The Power of the Prior:
Asymmetries in word and word class learning

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Questions
What role do prior hypotheses about word meanings play in the word learning process?
What about different priors for word meanings and word classes?

Experiments
Experiment 1: Nouns and Adjectives
Children were taught two nouns or two adjectives. During training a puppet would point out three exemplars for each word from an array of animals and vehicles, and say 'Look it's a blick!' or 'Look, it's a blicky one!'. At test children were shown a new array and asked to find more blicks or more blicky ones. Table 1 shows the linguistic stimuli, a sample array can be seen in Figure 1.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Noun</th>
<th>Adjective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>blick</td>
<td>blicky</td>
</tr>
<tr>
<td></td>
<td>fep</td>
<td>feppy</td>
</tr>
</tbody>
</table>

Figure 1: Sample training/test array

Table 1: Linguistic stimuli used in Exp. 1

Table 2: Linguistic stimuli used in Exp. 2

<table>
<thead>
<tr>
<th>Condition</th>
<th>Noun Class</th>
<th>Adjective</th>
<th>Noun</th>
<th>Adjective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>blick-sa</td>
<td>fepp-sa</td>
<td>blick-do</td>
<td>fepp-do</td>
</tr>
</tbody>
</table>

Experiment 2: Nouns, Adjectives and Noun Classes
The procedure was identical to Experiment 1, except that children were taught either four nouns, four adjectives or two adjectival roots and two suffixes, indicating noun class. The arrays were identical to those used in Exp. 1 (Figure 1), and the linguistic stimuli can be seen in Table 2.

Table 2: Linguistic stimuli used in Exp. 2

<table>
<thead>
<tr>
<th>Condition</th>
<th>Noun Class</th>
<th>Adjective</th>
<th>Noun</th>
<th>Adjective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>blick-sa</td>
<td>fepp-sa</td>
<td>blick-do</td>
<td>fepp-do</td>
</tr>
</tbody>
</table>

Results

Experiment 1: Nouns and Adjectives
Children learning nouns behaved similarly to those in the Xu and Tenenbaum experiment, preferring to pick the smallest hypothesis consistent with the data. Children learning adjectives entertained different hypotheses, learning adjective meanings independent of the noun modified by the adjective.

Experiment 2: Nouns, Adjectives and Noun Classes
Children learning nouns behaved similarly to those in Experiment 1. Children learning adjectives now show a preference for adjective meanings that take into account the noun being modified. Children learning noun classes show a distinct pattern, splitting their preferences to pick the smallest or largest set consistent with the data.

Model

Below we sketch the outline of a model - implementation is in progress

Nouns and Adjectives (Exp. 1)

Prior on concepts used for noun or adjective meanings

Objects

Concept

Likelihood: probability of data given a concept (size principle)

The learner is biased to use different dimensions for nouns and adjective concepts (kind for nouns and property for adjectives) due to the prior probabilities associated with each grammatical category

Adjectives (Exp. 2)

This model would be similar to that proposed for in Exp. 1, except the learner is forced to consider adjective hypotheses that include both kind and property dimensions

Noun Classes

The behavior we see here likely reflects the learner acting on hypotheses determined by 1 of 2 components in the inference process: (1) determine which concept the one denotes (2) determine which/how many other concepts are denoted by words in the same class

Inference process will need to determine:
- What class generated this word?
- How likely is it that this is the only word generated by this class?
- What other words are likely to be generated by this class?
- How do concepts link up to classes?