

# Empirical Re-assessments of Stimulus Poverty Arguments

Recent years the standard Argument from the Poverty of Stimulus (APS) has received a number of empirical assessments, which supposedly have refuted the Innateness Hypothesis (e.g., Cowie 1999). Here we show that these efforts, exemplified by Pullum & Scholz (in press; henceforth P&S) fail for both logical and empirical reasons.

Perhaps the best known case for the APS concerns knowledge of *structure dependency* in polar interrogative questions (Chomsky 1975). Simple inversion sentences such as *Is<sub>t</sub> Alex t singing* are compatible with many inductive hypotheses, including the First Auxiliary Hypothesis (FAH), which fronts the first auxiliary. However, children as young as 3;2 have perfect knowledge of the correct, structure-dependent, transformation, which fronts the auxiliary following the first NP, which can be arbitrarily long.

Sentences like in (1) go against the FAH.

- (1) Is<sub>t</sub> [the boy who is]<sub>NP</sub> t<sub>t</sub> in the corner smiling?

If these examples are vanishing rare, one can but conclude that the knowledge of structure dependency is innate. It is this *if* that P&S challenge.

P&S correctly note that (1) is not the only type of sentences against the FAH. Significantly, Wh questions with an inverted auxiliary over a complex NP serve the same purpose:

- (2) How could<sub>t</sub> [anyone that was awake]<sub>NP</sub> t<sub>t</sub> not hear that?

P&S then proceed to count the frequency of evidence exemplified in (1) and (2), using a Wall Street Journal corpus. They find that in the first 500 sentences he examined, 5, or 1%, are of the two types. They also report three relevant examples in the adult sentences that Nina heard during a recording session (CHILDES). This leads P&S to estimate that no less than 0.1% to 1% percent of all input sentences are of the forms (1) and (2) (which, as we shall see momentarily, is a gross overestimation). They then conclude that children do have access to enough disconfirming evidence and that the APS must be rejected.

However, their logic is faulty. They must demonstrate that the frequency of disconfirming examples are *sufficient* to eliminate the competing FAH; only the proof of this undermines the APS.

So how much data is sufficient? It would surely be nice to give some absolute figures, e.g., “250 of these examples will set this parameter right”, but we are far from that level of understanding of language acquisition. However, there are indirect but equally revealing ways of testing for data sufficiency, which P&S fail to recognize.

Suppose we have two independent problems of acquisition, both of which involves a binary decision. Suppose further that children resolve these two decision problems at roughly the same developmental stage. It then must be the case that, all things being equal, the frequencies of disconfirming evidence for these two problems be roughly the same as well.

Now let the first problem be auxiliary inversion problem. A perfect example for the second problem is the well-known subject drop phenomenon in English children. If P&S were right, English children must rule out the FAH and also rule out the option of null subjects. Valian (1991) shows that English children’s subject drop stage ends at around the 36th month, and this is comparable to 3;2, the youngest group in Crain & Nakayama (1987). Following

the generalization that the use of *there*-type expletives correlates with obligatory subjects, *there*-sentences therefore disconfirm an optional subject grammar (Hyams 1986). Based on a random sample of 11,214 adult sentences in CHILDES, we estimate *there*-sentences to be around 1.2% (140/11214). If P&S were right, we would expect approximately 1.2% of all adult sentences to fall under the types in (1) and (2), disconfirming evidence against the FAH. And here comes the empirical problem of P&S's argument.

Aside from the unrealistic acquisition data, the WSJ, and other anecdotal evidence, the only CHILDES statistics P&S cite, that of Nina, are strangely selective. They only report counts from one file, NINA05.CHA, which happens to be the file that has the most number of critical sentences, out of all 56 files. And they do not give a denominator – how many adult sentences were recorded there – to give us a sense of how often these disconfirming sentences are encountered.

Here are the real counts. In all 56 files in the Nina corpus, we found:

- (3) 46,499 sentences, of which 20,651 are questions, of which
  - a. None were yes-no questions of the type in (1)
  - b. 14 were wh questions of the type in (2).

This places the frequency of critical sentences at approximately 0.03% — 40 times lower than 1.2%, the amount of evidence needed to settle on one of two binary choices by around the third birthday.

Just to confirm that the Nina statistics are no accident, we considered another corpus, that of Adam,

- (4) In a total of 20,372 sentences, 8,889 were questions, of which
  - a. None were yes-no questions of the type in (1).
  - b. Four were wh questions of the type in (2).

which gives a frequency of 0.01%.

Not only are those frequencies far below the magic figure of 1.2% required to learn the correct rule by the 36th month, it is also low enough to be considered negligible, that is, not reliably available for every human child. As far as one can test, children do not appear to entertain erroneous hypotheses as the FAH. The original APS not only stands unchallenged, but is strengthened, after being situated in a comparative framework of language acquisition with statistical evidence from corpus studies.

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