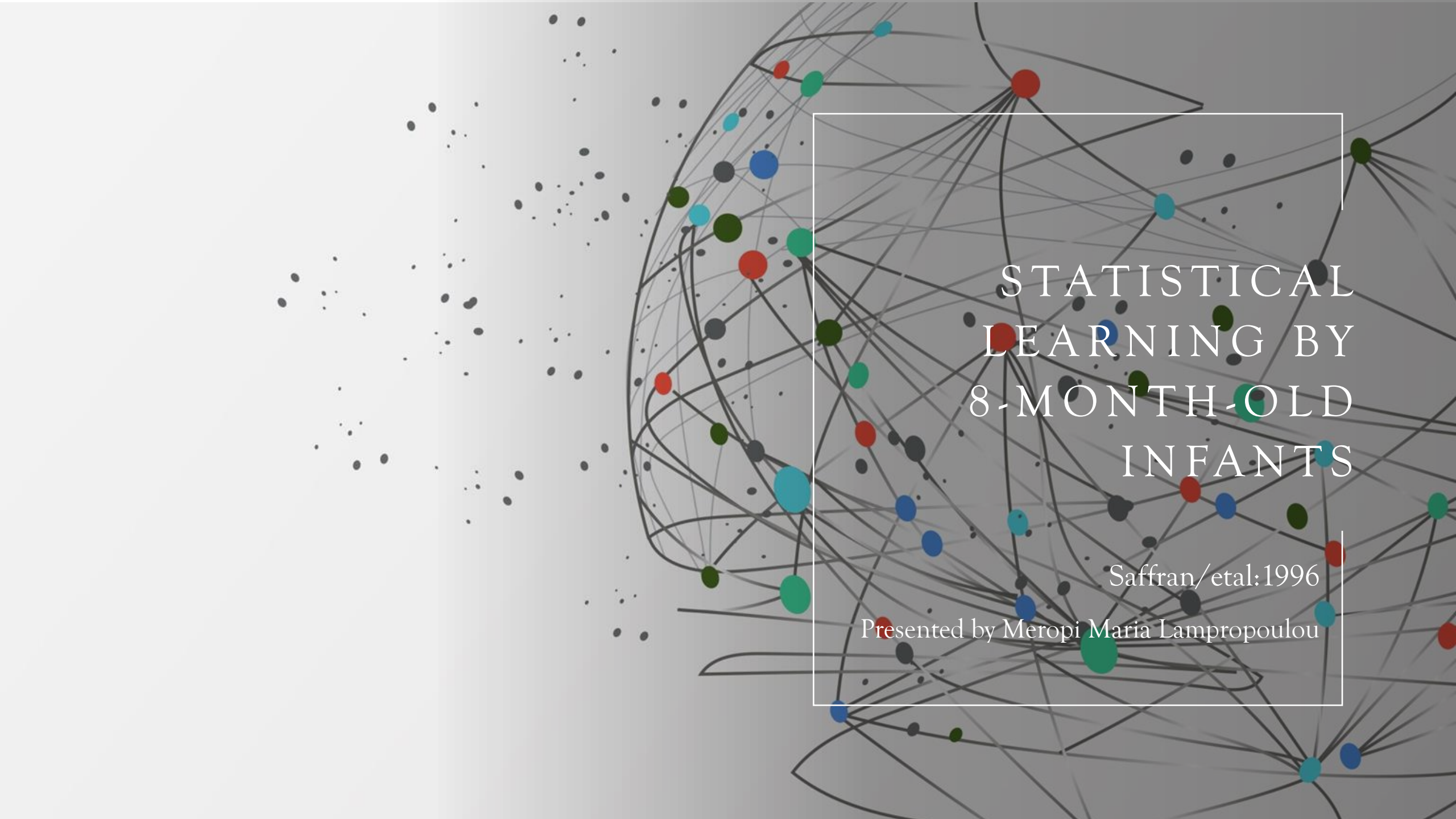


STATISTICAL LEARNING BY 8-MONTH-OLD INFANTS

Saffran/etal:1996

Presented by Meropi Maria Lampropoulou

Experience – dependent & experience – independent mechanisms in learning

- In nature all organisms use mechanisms to extract information
- Some species don't need prior experiences for information extraction while others do
- Language learners rely on a combination of experience – dependent and experience – independent mechanisms to extract information

Experience – dependent & experience – independent mechanisms in learning

The main focus of theorists is on the experience – independent mechanism which are necessary and dominant

- Two facts supporting that:
  1. complex forms of language production develop rapidly
  2. the available input is incomplete and sparse compared to the linguistic abilities of a child

Experience – dependent mechanisms in language acquisition

- However, there are experience-dependent mechanisms required in language acquisition
- Listening experience is important in many aspects of language acquisition (e.g. vocabulary, phonological structure)
- A hypothesis from many theorists: learning affects the acquisition of complicated linguistic aspects (DeCasper etal:1988)
- Infant considered poor learners, which indicates that innate factors are responsible for acquiring a natural language.

FOCUS OF THE PAPER

- Experience – dependent factors in language acquisition
- Ability of the infants to learn
- Does increased ability of learning mean that the experience – independent factors are not as important as previously assumed?

✓ Results suggest that experience plays a more important role in language acquisition than previously recognized

TOPIC UNDER DISCUSSION

Segmentation of words from fluent speech:

- achieved by 8-months-old infants
- identify statistical relationships between sounds in spoken language
- statistical learning only after 2 minutes of exposure

TOPIC UNDER DISCUSSION

Segmentation of words from fluent speech:

- achieved by 8-months-old infants
- identify statistical relationships between sounds in spoken language
- statistical learning only after 2 minutes of exposure

➢ 2 experiments: **Can 8-month-old infants extract information based on sequential statistics of concatenated speech?**

GENERAL EXPERIMENTAL SET UP

24 8-month-old infants

American English-speaking environment

2 minutes of continuous speech

three-syllable non-sense words

No acoustic information on word boundaries

(e.g. pauses, stress or any other prosodic cues)

Only cues - transitional probabilities

(higher within words than between words)

GENERAL EXPERIMENTAL SET UP

- Each infant tested individually on parent's lap
- Observer out of the sound-attenuated booth
- Infant's gaze directed to a blinking light on front wall

- Sound came from 2 speakers on side walls
- Blinking lights on side walls
- Infant's head turn to each side light
- No correlation between sound and light

Experiment 1

EXPERIMENT 1
PROCEDURE

Familiarization:

- monotone female voice by speech synthesizer
- repetition of four three-syllable nonsense words in random order (at a rate of 270 syllables per minute)
- same word never occurred twice in the stream
- familiarization – preference process developed by Jusczyk & Aslin 1995

EXPERIMENT 1
CONDITIONS

Counterbalanced stimulus conditions:

Condition A	Condition B
tupiro, golabu, bidaku, padoti (words used during familiarization)	dapiku, tilado, burobi, pagotu (non-words)

EXPERIMENT 1
TESTING PROCESS

Test Trials:

❖ Exposure to words and non-words (different syllable pairings)

Condition A:	Condition B:
• First 2 strings = words • Last 2 strings = non-words Example: tupirogolabudapikutilado	• First 2 strings = non-words • Last 2 strings = words

EXPERIMENT 1
TESTING PROCESS

Test Trials:

❖ Exposure to words and non-words (different syllable pairings)

Condition A:	Condition B:
• First 2 strings = words • Last 2 strings = non-words Example: tupirogolabudapikutilado	• First 2 strings = non-words • Last 2 strings = words

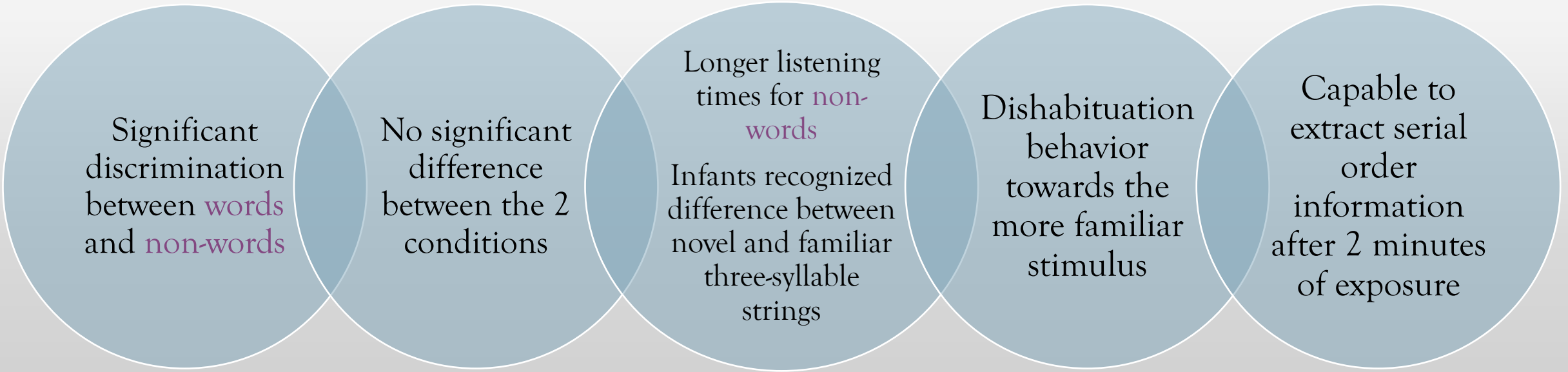
❖Transitional probabilities of non-words = 0

❖Counterbalanced design between-subjects -> ensures objectivity of preference

❖Each of four test strings presented with 500 ms interval time

❖3 different trials / 12 test trials per infant

EXPERIMENT 1 FINDINGS



Experiment 2

EXPERIMENT 2
PROCEDURE

Familiarization:

- Similar way with experiment 1 – words used were similar non-sense words to the artificial language used during experiment 1

Test trials:

- This time test items consisted of 2 words and 2 part-words
- Part-words: joining the final syllable of a word to the first syllables of another word

EXPERIMENT 2
CONDITIONS

Counterbalanced stimulus conditions again:

Condition A	Condition B
pakibu, tibudo, golatu, daropi (words)	tudaro, pigola, bikuti, budopa (part-words)

EXPERIMENT 2
TESTING PROCESS

Test trials:

Condition A:	Condition B:
• First 2 strings = words • Last 2 strings = part-words Example: pakibutibudotudaropigola	• First 2 strings = part-words • Last 2 strings = words

EXPERIMENT 2
TESTING PROCESS

Test trials:

Condition A:	Condition B:
• First 2 strings = words • Last 2 strings = part-words Example: pakibutibudotudaropigola	• First 2 strings = part-words • Last 2 strings = words

- In above example: part-word "tudaro" combines the words golatu, daropi
- Part-words could be judged as novel depending on infants' learning
- Difficulty in test discrimination -> transitional probabilities in part-words are lower between first syllables

EXPERIMENT 2
FINDINGS

Again: Significant discrimination between words and part-words

Longer listening times for part-words

Two minutes of exposure sufficient for 8-month-olds to extract information on sequential statistics of syllables

Novelty preference:

cannot be attributed to total lack of experience as with non-words in experiment 1

Infants learn and remember groupings of 3-syllable strings

(higher transitional probabilities surrounded by lower transitional probabilities)

GENERAL CONCLUSIONS

- ✓ Impressive performance given the impoverished nature of familiarization
- ✓ In both experiments: extraction of information after 2 minutes of exposure by 8-month-old infants
- ✓ Infants in real life benefit form other types of cues correlated with statistical information
- ✓ Possibility that experience - dependent mechanisms actually help in other language acquisition aspects too

REMAINING QUESTIONS

What remains unclear:

- Is statistical learning observed an indicative mechanism only for language acquisition?
- Despite existence of computational ability, is it safe to assess how much knowledge comes from experience-independent mechanisms?
- Some aspects of early development -> innately biased statistical learning mechanisms and not innate knowledge.
  - ✓If so, experiences during the early years may play a greater role than previously recognized.

ANY QUESTIONS?

THANK YOU FOR YOUR ATTENTION!