

# Empirical Assessment of Stimulus Poverty Arguments

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(2002)

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# Empirical Assessment of Stimulus Poverty Arguments

- Introduction
- Defining the argument from poverty of the stimulus (APS)
- How to support the argument
- Testing empirical claims
- Implications and conclusions

# The argument from poverty of the stimulus

- Numerous arguments for poverty of the stimulus, but inadequate reasoning
- Frequent claims include:
  - Properties of child's accomplishment
    - Speed, Reliability, Productivity, Selectivity, Underdetermination, Convergence
  - Properties of the child's environment
    - Ingratitude, Finiteness, Idiosyncrasy, Positivity, Degeneracy

# The argument from poverty of the stimulus

- “People attain knowledge of the structure of their language for which no evidence is available in the data to which they are exposed as children.” (Hornstein and Lightfoot, 1981)
- While relevant positive evidence does exist, it is not accessible to the learners during the acquisition process
- Lack of evidence that is adequate to the task

# The Argument from Poverty of the Stimulus (APS)

- a. A first language is learned either by data-driven learning (generalization from experience) or innately-primed learning (inborn domain-specific linguistic information)
- b. If we assume data-driven learning, an infant cannot learn something they do not have evidence for
- c. Empirical premise: infants do learn things without crucial evidence.
- d. Infants must not be learning using data-driven learning
- e. Conclusion: infants use innately-primed learning

# How to provide empirical support for the APS

- **ACQUIRENDUM CHARACTERIZATION:** describe in detail what is alleged to be known.
- **LACUNA SPECIFICATION:** identify a set of sentences such that if the learner had access to them, the claim of data-driven learning of the acquirendum would be supported.
- **INDISPENSABILITY ARGUMENT:** give reason to think that if learning were data-driven then the acquirendum could not be learned without access to sentences in the lacuna.
- **INACCESSIBILITY EVIDENCE:** support the claim that tokens of sentences in the lacuna were not available to the learner during the acquisition process.
- **ACQUISITION EVIDENCE:** give reason to believe that the the acquirendum does in fact become known to learners during childhood.

## 4. Empirical linguistic testing of inaccessibility claims

- Plurals in noun-noun compounding
- Auxiliary sequences
- Anaphoric one
- Auxiliary-initial clauses

# Plurals in noun-noun compounding

- Gordon (1986): children between 3-6 used irregular plurals as first elements of compounds (mice-eater) but not regular plurals in the same way (toys-eater)
- Assumes level ordered morphology
  - Irregular plurals will appear as non-head parts of compounds but regular plurals will not

# Plurals in noun-noun compounding

- **ACQUIRENDUM:** irregular but not regular plurals can be used as the non-head (non-rightmost) part of a compound.
- **LACUNA:** the set of all sentences containing compounds with irregular plurals as the non-head parts of compounds.
- **INDISPENSABILITY ARGUMENT:** the acquirendum cannot be learned without access to sentences containing compounds with irregular plural non-heads.
- **INACCESSIBILITY EVIDENCE:** the text frequency of compounds with irregular plurals as non-head components is extremely low.
- **ACQUISITION EVIDENCE:** purportedly achieved by the experiments reported in Gordon (1986)

# Plurals in noun-noun compounding

- **ACQUIRENDUM**: Does not account for common terms which violate this rule (issues-oriented, jeans-maker)
- **INACCESSIBILITY EVIDENCE**: not supported

# Auxiliary sequences

- Chomsky (1971) Example:
  - It rains.
  - It may rain.
  - It may have rained.
  - It may be raining.
  - It has rained.
  - It has been raining.
  - It is raining.
  - It may have been raining.
- Aux -> T(M)(have + en)(be + ing)

# Auxiliary sequences

- **ACQUIRENDUM:** Aux -> T(M)(have + en)(be + ing)
- **LACUNA:** the set of all sentences exhibiting the sequence ‘tensed modal auxiliary + perfect have + progressive be + present participial verb’ (hereafter, MHBV sequences).
- **INDISPENSABILITY ARGUMENT:** without hearing examples containing an MHBV sequence it is not possible to learn that such sequences are grammatical.
- **INACCESSIBILITY EVIDENCE:** clauses containing an MHBV sequence are ‘vanishingly rare’.
- **ACQUISITION EVIDENCE:** trivial, since it is undisputed that everyone who speaks English knows that MHBV sequences are grammatical

# Auxiliary sequences

- **ACQUIRENDUM**: The rules scheme, Aux  $\rightarrow$  T(M) (have + en)(be + ing), may not be what learners come to know
- **INDISPENSABILITY ARGUMENT**: Sentences fitting the schema can be learned from examples containing one item acting as head of the complement of another
- **INACCESSIBILITY EVIDENCE**: Numerous examples from novels as well as children's books
  - “must have been dreaming”
  - “you must have been thinking again”

# Anaphoric one

- Example: “John has a blue glass but Alice doesn’t have one.”
- Baker (1978): Children would need to be in an “unusual set of circumstances” where context clears ambiguity when the antecedent of *one* contains more than a noun.
- One here is used as an anaphor whose antecedent is a constituent called Nom
- Claims that a Nom cannot be just a noun
- “The student of chemistry was more thoroughly prepared than the one of physics”
- “I’d rather teach linguistics to a student of mathematics than to one of any discipline in the humanities.”
- Claims that a Nom can be a multi-word phrase

# Anaphoric one

- **ACQUIRENDUM:** the fact that anaphoric one can have Nom antecedents that are larger than just a single noun.
- **LACUNA:** the set of all utterances containing anaphoric one that reveal in context that the antecedent of one cannot be just a noun (i.e., examples like (11) in a context where Alice does have a glass).
- **INDISPENSABILITY ARGUMENT:** in order to learn that an instance of anaphoric one can have a multi-word antecedent, the learner must experience cases in which an instance of one has a multi-word antecedent.
- **INACCESSIBILITY EVIDENCE:** it is only in an ‘unusual set of circumstances’ (Baker asserts) that the learner will encounter one in a context where the antecedent is clearly more than just a noun.
- **ACQUISITION EVIDENCE:** none cited (the issue is nontrivial).

# Anaphoric one

- **INACCESSIBILITY EVIDENCE:** Examples found from writings and television shows.
  - “I cannot at the present moment recall what the General’s Christian name was. But I have no doubt he had one.”
- **ACQUISITION EVIDENCE:** There could be people who learned the wrong generalization.

# Auxiliary-initial clauses

- Chomsky (1971) Example:
  - “The dog that **is** in the corner **is** hungry”
  - “**Is** the dog that is in the corner hungry?” (the main clause auxiliary of the declarative is fronted)
  - “**Is** the dog that in the corner is hungry?” (the first auxiliary in the declarative is fronted)

# Auxiliary-initial clauses

- **ACQUIRENDUM**: the structure-dependent generalization about auxiliary-initial clauses
- **LACUNA**: the set of all sentences in which the initial auxiliary in an auxiliary-initial clause is not the first auxiliary in the corresponding declarative clause.
- **INDISPENSABILITY ARGUMENT**: evidence that distinguishes the structure-dependent and structure-independent hypotheses
- **INACCESSIBILITY EVIDENCE**: evidence has not been offered, but Chomsky asserts that utterances in which a clause has an initial auxiliary that would not be the first auxiliary in the corresponding declarative are so rare that “A person might go through much or all of his life without ever having been exposed” to them
- **ACQUISITION EVIDENCE**: not attempted by Chomsky, but Crain and Nakayama (1987) provide experimental confirmation that children do learn the acquirendum.

# Auxiliary-initial clauses

- **INACCESSIBILITY EVIDENCE**

- Numerous examples for wh-interrogatives, yes/no questions and even the “is...is...” example given.
- Questions are more frequent to children in everyday speech than any other speech act type

- **ACQUISITION EVIDENCE**

- If situations presenting the acquirendum are as rare as stated, then learners could acquire the incorrect generalization and go undetected.

# Implications and Conclusions

- Computational linguistics have demonstrated algorithms can learn more from a text than previously thought possible.
- Data-driven learning must be used to validate claims of APS