Empirical re-assessment of stimulus poverty arguments
Legate & Yang

The Case

The logic of APS is simple:
- if you know X, and X is underdetermined by learning experience, then the knowledge of X must be innate.

Given language data D, and a simple but incorrect hypothesis of D, H, the child behaves as though he does not entertain H
- The evidence necessary to rule out H is not available to the child
- The child possesses innate knowledge excluding H from the hypothesis space

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Forming a question in English involves inversion of the main clause auxiliary verb and the subject:

The data
- Is Alex e singing a song? (Alex is singing a song)
- Has Robin e finished reading? (Robin has finished reading)
- Are the boys e back yet? (The boys are back)

- Many possible hypotheses:
  - Linear: front the first/last auxiliary
  - Linear + hierarchical: front the first auxiliary following the first NP
  - Creative ones
  - …
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The Case
- Many possible hypotheses:
  - Linear: front the first/last auxiliary
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  - Creative ones
  - ...
- The point: Some of these hypotheses are less plausible, but with DDL the child must eliminate all competing hypotheses.

The Challenge
- P&S challenge to empirical content (not logic – snark!) of APS: children do encounter disconfirming evidence which serves to rule out the incorrect, structure dependent, hypothesis.
- There is only one alternative hypothesis to be ruled out: The first auxiliary hypothesis.
- L&Y: This is incorrect. Remember all the possible hypotheses from earlier?
  - But, since this would be an even harder task, they accept the challenge!
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• The Challenge
  • Corpus search results in 1% of sentences – or 5 out of 500 - of the 6) and 7) type
  • Estimates that no less than 0.1 to 1% of all input sentences are of the forms 6) and 7)
  • P&S: Point is: the critical evidence does exist!

L&Y: An extra logical step is missing:
The existence of disconfirming evidence says nothing about its sufficiency to rule out the first auxiliary hypothesis.

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• The Rebuttal
  • How much data is sufficient? (we will return to this question)
  • Suppose: two problems of acquisition, P₁ and P₂
  • Frequency of data that can settle problem, F₁ and F₂
  • Suppose: P₁ and P₂ acquired at same developmental stage
  • Then expect F₁ and F₂ to be roughly the same
  • Conversely: F₁ and F₂ significantly different
  • Then P₁ and P₂ must represent different learning problems

• The Rebuttal
  • Samples from submitted questions:
    • This assumes that all language rules are independent of all other language rules; that learning of one rule cannot help you learn another rule.
    • If we take prior knowledge into consideration, and A is learned before B, it seems reasonable that knowledge of A can assist in learning of B.

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• The Rebuttal
  • Take F₁ to be the frequency of sentences like 6) and 7)
  • Need a comparative setting of language acquisition (more on the problem with this in the next slide, so hold that thought!)
    • The subject-drop phenomenon (acquired at same age)
    • In some languages (like Spanish) it is optional to drop the subject but this is not done in English
      • Count the frequency of ‘there expletive sentences’ to get F₂
    • V2 (verb second movement) sentences in German and Dutch
      • A Lisa style example: Sarah must the labyrinth solve
      • Count the frequency of V2

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The Rebuttal

- Samples from submitted questions:
  - These are totally different linguistic phenomena.
  - If we take prior knowledge into consideration, and prior knowledge must be equivalent across acquisition problems, then comparison can not be made across languages.

First auxiliary hypothesis double check:
- Frequency of 6) and 7) that rule out the first-auxiliary hypothesis should also be approx. 1.2%
- Now we get a little snippy:
  - 'It is rather odd that... P&S cite anecdotes... What's more [the data is] curiously selective.'
  - So, they do the 'real' count for all 56 files in the Nina corpus:
    - 46,499 sentences of which 20,651 are questions
    - none were yes/no type in 6) and 14 were wh-questions of the type in 7).
    - $F_1$ approx. 0.068%

Also, check count from Adam corpus:
- 20,372 sentences of which 8,889 are questions
- none were yes/no type in 6) and 4 were wh-questions of the type in 7)
- $F_1$ approx. 0.045%

APS stands unchallenged: the knowledge of structure dependence in syntax is available to the child in the absence of experience.

Can a calculation of frequency on a corpus be used to determine the critical acquisition threshold?
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- The Message
  - The challenge of the APS fails
  - Some quotes:
    - "...DDL, proudly touted as innateness free, turns out to have many hidden assumptions – otherwise known as innate knowledge"
    - "...a more serious problem with DDL ... has to do with the wild statistical disparities between what is presented to children and how children actually learn"
    - "...it must be concluded that the innate knowledge of UG provides important learning priors to skew the distributional relations between adult and child languages."
    - "...innately primed learning is, still, ‘the only game in town’"