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Influence of Productivity on the Acquisition of Inflectional Markers

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Introduction

- Studies on acquisition of inflectional morphology often distinguish between *regular* and *irregular* inflection. This distinction originates from studies of English, which is characterized by having one default inflectional marker for a grammatical category (e.g. the plural suffix *-s*) and a minor number of exceptions to this default rule.
- We find this distinction rather inexpedient since this is not the case for all languages (e.g. Danish, German).
- In order to address this issue we have developed a scale with three degrees of productivity.
- Productivity is here defined as the ability of the inflectional marker to occur on new words. For the plural system this means the ability to add the plural marker (stem change + suffix) to a new noun in order to form a new plural noun.

In Danish the plural can be formed in four different ways:

- Plural suffix
  - *bil* [biːˀl] 'car' - *bil-er* [ˈbiːˀlɐ] 'cars'
- Stem change
  - *mand* [manˀ] 'man' - *mænd* [mɛnˀ] 'men'
- Plural suffix + stem change
  - *fod* [foðˀ] 'foot' - *fødd-er* [ˈføðˀɐ] 'feet'
- No change (singular = plural)
  - *mus* [muːˀs] 'mouse' - *mus* [muːˀs] 'mice'

Possible suffixes

/ɐ/ /s/
/ə/ /a/
/ø/ /i/

Possible stem changes

- Stød addition
- Stød drop
- Syncope
- a-quality change
- r-insertion
- n-insertion

Productivity scale

Danish plural markers

1. FULLY PRODUCTIVE: a-schwa suffix without phonemic stem change.
2. SEMI-PRODUCTIVE: e-schwa and zero suffix without phonemic stem change.
3. UNPRODUCTIVE: markers with phonemic stem change and markers with the foreign suffixes: /s/,/a/, and /i/.

Hypothesis

We predict:

- FULLY PRODUCTIVE plural markers to be the most frequent in child language input - hence also in output, then come SEMI-PRODUCTIVE and last UNPRODUCTIVE plural markers.
- children to produce more correct plural forms of FULLY PRODUCTIVE plural markers than of SEMI-PRODUCTIVE, and more SEMI-PRODUCTIVE than UNPRODUCTIVE plural markers.
- children to overgeneralize FULLY PRODUCTIVE plural markers and sometimes also SEMI-PRODUCTIVE but never UNPRODUCTIVE plural markers.
- the error direction to go from UNPRODUCTIVE to SEMI-PRODUCTIVE to FULLY PRODUCTIVE plural markers.

Empirical data

Lexical data: OLAM is a computational coding and analysis system for Danish. The OLAM-database includes about 43.000 lexical entries.

Naturalistic spontaneous child language input and output: Two twin pairs from the The Odense Twin Corpus and two singletons from Danish Plunkett Corpus. The children are recorded in interaction with their families approximately once every moth. The recordings are transcribed in CHILDES and coded in OLAM (morphologically and phonologically). The children are in the ages of 0;9 - 3;11.

Task 1: Semi-structured interviews on the basis of pictures and pre-prepared questions for maximal elicitation of noun plural forms. 80 monolingual Danish children aged 3, 5, 7 and 9 years participated in this task. 20 children in each age group. These children also participated in Task 2.

Task 2:. Picture-based elicitation task with 49 items. The experimenter asked the child: "Here is a goose. Here are two what?" and the child was supposed to produce the plural form of the noun. 160 monolingual Danish children aged 3, 4, 5, 6, 7, 8, 9 and 10 years participated in this task.

Results

Table 1. Frequency of FULLY PRODUCTIVE, SEMI-PRODUCTIVE and UNPRODUCTIVE plural markers in child language input and output including their lexical frequency (the Odense Twin Corpus and Danish Plunkett Corpus).

Degree of productivity	Lexical frequency	Input plural types	Input plural tokens	Output plural types	Output plural tokens
Fully productive	87%	63%	50%	58%	62%
Semi-productive	11%	31%	32%	33%	31%
unproductive	2%	6%	18%	9%	7%

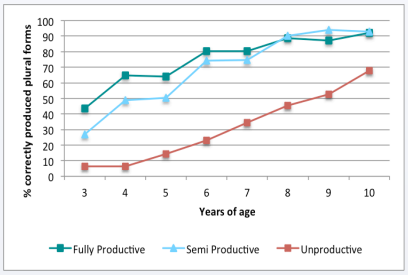

Figure 1. Shows the proportion of correctly produced plural forms by age and degree of productivity in Task 2. In the younger age groups, children produce more correct plural forms of nouns taking a FULLY PRODUCTIVE plural marker compared to nouns taking a SEMI-PRODUCTIVE plural marker, but they appear to coincide in the older age groups. On the other hand, UNPRODUCTIVE plural markers have much lower correctness rate in Task 2 compared to the other plural markers.

Table 2. Logistic regression of the outcome 'produced correct plural form' (Y/N), adjusted for productivity, age and their interaction as well as plural and singular token frequency (divided into quartiles).

Produced	Odds ratio	p-value	[95% conf. interval]	
Productivity				
FULLY PRODUCTIVE	ref.			
SEMI-PRODUCTIVE	.58	0.002	.41	.82
UNPRODUCTIVE	.08	<0.001	.04	.14
3 year olds	ref.			
4 year olds	2.49	<0.001	1.85	3.33
5 year olds	2.42	<0.001	1.79	3.26
6 year olds	5.68	<0.001	4.11	7.86
7 year olds	5.71	<0.001	4.13	7.89
8 year olds	11.15	<0.001	7.66	16.23
9 year olds	9.52	<0.001	6.64	13.64
10 year olds	16.36	<0.001	10.76	24.86
Plural token frequency				
0	ref.			
1-9	1.92	<0.001	1.66	2.22
10-29	3.66	<0.001	2.74	4.89
30-	2.65	<0.001	1.91	3.67
Singular token frequency				
0	ref.			
1-19	3.40	<0.001	2.77	4.17
20-79	3.23	<0.001	2.58	4.05
80-	3.65	<0.001	2.74	4.86

In Table 2 we see that the interaction is significant, thus the effect of productivity changes with age. The impact for the covariates changes the picture in the adjusted analysis compared to the crude rates presented in Figure 1.
We see that the odds for producing the correct plural form are reduced by 42% for items with SEMI-PRODUCTIVE plural markers compared to FULLY PRODUCTIVE plural markers, and by 92% for items with UNPRODUCTIVE plural markers compared to FULLY PRODUCTIVE plural markers.
With respect to age, the odds increase with older age, especially when reaching school age, compared to the age of 3-years.
Furthermore, we observe that the effect of plural and singular token frequencies are somewhat similar in size. Compared to a plural token frequency of 0, we have a 1.9-fold increase in odds for frequencies between 1 and 9, a 3.7-fold increase for frequencies between 10 and 29, and a 2.7-fold increase for frequencies above 30. Compared to a singular token frequency of 0, the increases in odds are 3.4 for frequencies between 1 and 19, 3.3 for frequencies between 20 and 79, and 3.8 for frequencies above 80. Thus for both types of token frequencies something is better than nothing, but more is not necessarily better.

Conclusions

The study shows that plural acquisition is affected by morphophonological category

- Children produce more correct plural forms of nouns with a FULLY PRODUCTIVE than a SEMI-PRODUCTIVE plural marker and more of the latter than of nouns with an UNPRODUCTIVE plural marker in both Task 1 and Task 2.
- Children overgeneralize the FULLY PRODUCTIVE and SEMI-PRODUCTIVE plural markers but never the UNPRODUCTIVE in both Task 1 and Task 2.
- The error direction goes from UNPRODUCTIVE to SEMI-PRODUCTIVE to FULLY PRODUCTIVE plural markers.

References

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For further information

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