24.904
Language Acquisition

Class 3: Biological Bases of Language, continued

The obvious

- 5000 languages in the world
- speakers of one cannot usually understand speakers of the next
- exposure conditions strikingly influence how each one is acquired
  - massive correlation b/w being born in France and speaking French

The obvious

- The particular languages that people speak must be “learned” in some way

Equally obvious once you think about it…

- some part of the capacity to learn languages must be “innate”

“Under widely varying environmental circumstances, while learning different languages, within different cultural settings and under different conditions of child rearing, with different motivations and talents, all normal children acquire their native tongue to a high level of proficiency within a narrow developmental time frame.”

(Gleitman & Newport 1995)

What we’re up to

- Examining the viability of a specific claim about this capacity:

- language acquisition in humans involves a type of learning that is heavily constrained, or predisposed to follow certain limited courses, by our biology

What we’re up to

- **last time**: logical and empirical arguments

- **today:** arguments from the relative *irrelevance* of experience

What we're up to

- **last time**: logical and empirical arguments

- **today:** arguments from the relative *irrelevance* of experience

1. language learning proceeds uniformly within and across linguistic communities despite extensive variability of the input provided to individuals

2. the child acquires many linguistic generalizations that experience could not have made available.

Milestones of normal language development

- Linguistic milestones achieved in parallel fashion across languages

  - babbling around 6-8 months

  - first word production around 10-12 months

  - spurt of vocabulary growth and rudimentary sentences in the second year of life; “telegraphic stage”

  - considerable elaboration between years 2-5: complex sentences, stable use of functional morphology, etc.

What does this tell us?

- Lenneberg (1967): the uniformity of milestones as evidence that language acquisition is controlled, at least in part, by some underlying maturational timetable (like puberty, baby-teeth).

- but consistent with other things also…

    - e.g. perhaps the only logical way to learn, through time and exposure, all the detailed facts about the language that they are hearing from adults around them

Testing the alternatives

- Somehow need to disentangle the environmental exposure from maturation of the learner

- Natural experiments

Language development in the blind child

Language development in the blind child

- Landau and Gleitman 1985 (replication in Murphy 1987)
  - naturalistic data collected from 3 congenitally blind children from ages 2-4
  - experimental studies of vision-relevant word comprehension on 1 child, Kelli

Language development in the blind child

- onset of speech below median but within normal limits
- initial word combination below median, but within normal limits
- by age 3, indistinguishable from sighted children in lexical and syntactic complexity
- earliest expressed meanings very similar to those of sighted children
  - “blind children talk about what most young children talk about: mommies, daddies, dolls, cookies, and toys" (p.30)

Language development in the blind child

- Among earliest words:
  - *look*, *see*, and color terms
    - same as sighted

Language development in the blind child

- Experiments on vision-relevant word comprehension
- *Look up!*

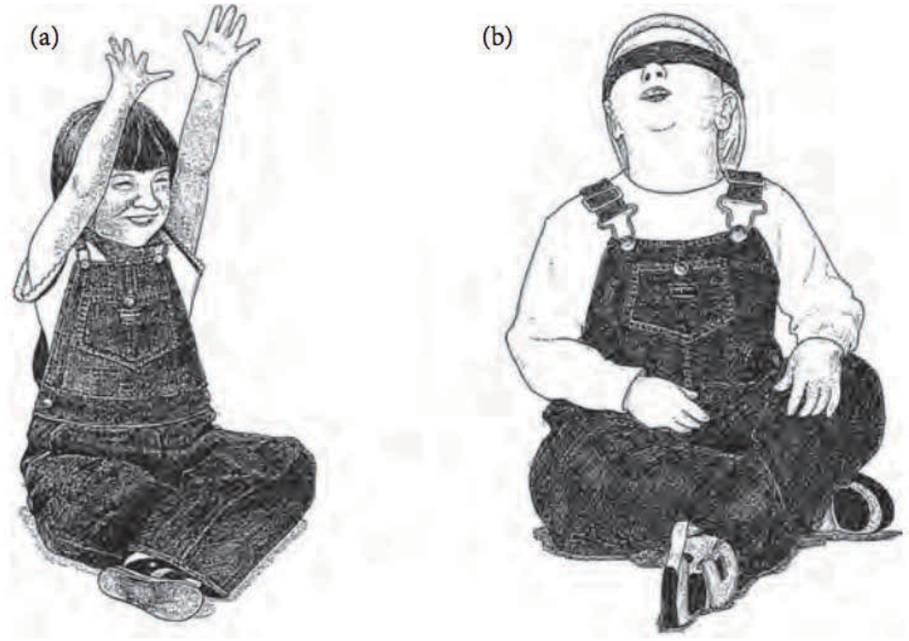

FIGURE 6.1 The blind child Kelli responds to the command 'look up' by raising her hands (Panel A), while the sighted/blindfolded child responds by raising her (unseeing) eyes (Panel B). This shows that the blind and sighted child shares a representation for 'look' that means 'perceive', but that the particular modality of perception differs. (Adapted from Landau and Gleitman, 1985.)

Does *look* mean *touch* for the blind child?

- *Touch X but don't look at it! Now you can look at it*.
  - initial taps vs. systematic manual exploration
- *Look at X but don't touch it!*
  - elicits confusion
  - blind looking, unlike sighted looking, entails touching; neither blind nor sighted touching entails looking

Does *look* mean *touch* for the blind child?

- Appropriate modulation for sighted third-party
- *Make it so that Mommy can't see X!*
  - hide in pocket (rather than e.g. move out of reach)

Language development in the blind child

- *look* and *see* as terms for perceptual exploration, unlike *touch*
- sighted children may have a more constrained notion of *look* as tied to vision (aside: do they?)
  - *Look with your hands!* elicited confusion in sighted control participants

Scaling up…

- Just how rich is blind individuals' knowledge about vision and how similar is it to the knowledge of sighted people?

Bedny et al. (2019)

Verbs of perception:

- gawk caress characterize gaze dab classify glance feel discover glimpse grip look pat investigate see perceive scrape question stare stroke recognize view tap scrutinize watch tickle touch study

Verbs of emission:

- blaze flare groan buzz flash growl chime flicker grumble clang grunt glisten mutter creak glitter shout glow squawk shimmer hiss shine whimper sizzle sparkle whisper squeak twinkle yelp

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- Can blind learners acquire detailed knowledge of this space of verb meanings without first person access?

- Congenitally blind adults (N=25) and sighted controls (N=22)

- Participants judged semantic similarity for pairs of verbs referring to:

    i. visual vs. tactile vs. amodal perception

    ii. visual vs. auditory emission

Bedny et al. (2019)

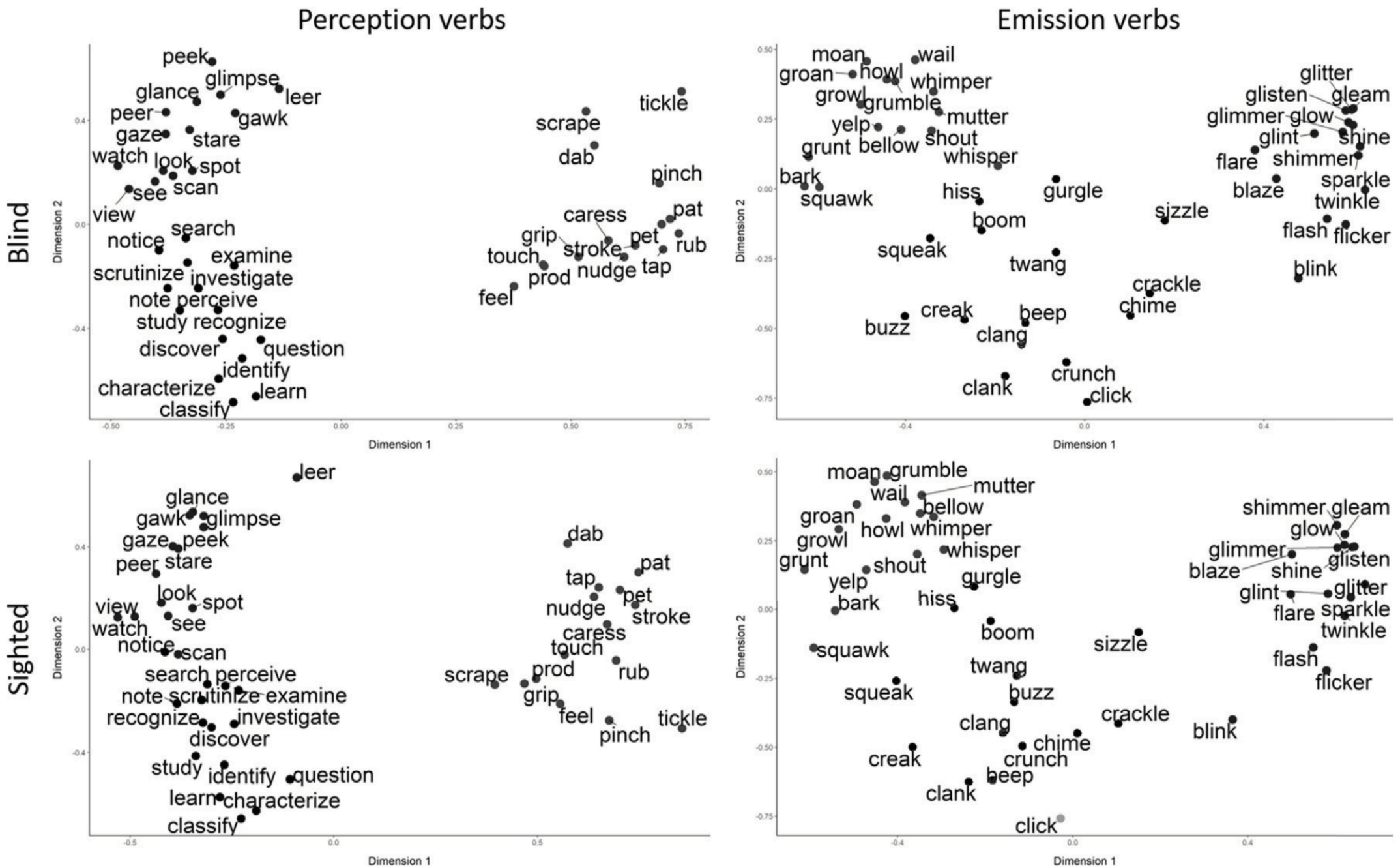
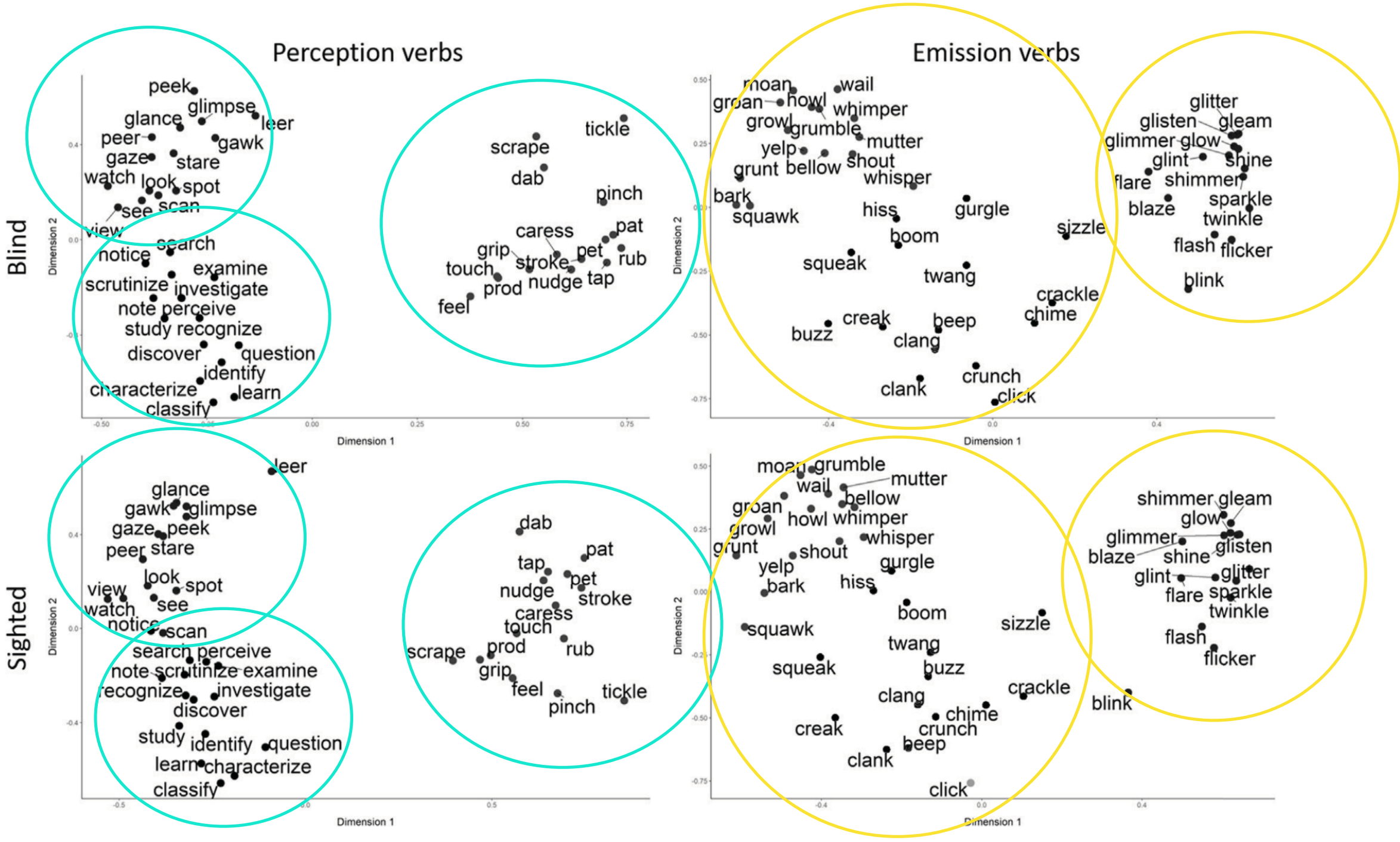


Fig. 2. Blind (top) and sighted (bottom) group MDS results for perception (left) and emission (right) verbs. First two dimensions shown.

Bedny et al. (2019)



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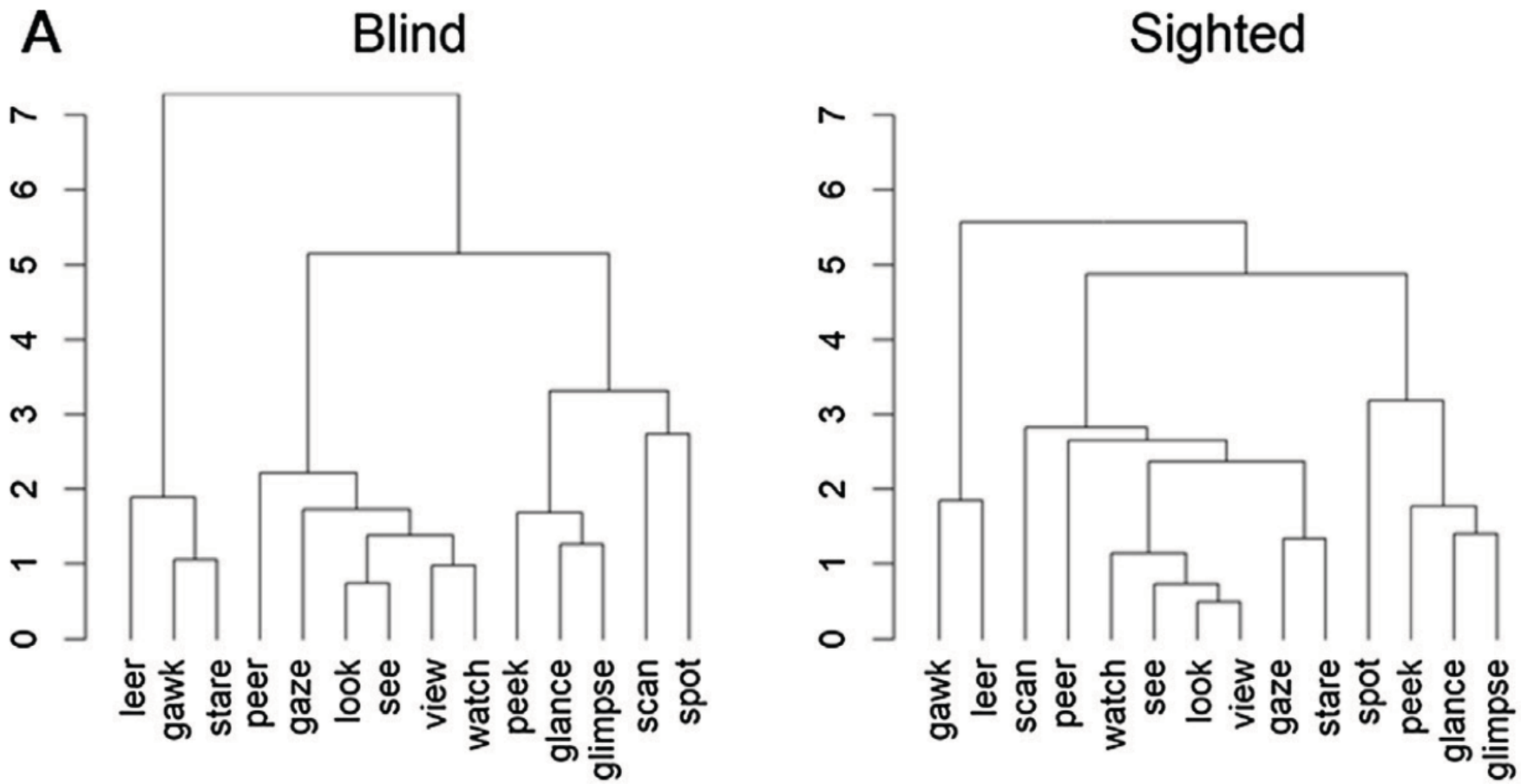
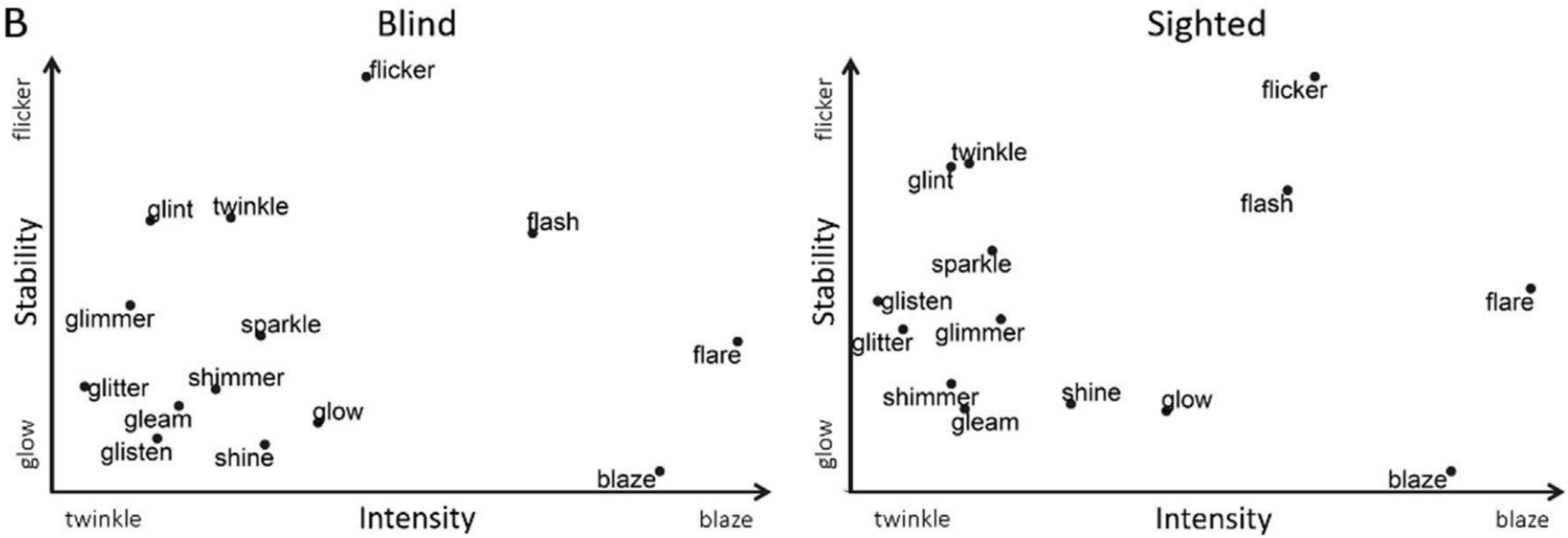
Substructure within visual perception verbs



Bedny et al. (2019)

Features of visual emission verbs



Bedny et al. (2019)

- Blind adults share with sighted adults rich knowledge about visual verbs

1. Modality as a central feature of perception verbs

   - no conflation of visual perception verbs to tactile or modal ones)

Bedny et al. (2019)

- Blind adults share with sighted adults rich knowledge about visual verbs

1. Modality as a central feature of perception verbs
   - no conflation of visual perception verbs to tactile or modal ones

2. Representations are not more noisy or heterogeneous compared to sighted
   - temporal structure of perception verbs, temporal+intensity profiles of emission verbs represented in similar ways

Upshot

- Resilience of knowledge acquisition to dramatic change in first-person sensory histories

- Implications for the endowment question…

- Implications re: learning…

Language development in the deaf child

Language development in the deaf child

- Most deaf children are born to hearing parents
- If the child is not exposed to a sign language, the child is deprived of primary linguistic data…
- …even though:
  - other potentially essential components for normal development, including various aspects of social support, are in place
  - there are potentially strong incentives to communicate

Homesign

- Despite their degraded language learning conditions, these children develop what's called **homesigns**

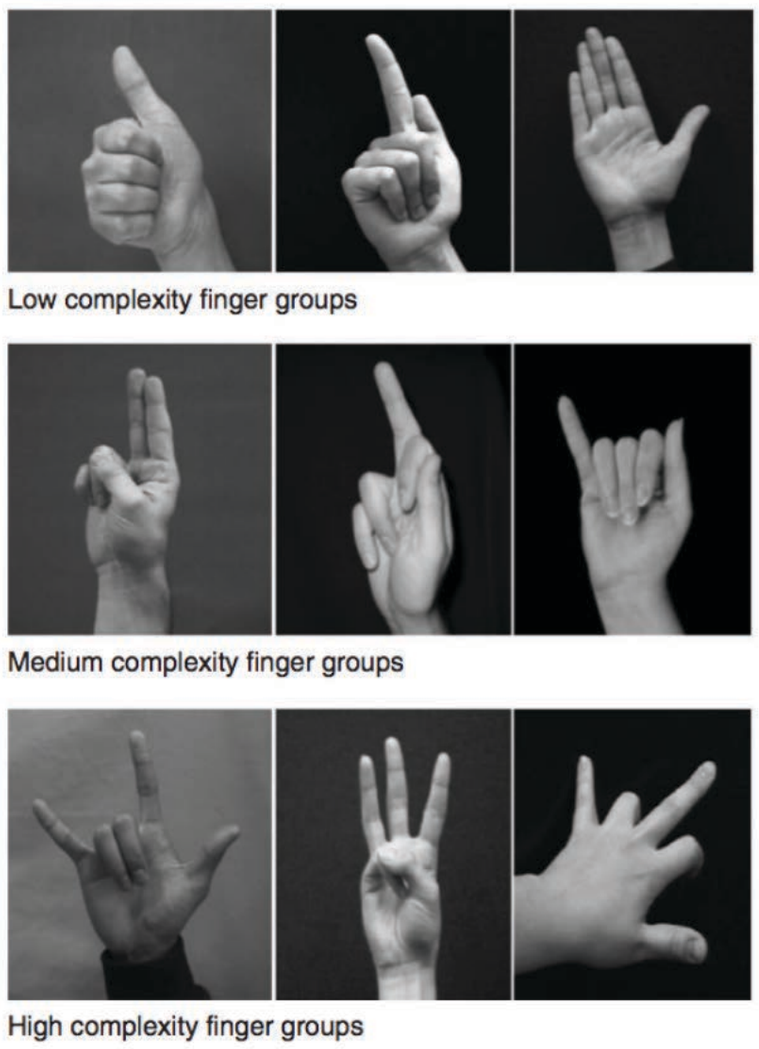
Homesign: A basic communication system created within a family that involves at least one linguistically, but not socially isolated, deaf individual. These deaf individuals use **gestures** to communicate with the people around them, devising a method for communicating through gestures that becomes systematic, and for the deaf individual, it is their primary means of communication.

Linguistic milestones

- On the same track as the hearing child, at least initially
  - manual babbling around 6-8 months
  - single manual gestures around 10-12 months
  - gesture combinations in the second year of life

Nature of homesigns

Biases homesign systems share with sign languages (though not necessarily the gestures of the caregivers)



- Higher complexity finger groups in handshapes representing properties of the object (ex: tasty) vs. lower complexity finger groups in handshapes representing how objects are handled (ex: eat) (Brentari & Coppola 2012)

Nature of homesigns

Biases homesign systems share with sign languages (though not necessarily the gestures of the caregivers)

- Basic functional morphology and productivity with such elements
  - symbols for negation, question-formation
  - demonstratives (“this”), possessives (“my”)

Nature of homesigns

- More generally, the gestures from caretakers of homesigners do not seem to form the basis of child homesign systems (Goldin Meadow & Mylander 1983). They seem to innovate on their own.

Nature of homesigns

1. Homesigners distinguish nouns and verbs, even if the signs of their caretakers do not (Goldin Meadow & Mylander 1990).

Nature of homesigns

2. Homesigners do not use the word order of their caretakers.

- Whereas gesturing adults use an order corresponding to their spoken language (e.g. “you twist the jar”), homesigning children in US and Taiwan have been observed to converge on a post-verbal subject order (e.g.“jar twist you”) (Goldin Meadow & Mylander 1998, Goldin Meadow & Zheng 2002)

Nature of homesigns

3. Homesigners distinguish plain noun phrases (bird) from those with determiners/articles (that bird) even when the gestures of their caretakers do not

What homesign tells us

- Homesigners are not merely copying the gestures of the hearing caretakers around them. Instead, they are creating their own systematic uses of gestures.

- There seem to be some biases in the way these systematic gestural systems develop, suggesting that the human mind naturally imposes some order on the linguistic system it uses.

Interim summary

- Deprived of access to sign language past some critical stage (early adolescence, perhaps), a deaf learner will only have the homesign system as a system of communication

- Though structure is imposed on this system, it never reaches the elaborateness and productivity of a linguistic system

- But what happens if a homesign system serves as *input* to a younger learner in the critical period?

Children creating language: Nicaraguan Sign Language

Children creating language: NSL

- In 1978, the Nicaraguan government opened the nation's first public schools for the deaf.

- The deaf children who entered had no common sign language, but did have their own individual homesign systems.

- Once the children were in contact with each other, a new common sign language emerged: Nicaraguan Sign Language.

Increase in complexity

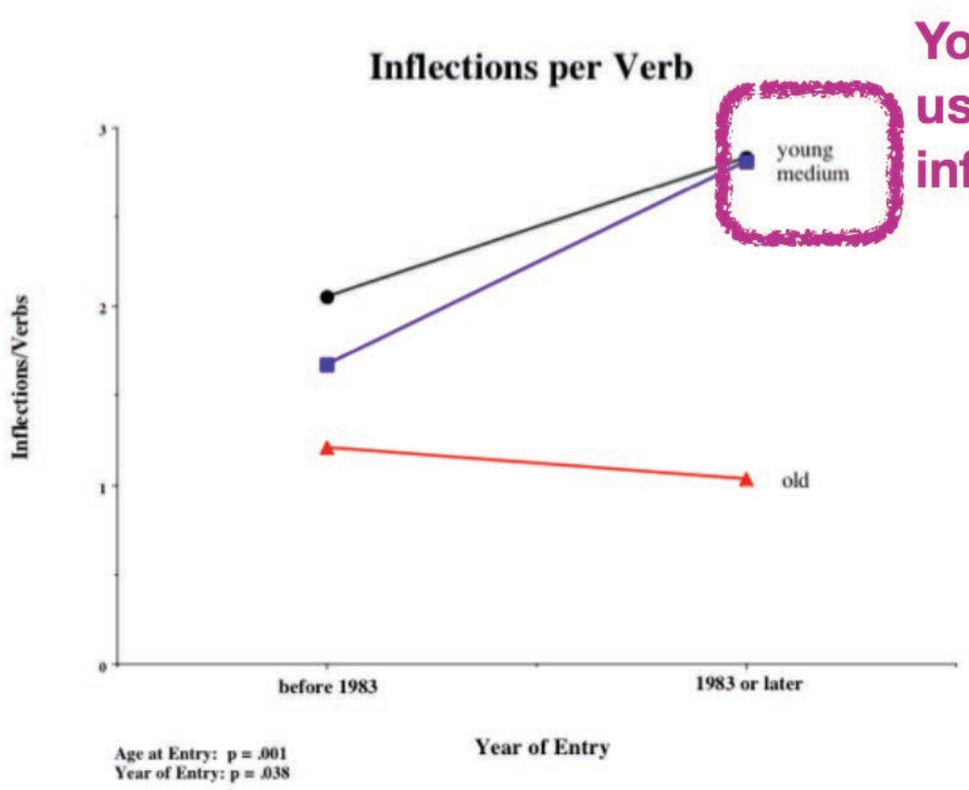


Figure 2. The number of inflections per verb is greater overall for signers who entered the community in 1983 or later, and for signers who were exposed to the language at a *young* or *medium* age. The *young* and *medium* Age at Entry signers are particularly affected by a later Year of Entry.

Younger children use more inflections.

Inflection:

He likes me.

(as opposed to "he like me")

Senghas 1994

Increase in complexity

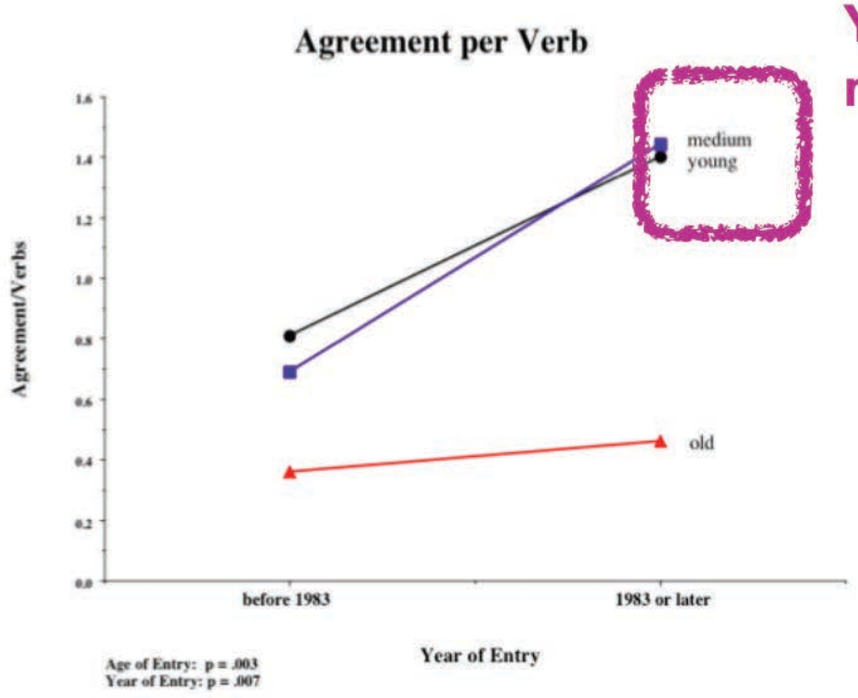


Figure 3. The number of inflections showing agreement per verb is greater overall for signers who entered the community in 1983 or later, and for signers who were exposed to the language at a *young* or *medium* age. The *young* and *medium* Age at Entry signers are particularly affected by a later Year of Entry.

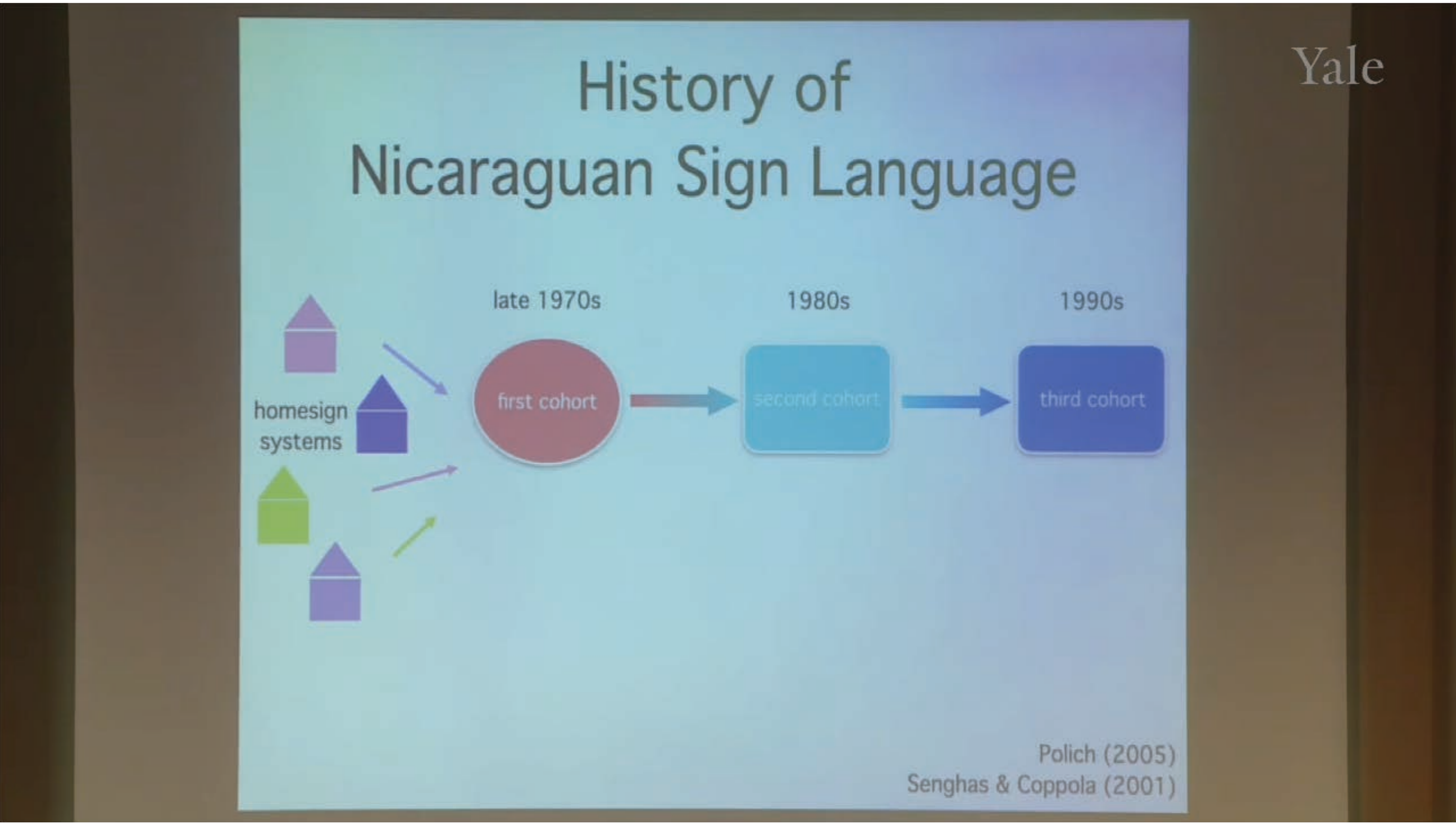
Younger children use more agreement markers

Agreement:

He is smiling.

(as opposed to "he are smiling")

Senghas 1994



clip from a talk by Annemarie Kocab, Harvard University

Five loaves and two fishes

- Young children seem to be the driving force of language creation here. They are the innovators and the ones who retain the more complex structures that result from these innovations.

- Experience within some delimited timeframe is crucial— otherwise does not elaborate beyond homesign systems — but it can apparently be very little.

- The child has the tools she needs to go incredible distances with the little she gets