Environmental Effects on Parental Teaching and Infant Word Learning

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Background

Infants learn language in context-rich environments with multiple possible referents, but **how do children know what a novel word refers to?**

A computational model of word learning predicted that multiple cues, including **gestures**, **guided referent identification** (Monaghan, 2017).

Parental gesture use and its quality is related to language development (Rowe, Özçalışkan and Goldin-Meadow, 2008; Cartmill et al., 2013).

Infant word learning occurs in an interactive context, where speaker and listener adapt to each others' knowledge state (O'Neill, 1996; Bahtiyar & Kuntay, 2009). However, **how parents adapt cues to the environment is not yet known.**

Do parents alter gestures based on referential uncertainty? Do infants of parents who gesture more learn better?

Method

Participants: Parent-infant dyads, infants 18—24 months-old
Training, *n* = 47 (*M* = 20.9 mo, *SD* = 1.7 mo, m:f = 27:20)
Testing, *n* = 27 (*M* = 20.8 mo, *SD* = 1.6 mo, m:f = 13:14)

Training procedure: 3 novel words as labels (noop, darg, terb)
3 novel objects as targets, 6 as foils (randomly assigned)

Parents were asked to teach infant novel label-referent pairings, viewed at 70cm, for 30 seconds. Each participant underwent three conditions (Fig.1):

One-referent: 1 target ("noop")

Two referents: 1 target ("terb") + 1 foil

Six referents: 1 target ("darg") + 5 foils

Testing procedure: Infants tested on novel labels they learnt (six trials; Fig.2):

"Where is the [target]? Can you see the [target]? Point to the [target]."

1. "terb":
2. "noop":
3. "darg":

Results

Training was video-coded (Rowe, Özçalışkan & Goldin-Meadow, 2008). IRR: 20% were coded by a second coder; κ=.86 for speech with gesture (N=160) and κ=0.78 for gesture (N=284).

Speech + gesture: per utterance as **complementary** (singling out target) and **supplementary** (related information about the target, e.g. colour).

Gesture: per utterance as **deictic** (singling out objects, e.g. pointing) and **representational** (object characteristics, e.g. hands indicating 'round').

Linear mixed effects models were used to predict gesture and speech use (random effects: participant & infant age; fixed effects: condition & vocabulary, UK-CDI expressive & gesture subscales).

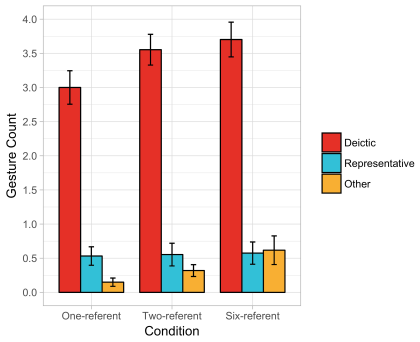

Fig.3 – Gesture type generated by parents per condition (mean & std. error)

Deictic gestures: effect of condition (p = .015), with a significant increase in gestures from **one to two referents (p = .030)**, and **one to six (p = .006)**, but not two to six (p = .553; Fig.3).

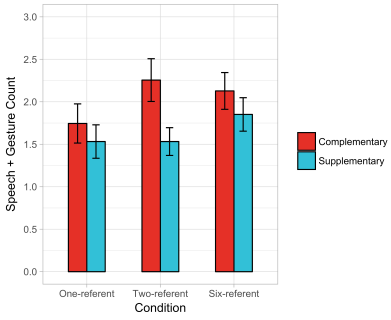

Fig.4 – Speech + gesture type generated by parents per condition (mean & std. error)

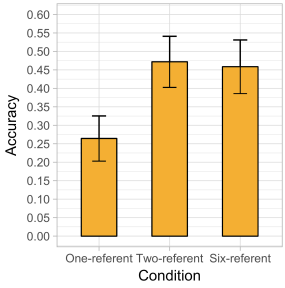

Fig.5 – Infant word learning accuracy per condition (mean & std. error)

Complementary speech + gesture: effect of condition and symbolic gesture vocabulary (p = .041), with a significant increase from **one to two referents (p = .012),** but not one to six (p = .096) or two to six (p = .376; Fig.4).

Infant accuracy during testing trials: effect of condition (p = .048), with significant increase in accuracy from **one to two referents (p = .028)** and from **one to six (p = .044)**, but not two to six (p = .893; Fig.5).

Discussion & Next Steps

Parents **altered gesture use** according to the **presence, but not the degree of referential uncertainty**.

Infants learnt best with a small amount of referential uncertainty, in-keeping with Monaghan's (2017) computational model.

There was **no translation of parental gesture use during training to infant accuracy in testing** – possible reasons are sample-related (Hirsk-Pasek et al., 2015).

Future analysis and studies:
- Parental prosody analysis for prosodic cues during training and its relation with infant performance on word learning
- Does an enforced parent gesture condition improve word learning?

Acknowledgements: Our thanks to Delyth Piper (Lancaster University)

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