The effect of variation in the acquisition of grammar by children

Karen Miller & Cristina Schmitt
Introduction

- Process of Language Acquisition
- Background: Child Acquisition of Variable Input
- Our Research Questions

Phonological Variation

- Spanish Plural Morphology—/s/ lenition

Morphological Variation

- Portuguese Plural Morphology—variable agreement in DP
- English Agreement on auxiliary ‘do’

Conclusion
<table>
<thead>
<tr>
<th>Introduction</th>
<th>Process of Language Acquisition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonological Variation</td>
<td>Acquisition of Variable Input</td>
</tr>
<tr>
<td>Morphological Variation</td>
<td>Research Questions</td>
</tr>
<tr>
<td>Conclusion</td>
<td></td>
</tr>
</tbody>
</table>

**Process of Language Acquisition**

**Experience:**
- Exposure to language: input (E)

**Genetic endowment:**
- Innate capacity to learn language (I)
  - parameters (macro or micro)
  - morphosyntactic features
- Learning function (process of acquisition) (L)
  - triggering
  - weighting of possible hypotheses/grammars
Experience:

Exposure to language: input (E)

<table>
<thead>
<tr>
<th>Consistent Input</th>
<th>Variable Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>[s] → pl</td>
<td>[s] → pl</td>
</tr>
<tr>
<td>[zero] → sg</td>
<td>[zero] → pl</td>
</tr>
<tr>
<td></td>
<td>[zero] → sg</td>
</tr>
</tbody>
</table>

A Focus on Input Type

ViLA 2012  Munster, February 2012
An Example of Input Type

I have 4 dog[0].

Eat your bean[s]!

I have the marble[0]

I saw some cat[s]

How many cat[0] are there?
Evidence for Input Matching: Children produce sociolinguistic variation early in development (Smith et al. 2007, 2009; Labov 1989) but do not always produce the variant forms in the same extra-linguistic contexts as adults (Miller 2007; Roberts 1994).

Evidence for Regularization: Children seem to impose structure and regularize forms (not always matching of frequencies)
- Impoverished input (Senghas 2009)
- Artificial language learning with variable input (Hudson-Kam & Newport 2005, 2009)
- Sociolinguistic variation (Henry 1995)
Research Questions

1. Does variation involving an omission of a form affect acquisition of the grammatical morpheme associated to that form?
   1. Chilean Spanish – Plural Morphology
   2. WC English – Agreement on Auxiliary ‘do’

2. What is the effect of different types of variation on acquisition?
   1. Brazilian Portuguese – Plural Morphology
Spanish /s/ Lenition – Plural Morphology

**Mexico City**

1. Llegó la niña
2. Llegaron las niñas

**Chinese**

1. *xuesheng lai le*
   student come ASP
   'The student/students came'

**Chilean Spanish**

1. Llegó la niña
2. Llegaron las niñas
3. bus

[las]/ [lah]/ [la]
iña[s]/ [h]/ [0]
bus[s]/ [h]/ [0]
The Input: Mexican v. Chilean Spanish
Exp. 1 Comprehension of Indefinites
Exp. 2 Production of Indefinites

CHILE

las ↔ [s] (25%) [h] (60%) Zero (15%)
gatas ↔ [s] (25%) [h] (25%) Zero (50%)
blancas ↔ [s] (3%) [h] (36%) Zero (61%)
The Input: Mexican v. Chilean Spanish
Exp. 1 Comprehension of Indefinites
Exp. 2 Production of Indefinites

MEXICO CITY

\[ \text{las} \rightarrow [s] \quad \text{gatas} \rightarrow [s] \quad \text{blancas} \rightarrow [s] \]
### Comprehension of Plural Indefinites

#### Participants

**7 Experimental Tasks**
- Act-out (2 experiments)
- Picture Matching (2 experiments)
- Elicitation (2 experiments)

**Over 30 Children (4-5;11)**
- ChWC children --> [s] / [h]
- ChMC children --> [s]/ [h]
- MexWC children --> [s]

---

*ViLA 2012  Munster, February 2012*
Experiment 1

Method & Materials

Pon una____ pera/ unas____ peras en la caja
Put a/one-SG pear-SG/ some-PL pears-PL in the box
Experiment 1

Miller & Schmitt 2006, 2009, in press

% of Plural Responses

- Adults (MexWC)
- ChMC
- ChWC

Legend:
- [s]
- [h]
Experiment 2

Method & Materials

A

¿Qué hay acá?
What’s here?

una araña

B

unas arañas
arañas
4 arañas
Experiment 2

Miller & Schmitt 2006, 2009

The Input: Mexican v. Chilean Spanish
Exp. 1 Comprehension of Indefinites
Exp. 2 Production of Indefinites

ViLA 2012  Munster, February 2012
Summary of Results

Miller & Schmitt 2006, 2009

- Many Chilean children, but not Mexican children, do not associate the plural marker on indefinites to ‘more than one’.
- We take this to indicate that the variable nature of the input (i.e., /s/ lenition) involving an omission affects children’s acquisition of plural morphology.
- We suggest that variable input (due to sociolinguistic factors) initially creates an ambiguous input for determining whether the target language has grammaticalized number or not.
Omission of Morphological /-s/

Mother & Schmitt in prep

<table>
<thead>
<tr>
<th>Br. Portuguese</th>
<th>Ch. Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Target:</strong> Agr</td>
<td><strong>Target:</strong> /s/</td>
</tr>
<tr>
<td><strong>Effect:</strong> omission of [PL]</td>
<td><strong>Effect:</strong> Plural as [s], [h], [Ø]</td>
</tr>
</tbody>
</table>

(1) AØ/s minhasØ/s meninaØ/s
The-PL girl-PL nice

(2) Esses livrosØ/s
These-PL book-PL

(3) Dois alunosØ
Two student-PL

(1) Mi-s/hØ niñita-s/hØ
My-PL daughter-PL

(2) Uno-s/hØ año-s/hØ
Some-PL years-PL

(3) Cinco niñita-s/hØ
Five girl-PL
# Omission of Morphological \(-s\)/

<table>
<thead>
<tr>
<th>Language</th>
<th>Det</th>
<th>Noun</th>
<th>Adj</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chilean</strong></td>
<td>[s,h] 85%</td>
<td>[s,h] 50%</td>
<td>[s,h] 39%</td>
</tr>
<tr>
<td><strong>Brazilian</strong></td>
<td>[s] 98%</td>
<td>[s] 59%</td>
<td>[s] 62%</td>
</tr>
</tbody>
</table>

Miller & Schmitt in prep

(Miller 2007)

(Koelling 2004)
Past work comparing European Portuguese to Brazilian Portuguese shows a delay in Brazilian children’s acquisition of plural morphology.

- 2 year olds
- PMT Task w/ novel words and novel pictures.

% of plural-set choice

<table>
<thead>
<tr>
<th></th>
<th>the-SG glorp-SG</th>
<th>the-PL glorp-PL</th>
</tr>
</thead>
<tbody>
<tr>
<td>EuP</td>
<td>4.5</td>
<td>76.7</td>
</tr>
<tr>
<td>BrP</td>
<td>12.5</td>
<td>57.4</td>
</tr>
</tbody>
</table>
Experiment 3

Method & Materials

**Children:**
- 21 BrMC 3;6-6; (Mean 5;)
- 20 BrWC 3;8-5;9 (Mean 4;9)
- 50 ChWC children (4;1 – 6;1, Mean: 5;0)
- 11 MexWC children (3;9 – 5;11, Mean: 4;7).

**Adults:**
- 25 ChWC, 12 MexWC, 11 BrWMC
Results

% of Plural Responses

- BrMC
- BrWC
- MWC
- ChWC

ummas
uma

Exp. 3: Chilean Spanish v. Brazilian Portuguese Plural
Exp. 4: MAE v. NSE on Agreement on ‘do’
Summary of Results

- Variability that causes ambiguity plays a role in acquisition.
  
  \[ \text{EuP} > \text{BrP} \quad \text{Mex} > \text{ChS} \]

- But variability does not affect acquisition in exactly the same way.

- 4 – 5 year old Chilean children seem to behave as if the input is impoverished while Brazilian children do not (at least by 3;0).
  
  \[ \begin{align*}
  & \text{Are Chilean children treating [h] as } \emptyset? \\
  & \text{Is Chilean input noisier than the BrP?}
  \end{align*} \]
**Agreement on ‘do’**

Miller 2011, in press

- Where *does* Kitty live?
  - She *doesn’t* have a home?

- She *don’t* like cat food.
  - *Don’t* she have a momma?

- She *does* too!

- What ☹ she want for Christmas?
Agreement on ‘do’

Miller 2011, in press

Exp. 3: Chilean Spanish v. Brazilian Portuguese Plural

Exp. 4: MAE v. NSE on Agreement on ‘do’
Agreement on ‘do’

*Misanalysis Hypothesis* (Radford 1992): Children exposed to non-agreeing *don’t* may initially misanalyze *do* as a non-agreeing modal.

Mother: She don’t live up that street no more.
Child: She do too!
**Agreement on ‘do’**

*Misanalysis Hypothesis* (Radford 1992): Children exposed to non-agreeing *don’t* may initially misanalyze *do* as a non-agreeing modal.

**Prediction:** Do she live up that street?
Experiment 4

Methods & Materials

24 (3;7-5;4: Mean 4;4) White MC Children

16 (3;11-5;7: Mean 4;5) White WC Children (75% don’t/ 25% doesn’t)

32 WC and MC Adult Controls
Experiment 4

Methods & Materials

2nd SG:  
**Researcher:** Ask Nate if he eats oranges.  
**Child:** Do you eat oranges?

3rd SG:  
**Researcher:** Ask Nate if his dad eats oranges.  
**Child:** Does your dad eat oranges?
Experiment 4

Do you eat oranges?  Does your dad eat oranges?

<table>
<thead>
<tr>
<th>Condition</th>
<th>Adults</th>
<th>MC Children</th>
<th>WC Children</th>
<th>Adults</th>
<th>MC Children</th>
<th>WC Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>2nd SG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd SG</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Miller 2011, in press
Experiment 4

1. **Does** your dad **eat** oranges? **Adult-like**

2. **Do** your dad **eats** oranges? **Agr on V**

3. **Do** your dad **eat** oranges? **No Agr**

Miller 2011, in press
Experiment 4

Miller 2011, in press

- Do your dad eat oranges?
- Do your dad eats oranges?
- Does your dad eat oranges?
Brown’s Sarah Corpus

<table>
<thead>
<tr>
<th></th>
<th>Interrogative ‘do’</th>
<th>Interrogative ‘does’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarah</td>
<td>3;10</td>
<td>3;6</td>
</tr>
<tr>
<td>Nina</td>
<td>2;3</td>
<td>2;2</td>
</tr>
</tbody>
</table>
1. Variable input involving an omission of a form affects acquisition of grammatical morphology.
   - Chilean v. Mexican Children
   - Brazilian v. Portuguese Children
   - WC English v. MC English

2. Variable input involving an omission of a form DOES NOT always affects acquisition of grammatical morphology in the same way.
   - Brazilian v. Chilean Children
Summary of Findings

Schmitt & Miller

Correa et al. 2005

% of plural-set choice

EuP | BrP
---|---
umas | 4.5 | 76.7
uma | 12.5 | 57.4

the-SG glorp-SG | the-PL glorp-PL
Summary of Findings

1. Chilean Spanish
   --Multiple forms [s] → [zero]
   --Phonological process (all syllable final /s/)

2. Brazilian Portuguese
   --Two forms [s] v. [zero]
   --Morphological process (nouns and adjectives are affected. Number on the determiner is almost always present: 98%)
Yang’s Variational Acquisition Model

After hearing $s$, the child
1. Selects Hypothesis $H_i$ with the probability $p_i$
2. analyzes $s$ with $H_i$
3. if successful, rewards $H_i$ by increasing $p_i$ otherwise, punishes $H_i$ by decreasing $p_i$

Hypotheses
- Grammaticalized number or not?
- Strong/Weak Agreement Morphology Aux and $v$
Yang’s Variational Acquisition Model

What this model gets us:

- The more ambiguity in the input (due to production and omission of forms), the longer it takes to map the variable form to the relevant morphosyntactic feature(s).

- In other words, in the case where the variable input involves an *omission* of a piece of morphology, the learner takes longer to map the form to the morphosyntax.
Thank you

Rodrigo Cárdenas, Alan Munn and Antoinette Hawayek
Victor Hugo Santana, Claudia Bahamonde

PSU Language Acquisition Lab
MSU Language Acquisition Lab

Assistants in Mexico, Chile, Brazil and US:
Katerina French, Pascale Schnitzer, Marena García, Cynthia Corona,
Erika Mendoza, Anelise Knevitz Bartholdy, Neca da Projeto, Rosângela do
Roosevelt, Hannah Forsythe

Faculty, students and parents from the daycares, schools and universities in
Porto Alegre-Brazil, Michigan, Mexico City, Michigan, and Punta Arenas-Chile.

NSF Grants 0446769, 0746089

ViLA 2012 Munster, February 2012