Can Children Invent Novel Communication Systems?

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AELCO 2018
Negotiating Meaning in Language Evolution

**Experimental Semiotics**

- **No Language**
  - **BIOLOGICAL EVOLUTION** (change)
  - **CULTURAL EVOLUTION** (emergence)

- **Language**

  (Language increases fitness of its speakers)

- **Language**

**Time**
Experimental Semiotics

<table>
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For the complete set of information (SI) Tables S1–S8

**Table S1. Raw data for Chain 1 in Experiment 1**

- **Generation**
  - 0
  - 1
  - 2
  - 3
  - 4
  - 5
  - 6
  - 7
  - 8
  - 9
  - 10

**Kirkby et al. (2008)**

**Perniss et al. (2010)**

**Nölle et al. (2018)**

**Fay et al. (2010)**
Model of Sign Creation and Evolution

Lister & Fay, 2017
Role of Children

Locke & Bogin, 2006
Referential Communication in Children

5-year-old child

‘Mummy’s hat’

‘two worms looking at each other

adult

Krauss & Glucksberg et al., 1966
Children typically demonstrate

- inability to describe unfamiliar referents if labels are not available (Krauss & Glucksberg et al., 1966).

- inability to repair communicative break-down (Garrod & Clark, 1993) unless scaffolding is provided (Matthews, Lieven, & Tomasello, 2007)

- routine lack of ambiguity monitoring (Rabagliatti & Robertson, 2017)
error for the whole language; transmission.

would come from communicative need in the case of real language though artificial, is an analogue of a pressure to be expressively removes the possibility of the language adapting to be more than 1 meaning, all but 1 of those meanings (chosen at before each participant's training. If any strings were assigned to Design of Experiment 2.

Languages in this experiment are evolving to be learnable, and once again, it is clear that the languages are becoming more structured. As can be seen in Fig. 2 shows how transmission error changes as the language evolves. Furthermore, the languages produced by the final generation are significantly more structured than the initial languages (mean increase 5.578, SD 2.968, t (3) 3.7575, p < 0.005). Because filtering rules out the possibility of gaining structure. These results show that, despite the blocking of underspecification, structure still evolves that enables the languages to specify meanings but instead must find some other means unambiguously. Such a language cannot rely on systematic under-generalizations that emerged in the previous experiment, a difference.

‘Alien’ Buzzer Language
### Previous Findings: Motivated Signs

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#### Online Transmission Pilot Study:
- **high tone** (0) = spiky, **low tone** (1) = fluffy
- **short** = small, **long** = large

with N. Panayotov & M. Tamariz
Previous Findings: Motivated Signs

<table>
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Referential communication in adults:
- **short** = small, **long** = large

Kempe, Gauvrit, Gibson & Jamieson (in press)
Previous Findings: Communicative Success

Kempe, Gauvrit, Gibson & Jamieson (in press)
Previous Findings: Motivated Signs

Kempe, Gauvrit, Gibson & Jamieson (in press)
Previous Findings: Alignment

Kempe, Gauvrit, Gibson & Jamieson (in press)
Previous Findings: Refinement

Kempe, Gauvrit, Gibson & Jamieson (in press)
Evidence for 3 components of sign creation in adults vs. children:

<table>
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Mechanisms?

- Children’s limited cognitive capacity limits ability to track partner signals.
Present Study

Reduced meaning space
Familiarisation phase

3 groups of participants:
• child-child dyads (n=24), 6-7-year-olds
• child-adult dyads (n=24), 6-7-year-olds vs. adult females
• teen-teen dyads (n = 14, on-going), 12-13-year-olds
Communicative Success

![Graph showing Communicative Success](image)

**Role**

- **Director first**
- **Director second**

**Condition**

- child-child
- child-adult
- teen-teen

**Mean PropAcc4**

**Round**

1 2 3 4 5
Alignment

[Graph showing mean similarity to partner (1 - nLED) across rounds for different conditions: child-child, child-adult, teen-teen. The graph is divided into two sections: Director first and Director second. Each section contains three lines representing the conditions mentioned above, with error bars indicating variability.]
Refinement / Symbolisation

Role

Condition
- child-child
- child-adult
- teen-teen

Mean length

Round
1  2  3  4  5

Director first

Director second
Evidence for 3 components of sign creation in children:

1. motivated signs
2. alignment
3. refinement

Mechanisms?

- Children’s limited cognitive capacity limits ability to track partner signals.
- Children’s mind reading ability is not as developed as previously assumed (see Oostenbroek et al., 2016; Cog Dev Special Issue 46/2018 on non-replication of passing of various ToM tasks in infancy).
Conclusion

Is adolescence the (critical?) period (Blakemore, 2018) of acute social awareness necessary for negotiating in-group conventions, including linguistic symbols?

Locke & Bogin, 2006
Thank You!

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