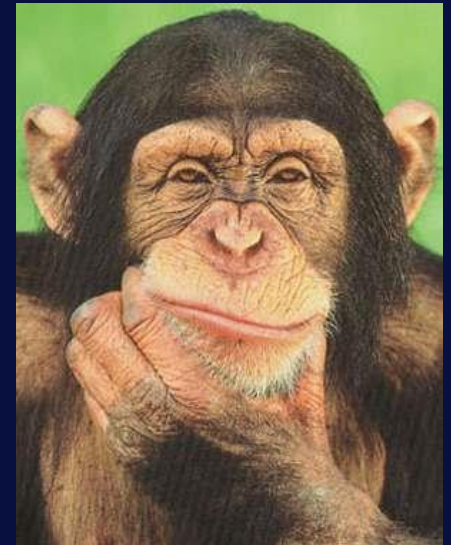
- **SEMANTICITY** - words have meanings
- **DISPLACEMENT** - words can be used to refer to things that are not present in time and space
- **STRUCTURE DEPENDENCE** - words can be 'chunked together' and moved around -
 - e.g. the policeman shot the man in the garage
- **CREATIVITY** - each sentence that is spoken might be a unique 'utterance'
- **GENERALISATION** - from one situation to another

Features of Language

- SEMANTICITY –
- DISPLACEMENT –
- STRUCTURE DEPENDENCE -
 -
- CREATIVITY –
- GENERALISATION -

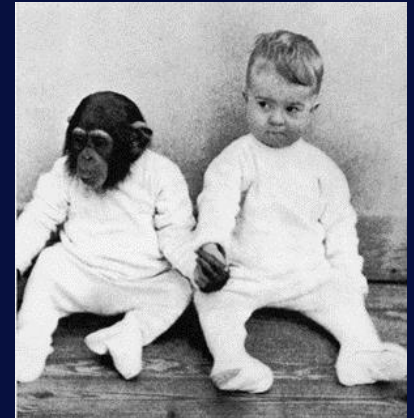
Language --- the great debate

- Why teach language to apes?
- the rationale
- if apes can learn language it supports **Skinner** (nurture) if not perhaps **Chomsky** is right (nature)



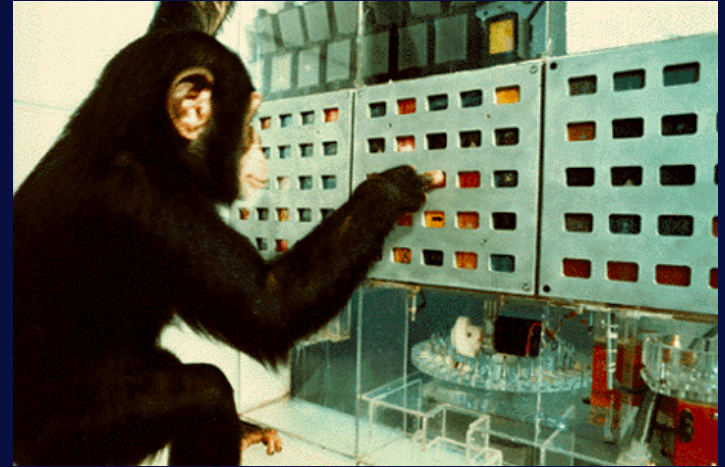
Teaching language to apes

- The earliest experiment
- The Kelloggs and Gua
- brought up like human baby
- continually exposed to speech
- ‘understood’ 70 words but never spoke
- chimps have NO vocal chords



Savage-Rumbaugh & Lana

- symbolic keyboard linked to computer and a vending machine
- if Lana requested ‘food’ she received it
- Lana understood symbols like ‘more’
- YES - semanticity YES - displacement,
- NO - structure dependence



Gardner & Gardner (Washoe)

- A case study
- Participant - a female chimp
- Age - approx 1 year old
- Procedure - Washoe lived in a caravan in the Gardner's garden & was taught American Sign Language (ASL)



Washoe's progress ...

- First SINGLE WORDS
- come, gimme, hurry, sweet, tickle
- 34 after 21 months
- by 4 years over 100 signs
- YES - SEMANTICITY
- signed TOOTHBRUSH in bathroom
- signed FLOWER in garden and when shown picture of flower

Washoe's progress ...

- YES - CREATIVITY
- Washoe spontaneously used combinations of signs
- GIMME TICKLE - come and tickle me
- OPEN FOOD DRINK - open the fridge
- LISTEN EAT - listen to the dinner gong
- GO SWEET - take me to the raspberry bushes



Washoe's progress ...

- NO STRUCTURE DEPENDENCE
- English children usually put the SUBJECT before the ACTION
 - Mummy come
 - Eve read
 - Car gone
- Washoe did not seem to do this
- GO SWEET or SWEET GO both used for take me to the raspberry bushes

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- Kanzi & Sue Savage-Rumbaugh
- ‘having a chat’



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- Kanzi's lexigram 'keyboard'



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- Research question: Can Kanzi learn symbolic language without training in the same way children do?
- **Method: Case Study - longitudinal design**
- The report of Kanzi's language development (the findings) is described as 'serendipitous' - occurred by happy chance

Bonobo Chimpanzees (Pygmy)

- These differ from other apes in following ways:
- More developed in social communication;
 - eye contact
 - gesture
 - vocalisations
- Better prepared to learn language than other apes

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Swahili
treasure



The participant:

- **KANZI** born 28/10/80 in captivity, his mother was a 'language chimp'
- Assigned to the language research centre at 6 months & reared in a language using environment with humans
- When 2.5 yrs old it was observed that he was using symbols spontaneously (perhaps because he had observed his mother)
- Also sister **MALIKA**

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Serendipitous observation

Kanzi

- began to use symbols without training after he was separated from his mother
- identified symbols correctly and did not confuse them (e.g. apple, orange, banana)
- understood spoken words

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The visual symbol system

- Indoors: battery powered keyboard with geometric symbols that brighten when touched, then speech synthesiser 'speaks' the word
- Outdoors: copy of keyboard as laminated pointing board
- each symbol called a lexigram



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Kanzi's (& Mulika's) **outdoor environment:**

- 55 acres forest; 17 food locations; must travel to 'get food' each location for a specific food type e.g. bananas to treehouse, peaches to lookout
- Kanzi learned where all the food was located
- could select a food from photos on the ground and could guide another person to his chosen location
- learned to use the symbols on the keyboard to indicate where he wanted to go

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Longitudinal case study - data collection

- records kept of Kanzi's/ Malika's language development (symbol use) for 17 months
- from the age of 2 1/2
- computerised records from keyboard
- notes from observers when outside
- Compared with progress of common apes: Sherman & Austin (different setting)

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Longitudinal case study

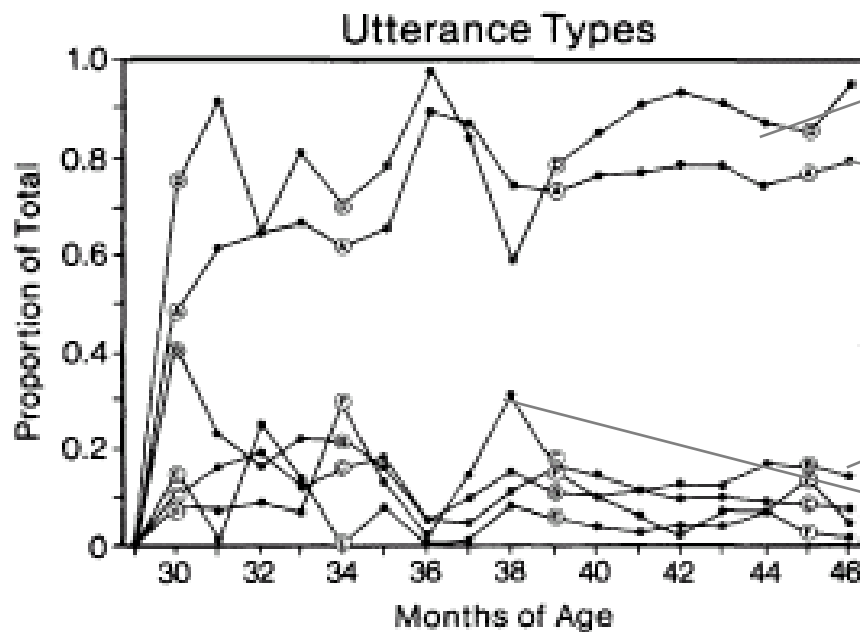
The data (assessing Kanzi's symbol use)

- correct or incorrect
- spontaneous
- imitation
- structured (e.g. responds to question)
- also behavioural concordance (agreement)
- e.g. if request to 'go to treehouse' led a person to the treehouse

Controls:

- Analysis of videotape against real time coding of symbol use by 2 observers
- Vocabulary Acquisition Criteria:
 1. Appropriate symbol production
 2. Occurs spontaneously 9/10 occasions & concordance is 9/10

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- (A) Single words used spontaneously
- (B) Single words elicited by companion's queries
- (C) Single words used in imitation or as a result of prompting
- (D) Combinations used spontaneously
- (E) Combinations elicited by companion's queries
- (F) Combinations used in imitation or as a result of prompting

D

A

B

F

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Example combinations

Results

2530 correct combinations
many were 'two foods'

e.g. hotdog & coke

265 imitated

person (g) chase Kanzi' person
(g) chase person (g)

g = gesture to indicate 'who'

indicates structure

dependence / correct syntax

Chase person 1(g) person2(g)
Person 1(g) pat(g) person2(g)
Person 1(g) person2(g) pat(g)
Person 1(g) chase person2(g)
Person 1(g) grab person2(g)
Person 1(g) chase(g) person2(g)
Person 1(g) person2(g) chase
Kanzi chase person(g)
Chase bite person(g)
Person(g) chase Kanzi

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- Testing Kanzi
- given lexigram and/or photo
- asked to match to object
- also match to spoken English
- see example list

Vocabulary Test: Kanzi

Item	Match symbol to English	Match photo to English	Match photo to symbol	Match symbol to Votrax speech
A-frame	X	C	C	C
Apple	C	C	C	C
Austin	C	C	C	C
Ball	C	C	C	C
Banana	C	C	C	C
Blackberry	C	C	C	C
Blanket	C	C	C	C
Bread	C	C	C	C
Campfire	C	C	C	C
Carrot	C	C	C	C
Chase	C	NP	NP	C
Cherries	C	X	C	C
Cheese	C	C	C	C
Childside	C	C	X	C
Chow	C	X	X	C
Clover	C	C	C	C
Coffee	C	C	C	C
Coke	C	C	C	C
Colony room	C	C	C	C

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- Kanzi: comparison of imitated or spontaneous to 'other ape learners'

Imitated Versus Spontaneous Utterances

Subject	Proportion of imitated utterances	Proportion of spontaneous utterances
Kanzi	.11	.80
Mulika	.20	.67
Nim	.39	.56
Sherman	.10	.78
Austin	.05	.90

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- Conclusion
- Kanzi learned to use the symbols spontaneously
- Compared to other species of chimps pygmy chimpanzees appear to be able to learn and use language more like a human child
- Kanzi & the language universals?
- **semanticity** - YES; **creativity** - YES;
- **structure dependence** - YES;
- **Generalisation** - YES; **Displacement** - YES

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Evaluative issues:

- ++ both quantitative and qualitative data
- ?? validity of measurement
- ?? reliability of measurement
- ?? representativeness of sample
- ?? ecological validity (level of realism)
- ?? generalisability to other pygmy chimps
- ?? ethical issues
- ?? differences between Kanzi & child learner
- ?? usefulness

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