Children's 2Aux Negative Questions: Elicited Production versus Spontaneous Speech

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1. Introduction

Studies on negative questions in early child English have found that children produce negative questions (1) in a fashion different from adults. In particular, it has been reported that children produce a large number of negative questions with two auxiliaries (henceforth 2Aux) in elicited production (EP) studies (Guasti et al., 1995; Hiramatsu, 2003; Ambridge & Rowland, 2009). However, as will be seen below, 2Aux sentences are largely restricted to elicited production. Children make far fewer 2Aux errors in spontaneous production (SP) (Stromswold, 1990), and they treat them as unacceptable in grammaticality judgment (GJ) tasks (Hiramatsu, 2003). These findings raise the following questions: What is the source of children's elicited 2Aux errors? How do we explain the asymmetries between EP, SP and GJ?

(1) a. What didn't he move?
    b. What did he not move?

(2) *What did he didn't move?

There are two major analyses of children's 2Aux negative questions within the generative framework: the parametric account (Guasti et al., 1995; Zuckerman, 2001), and the lexical misanalysis account (Hiramatsu, 2003). Under the former, children's 2Aux errors stem from a misset parameter. The latter instead argues that children's 2Aux error is a result of their misanalysis of the contracted form of negation, *-n't*.

In this study we use children's spontaneous speech to evaluate the parametric accounts. (The lexical misanalysis account is being evaluated in an experimental study now in progress.)

2. Parametric accounts

In this section we review the two leading parametric accounts: one proposed by Guasti et al. (1995), the other by Zuckerman (2001).

2.1. Neg-in-IP

Guasti et al. (1995) elicited negative questions from 3- to 4-year-old children and found that children produced a number of non-adult-like structures, as in (3).[1] Some children failed to invert the auxiliary (3a), while others doubled the auxiliary (3b) or doubled both the auxiliary and the negation (3c). In addition, Guasti et al. treated the *not*-structure in (3d) as a non-adult form, on the grounds that even though it is an acceptable sentence, (3d) is not the structure that an adult would use in the specific context set up in the experiment.[2] In Guasti et al. (1995), 2Aux questions were the most frequent errors

[1] The percentages are drawn from Zuckerman (2001).

[2] Some native speakers have reported, however, that they find (3d) grammatical and appropriate even in Guasti et al.'s experimental setting. In our study, we treat such structures as grammatical.

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in children's negative questions. Similarly, in Hiramatsu (2003), thirteen children produced a total of 42 ungrammatical negative questions, and the majority (83%) were 2Aux errors.

(3) a. What she doesn't want for her witch's brew? (No inversion: 23%)
b. What did he didn't wanna bring to school? (2Aux: 40%)
c. Why can't she can't go underneath? (Neg+Aux doubling: 8%)
d. Why can you not eat chocolate? (*Not*-structure: 10%)

What the non-adult structures in (3) have in common is that negation remains in IP. Assuming the Neg-Criterion, which requires a Neg-operator and a [+neg] head to stand in a spec-head relation (Rizzi, 1991; Haegeman & Zanuttini, 1991), Guasti et al. (1995) propose that the projection in which the Neg-Criterion is satisfied is subject to parametric variation. In some languages (like Paduan), the negation marker can no longer satisfy the Neg-Criterion if it moves outside of IP (4). In other languages (like English), it can (5). English-learning children initially believe that English is like Paduan, as Neg-in-IP is the default setting of their parameter. The child goes through a Paduan stage for some period of time, and then changes permanently to the English setting (Guasti et al., 1994).

(4) Paduan
a. *Cosa no galo fato?
what NEG has-he done
'What hasn't he done?'

b. Cosa ze che nol ga fato?
what is that NEG-he has done
'What hasn't he done?'

(5) English
a. What hasn't he done?
b. *What he hasn't done?

How does this result in 2Aux questions? Assuming that children have knowledge of I-to-C movement in both positive and negative questions, the researchers propose that 2Aux errors occur when children use the contracted form of negation, *-n't*. In this case children are faced with conflicting requirements: On the one hand, negation has to remain in IP; on the other hand, the inflectional material (to which *–n't* is affixed) must move from I to C. Children resolve the conflict by leaving *-n't* in I, and producing an extra auxiliary to keep it from being stranded.

2.2. Economy analysis

Zuckerman (2001) proposes a slightly different parametric account of children's non-adult sentences. He argues that children are exposed to two types of negative questions: one type with *-n't*, the contracted form of negation, in C (e.g., *What don't you like?*); the other with *not*, the full form of negation, in IP (e.g., *What do you not like?*). Failing to discern any semantic difference, children treat them as stemming from the same numeration and as identical in meaning. Therefore they see them as indicating two contradictory settings of one parameter. Faced with two possible settings, children reject the possibility that both are allowed (i.e., 'Neg-in-IP' and 'Neg-outside-IP'), and show a preference for the more "economical" option: Neg-in-IP, which does not require movement of negation.

Though Zuckerman's (2001) explanation also appeals to parameter-setting, it differs from Guasti et al.'s in the following way: Zuckerman's analysis is "global", in the sense that "children do in fact compare the target structure to [an] alternative they think exists in the target grammar" (p. 158). On the other hand, the proposal by Guasti et al. (1995) is "local": Children's intermediate stage is assumed to be independent of alternatives that may exist for the target structure. Despite the differences between

the two analyses, both assert that children acquiring English pass through a non-adult, Neg-in-IP stage, prior to acquiring the target grammar.

3. Puzzles for the parametric accounts

The parametric accounts run into trouble when we look at children's grammaticality judgments, and their spontaneous production of negative questions. First, Hiramatsu (2003) found that the same children who produced 2Aux questions in an elicited production task rejected a majority of 2Aux questions in a grammaticality judgment task. If the forms that children produce in EP are grammatical for them, as the parametric accounts assume, how do we account for this asymmetry between elicited production and grammaticality judgments? The second puzzle for the parametric accounts comes from children's spontaneous speech. Despite the high frequency of 2Aux errors in EP, children produce few 2Aux errors in spontaneous speech: For instance, Stromswold (1990) examined 14 children's spontaneous speech and found only seven examples of clear 2Aux errors among 40,600 questions. How can the "Neg-in-IP" setting account for this asymmetry between EP and SP?

Below we evaluate the parametric accounts by further examining children's spontaneous speech.

4. Evaluating the parametric accounts: Children's spontaneous speech

The parametric accounts make several testable predications about possible non-adult-like structures in children's spontaneous speech. We assume with Guasti et al. (1995) that children have only one grammar at a time. Previous EP studies, which elicited negative questions from 3- to 4-year-olds and reported a high percentage of 2Aux errors, suggest that a large proportion of these children still have the Paduan grammar. Looking at the spontaneous speech of younger children, we expect a similar or even larger proportion of children to still have the Paduan grammar. If children are in the Neg-in-IP stage, we expect 2Aux errors and *not*-questions, but no grammatically well-formed *n't*-questions, up until they set the parameter to the adult-English value. On the other hand, children who have already set the parameter to the target value in the first transcript will produce only well-formed *n't*- and *not*-questions.

For present purposes we will set aside negative questions without SAI, because the lack of SAI is not specific to negative questions. Findings from naturalistic data indicate that children also produce *positive* questions without inverting the auxiliary, especially *why*-questions (see Berk, 2003; Labov & Labov, 1978; Thornton, 2004, among others).[3] We will also set aside questions with both negation and auxiliary doubled, because we did not find any such examples at all in the spontaneous speech of the children whose corpora we examined.

Notice that the parametric accounts take the child's grammar as the only possible source of negative questions. As a reviewer has pointed out, there might actually be multiple sources. For example, a child's Paduan-like grammar might give rise to 2Aux errors, while grammatically well-formed *-n't* questions arise from rote-learned forms. If this is the case, we expect an "overlapping" stage in which both 2Aux sentences and grammatical *n't*-questions occur. This view faces at least two serious problems, however. First, the grammatical *n't*-questions that children produce vary in both the subject (proper names, pronouns, demonstratives) and the auxiliary (*can*, different forms of *do* and *be*), which makes it less plausible that children's well-formed negative questions are simply memorized routines. Second, there is an asymmetry between EP and SP: While 2Aux errors occur with high frequency in elicited questions, they occur only very rarely in spontaneous questions. If another source of grammatical *n't*-questions in SP existed, why would it be unavailable in EP?[4]

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[3] In addition, in certain contexts questions without SAI are acceptable even for adults (see Pires & Taylor, 2007).

[4] The reviewer offers another possibility along the same lines, predicting the co-existence of grammatically well-formed *n't*-questions and ungrammatical 2Aux questions: Children might vacillate between the English setting and the Paduan setting, in the spirit of Yang (2006). As we will see, this possibility is not supported by our data, as not a single child vacillates between 2Aux errors and negative *n't*-questions. Furthermore, such a view would have difficulty explaining the asymmetry between EP and SP.

5. Children's negative questions in spontaneous speech: Transcript analysis

5.1. Subjects and method

We studied the spontaneous speech of four children acquiring English, whose corpora are available on CHILDES (MacWhinney, 2000). The corpora we analyzed are summarized in Table 1. The CLAN program Combo was used to extract all child utterances containing both *-n't* / *not* and a question mark. Results were checked against the original transcripts to exclude imitations, repetitions and formulaic routines. Fragments (e.g., *Not this one*?) and tag questions (e.g., *Isn't it*?) were also excluded.

Table 1
English corpora analyzed

Child	Corpus	#child utterances	Age span	# of transcripts
Sarah	Brown	31,195	2;03-5;01	139
Lily	Providence	39,852	1;01-4;00	80
Violet	Providence	17,274	1;02-3;11	54
Mat	Weist	10,157	2;03-5;00	56

5.2. Results

The results for children's negative questions in spontaneous speech are summarized in Table 2.

Table 2
Children's negative questions in spontaneous speech

Child	Grammatical		2Aux	No SAI		Others	Total
	Using *-n't*	**Using *not***		Ungrammatical	Possibly grammatical	(tense doubling, wrong agreement, omission error, etc.)	
Sarah	40	**1**	**0**	4	8	6	59
Lily	5	**9**	**1**	0	0	1	16
Violet	6	**1**	**1**	0	2	2	12
Mat	10	**1**	**0**	6	3	4	24
Total	61	**12**	**2**	10	13	13	111

Once again, if children still had a Paduan-like grammar at the ages of 3 to 4, we would expect even more errors in the spontaneous speech of younger children. The results go in the opposite direction. As shown in Table 2, out of 111 negative questions, only two (<2%) contained an extra Aux, a result consistent with Stromswold (1990). The actual 2Aux errors are listed in (6): One was produced by Lily at the age of 2;08,06, and the other by Violet at 3;08,23.[5]

[5] In fact, it is not entirely clear that Violet produced even one 2Aux question, given the uninterpretable portion of her utterance (transcribed as "yy"). The child may have intended something like, "I do, and you don't." Nonetheless, in the interest of conservatism, we are counting this as a 2Aux error.

(6) The 2Aux errors:

Lily,
Transcript 54, Line 1391
*CHI: xx , it doesn't have a feather .
*CHI: it doesn't have a feather Mommy .
*MOT: it doesn't ?
***CHI: does it doesn't?**
*MOT: I , I thought it had a feather .
***CHI: does it doesn't ?**
*MOT: it does , I think .

Violet
Transcript 52, Line 806
*MOT: can you help me put (th)em all out like this ?
*CHI: xx yeah but I moved all the dinosaur you don't okay ?
*MOT: okay .
***CHI: yy do you don't ?**
*MOT: nope I don't .
*CHI: um did yy did you forget when you did you forget a long long time ago yy yy yy dinosaur movie ?
*MOT: I forgot all of them .

Furthermore, the parametric accounts make the following predictions: If a child is still in the Neg-in-IP stage at the beginning of her corpus, we expect that for some period of time she will produce well-formed *not*-questions and incorrect *n't*-questions (such as 2Aux sentences), but not well-formed *n't*-questions. On the other hand, if a child has already reset the parameter to the adult English value by the point when her corpus begins, we expect only well-formed *n't*- and *not*-questions in her spontaneous speech. Yet, in the two children who produced a 2Aux error, both errors occurred *after* the child had already begun producing adult-like negative questions with *-n't.* Lily produced her first negative questions with *–n't* at 2;07,23 (Transcript 52), and Violet at 3;06,00 (Transcript 39), in both cases earlier than the 2Aux error. The evidence from 2Aux errors in spontaneous speech thus runs counter to the parametric ('Neg-in-IP') account.

For the two children who produced 2Aux errors, their *not*-structure is also expected to be available *earlier* than *n't*-structures. However, as shown in Table 3a and 3b, contrary to the prediction, Violet actually used *-n't* slightly earlier than *not,* though the gap was not statistically significant (binomial $p=(6/(6+1))^1=.463$) Lily did begin using *not* slightly earlier than *-n't.* However, her first uses were in adjacent transcripts, and the gap was not statistically significant (binomial $p=(9/(5+9))^1=.643$). Thus, once again, the evidence from *not*-structures runs counter to the predictions of a parametric ('Neg-in-IP') account.

Table 3a
Children's first negative questions with -n't

Child	Transcript #	Line	Age	Utterance
Sarah	sarah065	122	3;6.16	Can't you work this thing?
Lily	lil52	1384	2;7.23	Don't you know?
Violet	vio39	1213	2;8.19	Why don't you just stop?
Mat	mat17	486	3;0.02	Why can't I watch a movie?

Table 3b
Children's first negative questions with not

Child	Transcript #	Line	Age	Utterance
Sarah	sarah138	1153	5;0.30	How_come that's most and that's not?[6]
Lily	lil51	784	2;7.16	Is it not hot?
Violet	vio49	1075	3;6.00	Why are we not done?
Mat	mat17	226	3;0.02	Why were you not xxx , way way in?

To sum up, the parametric accounts assert that children go through a Neg-in-IP stage before acquiring adult-like negative questions with *-n't*. Yet, evidence from spontaneous speech does not show such an intermediate stage. We do not find children who frequently produce 2Aux questions, nor children whose *not*-questions precede their grammatical *n't*-questions.

6. Proposal

We reject the idea that children ever set the 'Neg-in-IP parameter' to an incorrect value. Instead we propose that children's 2Aux questions are performance errors, resulting from a repair strategy to save a mislocated *-n't*. Let us see in detail how the new proposal accounts for the 2Aux error (or its absence) in children's spontaneous production, elicited production and grammaticality judgments.

6.1. Why are 2Aux errors rarely produced in spontaneous speech?

With this new proposal, the paucity of 2Aux errors in spontaneous speech follows directly from Grammatical Conservatism: Children do not start using a new linguistic construction productively in their spontaneous speech until they have both determined that the construction is permitted in the adult language, and identified the adults' grammatical basis for it (Snyder, 2007). As a consequence, children seldom make "co-mission" errors (such as 2Aux errors) in spontaneous speech. The principal source of such errors would be attempts to use an adult construction before the child knew how.

Hiramatsu (2003) not only found that the same children who produced 2Aux questions in EP judged them to be ungrammatical, but also that they judged negative questions with raised *-n't* to be grammatical. This supports the view that the child grammar does not provide any grammatical basis for 2Aux questions. Such forms are probably ruled out by the child's grammar all along, because of a PF principle forcing deletion of the lower copies of a moved element.

6.2. Why are 2Aux errors produced in EP?

Now we turn to why children sometimes ask 2Aux questions in EP. Our proposal is that these errors stem from a performance error, followed by a repair operation that is provided by the grammar.

For quite a few languages, there is disagreement on whether sentential negation is a head or a specifier (see, e.g., Merchant, 2001; Moscati, 2010; Ouhalla, 1990; Rizzi, 1989; Zanuttini 1997; Zeijlstra, 2008, among others). Here we assume that in English, negation can occupy both positions, depending on its morphological form: The affix *-n't* occupies the head position of NegP, which later incorporates into Infl. The full form *not* occupies the specifier position, which does not incorporate into Infl.

Let's look at a negative question with *-n't* (7) as an example. Its syntactic derivation in adult English is presented in (8): The contracted form of negation *–n't*, which originates in the head of

[6] Note that Sarah's only grammatical question with *not* was a *how come* question, which does not require SAI.

NegP, first incorporates into Infl because it needs a host. Then Infl raises overtly to C in order to check its strong Q feature, carrying *-n't* along with it.

(7) What didn't Smurf move?

(8) Adult grammar:
[$_{CP}$ *What* [$_{C}$ *Infl+n't+ø*] [$_{IP}$ *Smurf* [$_{I}$ ~~*Infl +n't*~~] [$_{NEGP}$ [$_{NEG}$ ~~*n't*~~] [$_{VP}$ [$_{V}$ *move*] ~~*what*~~]]]]

In an EP study the children are under a certain amount of pressure, simply because of the demands of the experimental task. Under this pressure they may accidentally put *-n't* in the wrong place: Instead of putting it in the head position of NegP, they put it in Spec, NegP, a position from which it cannot incorporate into Infl. The result is presented in (9): The affix *-n't* is stranded within IP, in a position where it is unpronounceable. Children know that *-n't* is an affix, which needs a host. To save the stranded *-n't*, children spell out the lower copy of Infl, thus producing 2Aux sentences.

(9) Child's misplacement of contracted negation:
[$_{CP}$ *What* [$_{C}$ *Infl+ø*] [$_{IP}$ *Smurf* [$_{I}$ ~~*Infl*~~] [$_{NEGP}$ *n't* [$_{NEG}$ ø] [$_{VP}$ [$_{V}$ *move*] ~~*what*~~]]]]
What did Smurf didn't move?

A reviewer has correctly pointed out that our analysis assumes a kind of parameter: whether a given negative marker is a specifier or a head. However, we are not proposing a *different* parametric approach, in the sense that initially the grammar always treats *-n't* as a specifier. Instead, the mislocation of *-n't* is a performance error, restricted to elicited production. The source of this performance error is discussed in Section 6.4. The 2Aux error is UG-compatible, but only in the sense that children are applying principles of UG to an erroneous representation.

6.3. Children's judgment of 2Aux sentences

The new proposal differs from the parametric accounts (Guasti et al., 1995; Zuckerman, 2001) in the following respect: What children produce in EP is not always grammatical for them. The 2Aux question is an attempt to compensate for a performance error, the mislocated *–n't*. This allows us to explain the asymmetry between EP and GJ, a puzzle for the parametric accounts. Different from an EP task, a GJ task requires the participants to identify whether a sentence can be generated based on their grammar and whether any principle/constraint of language is violated. To explain why children judge 2Aux sentences as ungrammatical, we follow Hiramatsu (2003) in her view that children know the PF principle that deletes any copies of overtly moved elements. In addition, children are aware that *do*-support is not allowed to apply twice within a sentence.

6.4. The source of performance errors

One remaining puzzle that needs to be solved is that children in our spontaneous-speech study seem to become adult-like earlier than the child participants in the EP study. As shown in Table 3a, all the children in our study produced their first grammatical *n't*-question earlier than 3;06. Yet, EP studies indicate that children as old as 4 are still having problems with negative questions. Here we offer some speculations on how this age difference could arise.

To explain the delay of children's negative questions in EP, Guasti et al. (1995) suggest that children have to use a structure with some regularity before they can produce it reliably. To put it in other words, simply having the competence for a structure, without practice, is not sufficient to achieve adult-like performance in an experimental task. As shown in Table 2, children do not produce negative questions frequently in their spontaneous speech. This lack of practice, combined with the task demands of EP, may lead to the simple error of putting *-n't* in the wrong position.

6.5. A question for future research

A reviewer has pointed out that if heads such as *-n't* are sometimes erroneously treated as specifiers, this might lead to a series of testable predictions. Perhaps similar errors can be found with inflectional elements like modal particles and tense-markers. Can Tense/Modal/Aspect heads be miscategorized as specifiers, or are they different? We leave this question for future research. But here are some points to keep in mind. On the one hand, cross-linguistically negative markers can occupy either the spec or the head position. In this sense, the source of the mislocated *-n't* comes from an alternative setting of a parameter of UG. In contrast to negation, Tense, Modality, and Aspect are heads cross-linguistically. Thus it will be somewhat surprising if children also misplace these heads in a specifier position. On the other hand, if this did occur it would give rise to questions lacking SAI, and in fact such errors are widely attested in English-learning children's questions, especially *why* questions (see Berk, 2003; Thornton, 2004).

7. Conclusion

Parametric accounts of children's 2Aux negative questions argue that children go through an intermediate Neg-in-IP stage before acquiring the target grammar of negative questions. The evidence from negative questions in the spontaneous speech of four children does not support a parametric ('Neg-in-IP') account: The children made extremely few 2Aux errors in their negative questions. Moreover, in the two children who did produce a 2Aux error, it occurred well after the onset of grammatical *n't*-questions. Moreover, questions with *not* were acquired no earlier than questions with *n't*. We have therefore proposed that the 2Aux error is ultimately a performance error: The 2Aux form results from a kind of "repair strategy" that permits a mislocated *-n't* to (at least) be pronounced. This new proposal explains not only the asymmetry between EP and SP, but also the asymmetry between EP and GJ.

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