Analyzing Semantic-Pragmatic Processing of Scalar Implicatures in Typically-Developing Children

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Background

Logical and Implicature ‘some’
- The quantifier ‘some’ can have both a logical, “some, and possibly all” meaning or a pragmatically enriched “some, but not all” meaning, derived by conversational, scalar implicature (Grice 1975).
- These interpretations arise as a function of pragmatic context and syntactic context.
- Sentence 1 shows the logical interpretation while sentence 2 shows the pragmatically enriched meaning.
  1. If some players make a goal, you owe me lunch.
  2. ... and all of them did, so you owe me lunch.

Existentials in Child Language
- Research into children’s understanding of existentials has reached virtually all of the possible conclusions regarding whether or not children have adult-like knowledge of the pragmatic-logical distinction in existental quantifier interpretation:
  - Children do not understand the logical meaning (Bellin & Lust 1975, Johnson 1977).
  - Children understand the logical meaning, but not the pragmatic meaning (Noveck 2001, Chevalier, Noveck, Happe & Wilson 2005).
- None of the existing research carefully controls the phonetic variants of some.

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Experiment 1 (contd)

Stimuli
- There were eight sentences with animals jumping over a fence. Participants were assigned to a condition in which they heard only 1 of the 3 phonetic variants of some, as pilot attempts, reported in Thordarson (2009), to test phonetic variants within subjects failed.
- Four target sentences were declaratives presented after a video in which either 3 or 4 of 4 animals jumped over a fence:
  - Implicature Generating Context
    - Sm/some/SOME Cats jumped over the fence.
  - The other two of the four target sentences appeared in a downward-entailing environment, the antecedent of a conditional sentence:
    - Implicature Canceling Context
      - If sm/some/SOME cats jump over the fence, you owe me a quarter.
  - There were also two control sentences, using the words “all” and “none” with either 0 of 4 or 3 of 4 animals jumping over a fence, preceded by two training sentences with 4 of 4 or 3 of 4 animals jumping over the fence, also with the words “all” or “none”.
  - The three variants of some were tested significantly different from one another by pitch and variation.
    - SOME has a higher pitch than some (p < .001) and SOME has a higher pitch than sm (p < .001).
    - SOME has a longer vowel than some (p < .012).
    - SOME is a longer word than sm (p < .013).

Three Types of Some

<table>
<thead>
<tr>
<th>Variant of Some</th>
<th>Word Duration (s)</th>
<th>Vowel Duration (s)</th>
<th>Maximum Pitch (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sm</td>
<td>.301</td>
<td>n/a</td>
<td>297.7</td>
</tr>
<tr>
<td>some</td>
<td>.350</td>
<td>1.19</td>
<td>273.2</td>
</tr>
<tr>
<td>SOME</td>
<td>.398</td>
<td>1.54</td>
<td>471.2</td>
</tr>
</tbody>
</table>

Results
- Adults canceled implicatures with a pitch-accented SOME, though not significantly more or less than with the other two types (p < .05).
- With respect to reaction time, adults seem to process the standard variant of some (no pitch accent), but with a full vowel, faster than the two phonetically marked versions sm and SOME (1-way ANOVA, F(2)=3.884, p < .05).
- SOME is faster than sm, p < .001, and some is faster than SOME, p < .01, by post-hoc test.

Experiment 2

Methods
- Participants: 23 monolingual, English-speaking children (Age range = 7-10 months, Mean Age = 8.4 months).
- Children were required to have complete IRB consent forms signed by their guardian, and full within the norm of two standardized tests: a language test (the CELF-4) and a nonverbal IQ test (the K-BIT-2). 10 children were outside of the norm and 6 of children did not pass the fill in the experiment, and were excluded from the study.

Procedures
- The procedure was identical to Experiment 1. Children were instructed to listen and answer as quickly as possible if they thought they heard "some" ("Sam") and the panda puppet ("Bert") was correct or not.
- The stimuli were similar to Experiment 2.

Questions
- In earlier work (Thordarson 2009, Grinstead et al 2010), preschool children appeared to attend to duration and not pitch, in contrast to an adult control group, in interpreting variants of some.

Do older children appear more adult-like in using both pitch and duration to interpret phonetic variants of some?

Results
- Children are not different from adults in their judgments of sm and SOME in implicature generating contexts (p > .05), but are different with respect to some (1-way ANOVA, F(2)=3.884, p < .001).
- These results are similar to those of Thordarson (2008), who argued that children paid attention to duration, in that long words (some and SOME) generated implicatures, while the short variant (sm) does not.
- Also similar to Thordarson’s preschool children, our 5-8-year-old generate more implicatures in downward-entailing contexts with some (chi-square = 11.748, p < .001) and SOME (chi-square = 4.818, p = .027) than adults do, but not with sm (p > .05).

Discussion
- Accuracy results suggest that the roughly 7 year-old children in our sample, like the 5 year-old children in Thordarson’s (2008) sample, appear to depend on duration as a phonetic cue, instead of pitch, to signal pragmatic implicatures.
- Also as in Thordarson’s preschool sample, our school-aged children generated more implicatures in the implicature canceling condition than adults did, except with sm. This ability to look adult-like with sm in implicature canceling contexts is probably what underlies their apparently adult-like behavior in previous work (e.g. Chierchia 2001).
- An intriguing result is the difference in reaction time between adults and children with some in the Implicature Canceling condition. Since some is the most frequent variant of “some” (Thordarson 2009), it is interesting that the children in our sample are so much slower than adults.

Experimental Design
- In Experiment 1, participants were presented with 4 sentences, two training, two control. In Experiment 2, only 2 sentences were presented, one training, one control.
- There were 8 sentences, 4 training, 4 control. In Experiment 1, 4 sentences were presented, 2 training, 2 control.
- In Experiment 1, participants were presented with 8 sentences, 4 training, 4 control. In Experiment 2, only 4 sentences were presented, 2 training, 2 control.