AUXILIARY PLACEMENT REVISITED

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ABSTRACT

The authors examine syntactic accounts proposed to explain the acquisition of auxiliary inversion in Yes/No and WH questions; they argue that no purely syntactic explanation is adequate and that differences in input and variation in presuppositional function across question types contribute to the development of auxiliary placement. The experiment described below re-examines inversion claims for English questions in the light of imitation and production data from young children. The results of this study are not supportive of any current account of the syntax of English questions. It is suggested that if inversion is to be understood, confounding factors must be examined separately, then controlled in more refined acquisition studies.

1.   Introduction

Explanatory work in the acquisition of syntax has two complementary goals: to derive predictions about the course of acquisition from the rules and representations of grammatical theory, and to constrain grammatical theory on the basis of the observed acquisition data. Recently there has been a revival of interest in the acquisition of the syntax of the English auxiliary system, particularly with respect to subject-auxiliary 'inversion' in Yes/No and WH questions (Erreich 1984; Pinker 1984; Hyams 1986; Nakayama 1987). Because auxiliaries are complex, frequent, and reasonably regular, early versions of generative grammar relied heavily on the success of analyses of this component of the grammar (Chomsky 1957), and competing theories of syntactic representation continue to be evaluated at least in part in terms of their handling of the auxiliary data (Chomsky 1981; Bresnan 1982; Gazdar, Pullum & Sag 1982). Auxiliaries also provided some of the earliest insights into developmental sequences in syntax, and remained a topic of primary importance to theorists and acquisition researchers in the late 1960's and throughout the 1970's (Klima & Bellugi 1966; Brown 1968; Bellugi 1971; Hurford 1975; Kuczaj & Maratsos 1975; Kuczaj 1976; Prideaux 1976; Labov & Labov 1978; Mayer, Erreich and Valian 1978; Ingram & Tyack 1979; Kuczaj & Brannick 1979).

Failure to invert is observed when a child uses auxiliaries in
questions, but maintains declarative Subject-AUX-Verb order (e.g.,
What _he is_ doing? Why _he isn't_ eating? _You are_ going home now?).
We will suggest that despite the centrality - and the longevity -
of the auxiliary placement issues, no current syntactic account
can explain the acquisition facts. Indeed, the facts themselves
are in dispute: for each logically possible pattern of results,
there exists not only a theory that predicts it, but data to support
it as well.

First, the notion of transformational complexity derived from
the Standard Theory (Chomsky 1965) predicts that inversion should
be earlier or more accurate in Yes/No questions than in WH questions,
and in both types of affirmative questions than in negative
questions. This prediction is supported by several studies (Klima
& Bellugi 1966; Bellugi 1971; Brown 1968; Kuczaj & Maratsos 1975).
Within the Government and Binding model (Chomsky, 1981), however,
acquisition difficulty is postulated to derive from markedness
considerations, although there seems to be no markedness principle
which would account for a Yes/No vs. WH or an affirmative vs.
negative difference in inversion. Indeed, one proposal (Hyams
1986:51) implies that for Italian at least, it is necessary to
distinguish between a 'verb preposing' analysis of inversion in
the case of WH movement, and a separate **move-INFL** account (an
instance of **move alpha**) of the Standard Theory treatment of
Subject-AUX inversion.

Secondly, Lexical-Functional Grammar (Pinker 1984) predicts
no difference in the emergence of inversion in different question
types, and other research supports this prediction (Erreich 1980,
1984; Hecht & Morse 1974 (cited in De Villiers & De Villiers 1978);
Ingram & Tyack 1979; Maratsos 1983). Pinker's account does not
deal with negation.

Finally, at least one model of markedness, based on the
implicational universal that languages with Yes/No inversion also
have WH inversion (Eckman, Moravcsik & Wirth 1987), would allow
for better performance on inversion in WH questions than in Yes/No
questions. Under one interpretation of a study of elicited and
spontaneous questions (Erreich 1984 (see below)), this model too
is supported. Again, however, this theory makes no predictions
concerning the effects of negation.

The experiment to be described below re-examines the inversion
claims in the light of previously unreported imitation and elicited
production data from children aged 3;0 to 4;6 (Derwing 1979). We
will show that the results of this study are not clearly supportive
of any account of the syntax of English questions. We will then

argue that pragmatic, discourse, and input effects may be confounded
with the syntactic representation issues in all published studies.
Finally, we will propose that if one is to understand the inversion
issue fully, these confounding effects must be examined separately,
then controlled for in more refined acquisition studies.

2.   Inversion in Yes/No vs. WH Questions

      Klima & Bellugi (1966) and Brown (1968) cited evidence from
the longitudinal study of Adam, Eve and Sarah that subject-AUX
inversion is mastered in Yes/No questions before it appears in WH
questions. That is, they argued that there is a period when children
are able to produce Yes/No forms correctly but are still producing
WH questions that maintain declarative word order (e.g., **What you
are doing?**). They linked the observed acquisition sequence to the
fact that the later acquired WH questions were derived through
both a WH preposing rule and an inversion rule, while the
earlier-acquired Yes/No questions required only an inversion
transformation.

      Kuczaj & Maratsos (1975) examined the imitation abilities of
one child (Abe) who was not yet spontaneously producing any
auxiliaries, inverted or otherwise, in Yes/No and WH questions.
When asked to imitate both grammatical (inverted) and ungrammatical
(uninverted) questions, he did not invert in the WH questions, but
did invert in the Yes/No questions, even when the target sentence
incorrectly used non-inverted syntax. The child's differential
treatment of Yes/No and WH questions was taken as evidence of an
acquisition sequence which occurred during a 'pre-organizational'
stage preceding the use of auxiliaries in his own productions.
This interpretation was further supported by the fact that the
child later spontaneously began to use auxiliaries first in Yes/No
questions, where inversion was present from the outset. These
results would lend a slightly different kind of support to Bellugi's
(1971) complexity explanation. Since the study concluded before
the child began to use auxiliaries in WH questions, it is not
reported whether inversion was present from the outset in that
question type.

      Despite this initial correspondence between data and theoretical
predictions, later cross-sectional studies indicated that some
children do not master subject-auxiliary placement in Yes/No
questions prior to WH questions. Hecht & Morse (cited in de Villiers
& de Villiers 1978), Ingram & Tyack (1979), and Erreich (1984)
claimed that their subjects made similar inversion errors in both
sentence types. However, it is not clear whether variation in

results across studies should be attributed to differences among subjects, differences in methodology, or perhaps both.

For example, the Harvard data are based on only three children, with naturalistic observation by trained researchers, while Ingram & Tyack had parents collect the data cross-sectionally. Surprisingly, the lack of Yes/No vs. WH effects in the latter case was caused by the fact that only 2 of the 21 children made any inversion errors at all; surely this runs counter to the general finding that inversion errors are a common feature of early English syntax.

Techniques for data analysis also vary. For example, one potential source of the divergence of Erreich's (1984) results from other work is the fact that she scored her results according to a productivity criterion (counting only utterance types rather than tokens) which had not been applied in other studies. Erreich also failed to report significance tests on the differences between error rates, stating only that 'Non-inversion was...common in both **yes-no** AND **wh-questions**' (p. 585). On closer examination, however, one finds that performance was numerically better on WH inversion (36% vs. 51%).

Finally, there is a lexical parameter to the acquisition of inversion: Labov & Labov (1978), Kuczaj & Brannick (1979), and Bloom, Merkin & Wootten (1982) have noted that the appearance of inversion is not consistent across WH words. One important consequence of this finding is that the amount of inversion found in studies of spontaneous speech will differ from that found in elicited production or imitation tasks, in which the number of tokens per lexical item is under the control of the experimenter.

3.   Inversion in Affirmative vs. Negative WH Questions

Bellugi (1971) reported a developmental difference in the acquisition of affirmative and negative WH questions. In an elicitation task that was undertaken after her analysis of the Harvard corpus, she noted that her subject, Adam, inverted all affirmative WH forms, but none of the negative forms (e.g., **Why you can't sit down?**). Despite her declared unwillingness to invoke the Derivational Theory of Complexity, Bellugi attributed this to the greater transformational complexity of the negative sentences. She was not, however, able to compare this result with spontaneous production data on Yes/No questions, since, in accordance with the developmental sequence discussed above, Adam made only seven inversion errors in a total of 205 positive Yes/No questions and

produced only three negative Yes/No questions (less than 1.5 % of the total for that type).

It should be noted that a similar problem of interpretation arises with Erreich's (1984) analysis of spontaneous WH questions: only 1.5% of the children's 982 questions were negative, and negative questions were not collected in the elicitation task. The only other study which examines the effects of negation on inversion accuracy in WH questions is Labov & Labov's (1978) analysis of a large sample of their daughter Jessie's spontaneous production of WH questions over a period of nearly three years. They found only 194 negatives (6.5%) in their sample of 2976 WH questions, and of these only 21 (10.8%) were inverted, compared with 57% of positive WH questions. Thus, fewer than one per cent of Jessie's WH questions were inverted negatives. Although these data support their claim that inversion accuracy was a variable rule for their child, they offered no further explanation as to why negation should be associated with more inversion errors.

Since other studies do not provide a breakdown of results in terms of affirmative vs. negative forms, it is difficult to comment on the importance of negation to the acquisition of subject-auxiliary inversion. In fact, most researchers have ignored the issue. For example, Pinker (1984: 276) mentions Bellugi's (1971) findings in his discussion of arguments against the transformational explanation, devoting considerable attention to Yes/No vs. WH inversion. However, he never returns to the issue of negative vs. affirmative WH questions in relation to his own theory. Maratsos (1983), McLaughlin (1984) and Reich (1986) also sidestep the problem: in their surveys of the inversion controversy they ignore the possibility of a distinction between positive and negative WH questions, yet all cite some negative WH questions as examples of evidence for the later acquisition of inversion in WH questions. This gives the misleading impression that lack of inversion in negative WH questions is typical of WH questions in general.

We would like to point out that the lack of inversion in negative questions is not their most remarkable characteristic. Rather, the fact that they comprise such a small portion of the spontaneous speech corpora suggests that they pose difficulties that differ in kind from those involved in the Yes/No vs. WH comparison. The frequency data suggest to us that functional constraints such as presuppositional markedness may limit children's attempted use of negative questions; the apparent lack of inversion may arise from planning difficulties for sentences which are outside the child's pragmatic repertoire. This issue will be discussed in greater detail below. Such an explanation is compatible with evidence (Hamburger & Crain 1982; Nakayama 1987) that the frequency

of other auxiliary errors is correlated with sentence complexity. For example, Nakayama found that auxiliary overmarking (e.g., **Whose is** that **is**?) was more common (1) in sentences containing relative clauses; (2) when the relative clause was long; and (3) when the relative clause had an object gap. Thus, a prompt such as **Ask Jabba if the girl is tall** is less likely to yield double auxiliaries than a prompt such as **Ask Jabba if the boy who is watching Mickey Mouse is happy**. We would claim that Nakayama's subjects used double marking when artificially constructing sentences which were beyond their productive capacity, and that analogous results should appear for inversion when children attempt to construct pragmatically difficult sentences in any imitation or elicited production task. Such effects are reminiscent of the early adult sentence-transformation studies (see Fodor, Bever & Garrett 1974), in which processing difficulty was associated with transformational complexity only in certain sentence manipulation tasks.

To summarize, the current consensus is that claims for a universal order of acquisition for Yes/No and WH questions are unjustified (de Villiers & de Villiers 1978: 107; Maratsos 1983: 753; Reich 1986: 121). Pinker (1984: 287) goes so far as to say that 'the supposed syndrome of inverting in Yes/No questions but not in WH questions either does not exist or exists only rarely. The common error pattern is to invert optionally in all questions.' Furthermore, little is known - or predicted by other linguists - about the effects of negation on inversion.

We concur with Pinker's (1984:261) frustration over the need to consult 'experimental studies of auxiliary development when such studies exist (all too rarely, alas).' Thus, we present here an extended, cross-sectional version of Bellugi's (1971) work with Adam, since this is the most often cited work which supports the claim that Yes/No inversion precedes WH inversion. By using methodologies (imitation and prompted production) which are similar in essential respects to Bellugi's, we will test the generality of the findings reported for Adam. Given the complexity of the issues, we can make no **a priori** predictions at this point concerning the outcome of the Yes/No vs. WH analysis. However, we do predict that inversion will be less frequent in negative than in affirmative questions.

4. Experiment

4.1 Subjects

The subjects were 24 monolingual English speakers; all were middle class children who attended daycare in Edmonton. They fell into three age groups: 3;0 - 3;6 (Group 1); 3;7 - 3;11 (Group 2); and 4;0 - 4;6 (Group 3). Each group consisted of four females and four males.

4.2 Procedure

The experiment consisted of an imitation task and a production task. Since the presence or absence of correct subject and AUX placement in negative WH questions was the focus of Bellugi's study, six of the stimuli were questions of that type (e.g., **Why isn't the boy happy?**). There were three affirmative WH inverted sentences (e.g., **Why is the dog barking?**); one affirmative WH non-inverted question (**Who is hiding?**), two negative WH non-inverted questions (e.g., **Who won't run away?**) and one affirmative and one negative Yes/No question (**Is the dog black?** and **Isn't the boy singing?**). Although it would have been desirable to have an equal number of each question type, the attention span of the very young subjects was thought to be too short to accommodate a larger stimulus set.

The first task required subjects to imitate the set of 14 sentences, whose presentation order was randomized. The children were asked to repeat each sentence after the experimenter and were given up to three opportunities to do so.

The production task was patterned after Bellugi's (1971) experiment and took the form of a puppet show. Subjects asked questions of three hand puppets (representing a woman, a dog and a boy), while two experimenters manipulated the puppets and responded to the questions. One of the experimenters also acted as narrator and prompted the children with a series of indirect questions.

The sentences in the elicited production task corresponded to those in the imitation task, although the presentation order was altered so that a coherent story could be developed and acted out by the puppets and the children.

All responses were audio-taped and subsequently transcribed and scored as correct or incorrect with respect to three syntactic features only: 1) double negation or lack of negation; 2) presence or absence of the verb or WH marker; and 3) inversion. Other errors

or irregularities due to articulatory difficulties were ignored. As a check on the adequacy of the global scoring method, a separate tabulation was made of the inversion errors alone for the three sentence types; the same error pattern emerged.

4.3 Results

A five-factor ANOVA was performed in order to determine the effects of Sentence Type (Yes/No, WH inverted, WH non-inverted), Task (imitation or production), Modality (affirmative or negative), Age, and Sex. With the exception of Sex, each main effect was significant ($p<.01$). In addition, there were three significant first order interactions: Sentence Type by Task, Sentence Type by Modality, and Age by Sex. Pairwise comparisons of the cell means for each significant effect were made using the Newman-Keuls procedure (Winer 1971). For additional details on the findings reported here, see Derwing (1979).

The Sentence Type by Task interaction indicated that both WH inverted and Yes/No questions were significantly more difficult to produce than to imitate. Success in the production of non-inverted WH questions was not significantly different from imitation, with a high level of performance evident on both.

The Sentence Type by Modality interaction paralleled the previous case very closely. Each sentence type attained a relatively high level of success in the affirmative, but both WH inverted and Yes/No questions were more difficult in the negative. The non-inverted WH results were essentially the same for both affirmative and negative sentences.

The Sex by Age interaction was caused by the superior performance of the females in Group 2 when compared to the males in the same group; in fact, these girls performed at essentially the same level as both sexes in Group 3. Although this finding shows that age is not the sole predictor of inversion accuracy, performance did improve with age: an analysis performed on the age groups revealed a highly significant linear trend ($F(1,216)=58.88$, $p<.001$), and the quadratic trend was also significant ($F(1,216)=5.19$, $p<.05$). The youngest group of children found the task significantly more difficult than the older children, but an age-dependent ceiling effect was operative as the older children approached mastery of the structures.

The relevant findings, then, are (1) negative questions, both Yes/No and WH, were more difficult than affirmatives; (2) there was no difference in performance for Yes/No and WH questions of the same modality; and (3) inverted structures, again both Yes/No and WH questions, were more difficult than non-inverted structures.

4.4 Discussion

Perhaps the most important point to be made is that no current theory of syntactic representation can account for the inversion effects due to negation, while at the same time predicting no differences across question types. For this reason, we believe that one should look elsewhere for an explanation not only of our results, but of previous research as well.

4.4.1. Negative vs. affirmative

First, let us consider Bellugi's claim that inversion is mastered later in negative WH questions than in their affirmative counterparts. This finding has been strengthened by the broader data base of the present study. How can the lag be explained?

Bellugi accounted for her results in terms of a performance limitation related to the syntactic complexity of negative WH questions (1971: 101 ff.), within the framework of an additive, syntax-based model similar to the Derivational Theory of Complexity (see Fodor, Bever & Garrett 1974) - a theory which she specifically rejected. According to this view, the relative difficulty of negative WH questions is a consequence of bringing together two syntactic processes, negation and inversion, which the child must initially master in isolation. Since other researchers have not addressed the auxiliary placement problem associated with modality, there is no alternative explanation in the linguistic literature for this result.

Our explanation of the negation effects invokes the restricted pragmatic functions of negative questions. Although negative **why** and **who** questions are perhaps less obviously presuppositionally loaded (e.g., **Why aren't you laughing? Who doesn't like licorice?**), the other negative WH forms are used largely to express irony (e.g., **What aren't you going to do when you grow up?**) or to request confirmation (e.g., **Where aren't you going?**). (Notice that WH questions of the latter type must carry contrastive stress on the AUX; we take this to be a further indication of the distinctiveness

of these forms.) Since questions marking such pragmatic functions are nearly absent from the diary study data, we may assume that our subjects had rarely, if ever, attempted to produce such forms on their own. WH affirmative questions, on the other hand, represent the pragmatically unmarked case (e.g., **What are you going to do when you grow up? Where are you going?**), and are well represented in the diary study corpora. We therefore suggest that our subjects, like others before them, responded to the imitation and production tasks by producing negative WH questions on the basis of task-specific sentence construction strategies.

A secondary finding of this study was that inversion was also more difficult in Yes/No negatives than in Yes/No affirmatives. Because the Yes/No questions were chosen to provide a control measure of inversion in non-WH forms, only one example of each was used in the study. Nonetheless, the results do suggest that the factors governing inversion accuracy in WH questions may also be involved in Yes/No inversion. Again, there is a difference in the distribution of negative and affirmative Yes/No questions: negative inversion involves a presupposition (**Aren't you sleepy yet?**) which is absent in the affirmative form (**Are you sleepy yet?**).

4.4.2 Yes/no vs. Wh

Our experiment has failed to replicate the results reported by Bellugi (1971) concerning the relative lack of inversion in WH questions as compared to Yes/No questions, and no evidence was found to support Erreich's (1984) data, which suggest that inversion may be more accurate in WH questions. It does, however, support the larger number of studies cited above which find no difference in inversion accuracy for these question types.

Neither transformational complexity nor syntactic markedness can account for these results. However, it must be acknowledged that few conclusions can be drawn from a negative result, no matter how consistent it may be across studies. The similarity of inversion accuracy for the two types may reflect a common process of inversion in Yes/No and WH questions, but one must also consider the possibility that inversion is learned separately for these question types, and that extra-syntactic factors determine when inversion will be acquired by each child.

We find it implausible (and unparsimonious as an initial assumption) that children such as Adam and Abe, who quite evidently did invert much more readily in Yes/No questions, constructed grammars which were of an essentially different nature from those

of other children. We will therefore attempt to provide a functional account of both the common finding of no difference in inversion, and the less common finding of a developmental sequence. In order to do so, we must focus on similarities between these types with respect to the acquisition problems they pose for the child.

One such similarity involves the existence of competing uninverted forms in the adult input. Clearly, the existence of intonation questions alongside inverted questions with the same intonation contour provides the child with positive evidence that inversion is optional in Yes/No questions. Since by any account Subject-AUX order is unmarked, one should not be surprised to find children retaining this form, even as they begin to invert.

With respect to WH forms, Prideaux (1976) points out that clause-initial WH+NP sequences are also a structural feature of non-inverted relative clauses and WH complements. Additional structural interference may arise from the fact that **who** and **what** questions do not exhibit inversion when the WH word is the subject of the sentence (e.g., **Who doesn't want dessert? What didn't scare the boy?**), and thus compete with the inverted forms with who as the object (e.g., **Who doesn't she like?**). To further complicate matters, non-inverted **how come** and **what if** questions (e.g., **How come you aren't putting your toys away? What if Ted doesn't bring the car?**) may serve as misleading evidence that inversion is optional in WH negative questions. Again, this would account for the retention of the unmarked uninverted form.

With respect to the occasional finding of a clear advantage for inversion in Yes/No questions, we will tentatively suggest that this may be related to input factors, notably the frequency of uninverted Yes/No intonation questions and **how come** or **what if** questions in the child's main caregivers' speech. On this account, one could even predict earlier acquisition of inversion in WH questions in the case of a child who hears many uninverted Yes/No questions but few instances of uninverted WH questions.

5.   Conclusion

In summary, our findings confirm those of Bellugi for negative WH questions, and show similar results for Yes/No questions: in both question types, the negatives are more difficult and appear to be acquired later. For reasons already indicated, it seems unlikely that the results can be explained by a purely syntactic account, nor does the existence of individual differences in inversion accuracy necessarily imply optionality. We have proposed

two alternative vehicles of explanation, namely, differences in input (such as exposure to competing WH forms without inversion), and variation in presuppositional function across question types. However, since the modality and input issues have been almost completely ignored in prior research, the findings cited here are far from definitive. Further naturalistic and experimental investigations are required in order to isolate the roles of question type (Yes/No vs. WH) and modality (affirmative vs. negative) in inversion, and to relate these to the input the child receives.

It has often been suggested that variables other than purely syntactic development affect acquisition patterns. Wells (1979), for example, noted that social functions play a role in the emergence of auxiliaries in children's speech, and Newport, Gleitman & Gleitman (1977) found that auxiliary development is correlated with the mother's use of Yes/No questions. We suggest that explanations which admit relevant functional information will be needed to resolve the seemingly intractable issues surrounding the development of inversion in children's questions.

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