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# Complementizers, Markedness, and Readjustment in Children's Comprehension of Relatives and Clefts

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# COMPLEMENTIZERS, MARKEDNESS, AND READJUSTMENT IN CHILDREN'S COMPREHENSION OF RELATIVES AND CLEFTS

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## 1. Introduction

This study concerns the dynamics of acquisition. Specifically, it is concerned with the role of "normal forms" for grammatical rules in the child's analysis of input and his sequence of developing grammars.

The terms unmarked and marked are often used to describe intuitions and observations to the effect that some rules and principles are more basic to the design of language than others. The normal situation with respect to a rule or rule system in the world's languages or a particular language type is known as unmarked, and the working assumption of grammarians is that this situation is to be encoded by central rules and principles. Rarer and more idiosyncratic properties of languages can be called marked, and may be taken to result from features of grammar outside the central set of rules and principles that characterize the language type in question. This sense of marked and unmarked values is approximately that expressed by the idea of core versus peripheral grammar (Chomsky 1975, 1981).

There are no fixed criteria for deciding in advance what the unmarked and marked state is with respect to a particular rule system, but observation of relative frequency cross-linguistically is a standard signpost to markedness values. If a particular situation holds in the majority of languages (or

languages of a certain type) then we can make the working assumption that this is the situation that the theory of grammar should encode most directly, as a matter of core rules and principles. By the same token, if a particular situation occurs rather rarely, it is plausible to assume that it results from a peripheral rule of some type.

The facts of cross-linguistic frequency can be matched to grammatical pointers to marked vs. unmarked situations. So it is plausible to assume unmarked situations will be evidenced across a broad range of pertinent rules and constructions, while marked situations will be narrower in their scope, and dependent on factors such as lexical form (particular words) and individual structures.

So it is possible to categorize some situations as marked or unmarked based on cross-linguistic frequency and language-internal generality of rules, despite the fact that the principles that underlie the observed forms may not be understood fully. Preposition stranding in constructions involving leftwards dislocation of a constituent is a case in point. In English an entire PP may be displaced leftwards in various constructions, or the object of the PP alone may be displaced, leaving the preposition in situ. For example, when a relative clause or cleft construction involves an overt wh-word, relativization or clefting the object of a preposition may be left in place (2a, b):

1. a. Sue telephoned the library to which Bill had sent the book.

   b. It was the library to which Bill had sent the book.

2. a. Sue telephoned the library which Bill had sent the book to.

   b. It was the library which Bill had sent the book to.

Cross-linguistic considerations point to the preposition-initial (pied-piped) forms as the normal, unmarked situation and to preposition-final (stranded) forms as marked. Many languages permit only pied-piped forms, excluding stranding as ungrammatical (see van Riemsdijk 1978; Stowell 1981). Moreover, the admissibility of stranded forms even in English is structure and rule dependent, another pointer to a marked situation. (For example, a preposition can be stranded in so-called pseudo-passive forms, as in 'This bed has been slept in', but only where the preposition is immediately adjacent to the verb. See Stowell 1981 for discussion.)

Although the rule systems governing pied-piped and stranded constructions in English and other languages are the subject of debate, it is at least possible to put the facts roughly within a system of rules whereby pied-piped forms will be freely admitted and stranding more prone to restriction. Stowell 1981 notes that both pied-piping and stranding will be entailed by a maximally general formulation of the rule for dislocating a constituent to the front of a sentence--i.e., if the rule that moves the left-fronted element in various constructions if formulated simply as 'move $\alpha$', where $\alpha$ refers to a phrase of any type. So under this general statement of the rule we expect dislocation of both PPs, as in pied-piped forms, and of NPs, as in stranded forms. Bare NPs are of course also fronted in cases where a non-prepositional argument is the focus of the construction (as when, for example, a direct object is relativized: '..the man who John saw'), demonstrating the need for a rule that will include movement of a bare NP independent of stranded constructions. Thus it is plausible to assume that the cross-linguistic oddity of preposition stranding results from conditions that affect that application of the leftward movement rule, rather than on restrictions on the formulation of the rule per se. Recent analyses attempt to describe the conditions that admit stranding in terms of the inventory of local environments in which the gap left by a moved constituent may be located (i.e., whether this inventory includes prepositional object position) and/or rules that adjust the structure of the sentence in such a way that the prepositional object effectively becomes a direct object, and thus conforms to the specifications on local environments for gaps (cf. Kayne 1984, Chts. 5 & 9, and references therein). These analyses have in common that they allow for restriction of stranding, while leaving the possibility of pied-piped forms intact. The marked nature of stranding is thus captured, after a fashion: the conditions under which a general rule of fronting applies may vary due to language particular specifications and rules, such that stranding is admitted in the exceptional case.

Accepting that pied-piping is the unmarked, normal state and stranding marked and atypical, and that these facts are encoded in a system of rules whereby stranding is accounted for by additional, language-particular specifications, we can ask what the role of these distinctions is in acquisition. The child's task in learning his native language is assumed to be basically a matter of filling out one of a limited number of innately available schemata (Chomsky 1975, 1980). The speech around him will provide clues from which the child will project a grammatical system that will provide for forms and structures for which he has no direct evidence. The timing of the child's hypotheses--when he makes the leap from individual pieces of data to a rule or rule system that goes beyond the data at hand--is part of acquisition theory, and not necessarily derivable

from the form and organization of rules for adult grammars.

We can oppose two broad hypotheses with respect to the learning of pied-piped and stranded constructions. Assume that the child learning English will not in the first instance hear cases of pied-piping. Although pied-piped forms are unmarked in terms of their cross-linguistic distribution, pied-piping is formal sounding in modern English; stranded constructions are more colloquial. On the first learning hypothesis, which we can call the rapid projection theory, the child quickly forms the most general grammar compatible with the input data and his innately given knowledge of possible rule systems and projects a grammar that conforms to the unmarked situation. Thus he will project a grammar that permits pied-piping, even in the absence of pied-piped forms in the input. The projection of a grammar that permits pied-piping may be based on any instance of leftward movement (for example, from subject or direct object position), leaving the child open to having made an error should it turn out that English is not a language that permits movement of a prepositional object (with or without pied-piping); or the child's projection of pied-piped forms may be based on stranded constructions. On this picture, one might expect pied-piped forms to be as easy or easier for children than stranded forms, despite their infrequency in the input.

Alternatively, the child's grammar for some period may hug the ground of the data. Under a restricted interpretation theory, the child learning English may, in the face of stranded forms and the absence of pied-piped forms, project a grammar that blocks the latter, and so in part falls outside the purview of the normal, unmarked situation. (There are various alternatives for what such a grammar might look like: for example, the grammar might block movement from oblique positions as far as the general rule of leftwards movement is concerned--a situation not uncountenanced in languages--and permit stranded prepositional object constructions only by virtue of some special list mechanism that specifies predicates and/or structural fragments in which stranding has been encountered.) If the child does follow the restricted interpretation path, then pied-piped forms might be expected to cause difficulty for some period.

In what follows, it is shown that pied-piped forms do in fact cause difficulty for the child; pied-piped forms are actually harder than stranded forms for preschool and young school-age children, at least in one of the restricted range of structures we tested (dative relatives and clefts of the types in (1-2), above). Thus there is no positive support for the rapid projection theory, within the confines of the structures we tested. This finding is discussed in more detail below where it argued that the rapid projection theory should not necessarily be rejected, despite the difficulty caused by pied-pied forms in this study.

## 2. The Study

The main experiment in this study was a comprehension task, which tested children's interpretation of the sentence types listed in Tables 1 and 2.

TABLE 1

TEST CONSTRUCTIONS: SIMPLE SENTENCES

| | |
|---|---|
| 1. Simple datives | |
| | Example: The dog pushes the horse to the cow. |
| 2. Non-dative relatives--subject position relativized | |
| A. That | |
| | Example: The pirate watches the dog that pushes the horse. |
| B. Which | |
| | Example: The pirate watches the dog which pushes the horse. |
| 3. Non-dative clefts--subject focus | |
| A. That | |
| | Example: It's the dog that pushes the horse. |
| B. Which | |
| | Example: It's the dog which pushes the horse. |
| 4. Non-dative relatives--object position relativized | |
| A. That | |
| | Example: The pirate watches the dog that the horse pushes. |
| B. Which | |
| | Example: The pirate watches the dog which the horse pushes. |
| 5. Non-dative clefts--object focus | |
| A. That | |
| | Example: It's the dog that the horse pushes |
| B. Which | |
| | Example: It's the dog which the horse pushes. |

TABLE 2

TEST CONSTRUCTIONS--DATIVE RELATIVES and CLEFTS

| | |
|---|---|
| 1. Dative relatives--stranded. | |
| A. That | |
| Example: | The pirate watches the horse that the dog pushes the cow to. |
| B. Which | |
| Example: | The pirate watches the horse which the dog pushes the cow to. |
| 2. Dative relatives--pied-piped | |
| Example: | The pirate watches the horse to which the dog pushes the cow. |
| 3. Dative clefts--stranded | |
| A. That | |
| Example: | It's the horse that the dog pushes the cow to. |
| B. Which | |
| Example: | It's the horse which the dog pushes the cow to. |
| 4. Dative clefts--pied-piped | |
| Example: | It's the horse to which the dog pushes the cow. |

The sentence types in Table 1 essentially provided a measure of the child's mastery of some of the component parts (dative structure, relativization, clefting) of the relative and cleft constructions in Table 2, performance with which was the main focus of the study. As the examples in Table 1 illustrate, children were tested with simple dative constructions (1-1), and non-dative relatives and clefts, both where the head of the construction referred to subject position (1-2, 1-3) and where the head of the construction referred to direct object position (1-4, 1-5). In each of the relative and cleft constructions, there was a condition with the complementizer that, and a condition with the relative pronoun which. The same variation (that/which) was tested for the stranded dative constructions in Table 2, alongside pied-piped forms. The that relatives and clefts allow for the possibility of factoring out difficulty with the tested construction per se from difficulty caused by the wh-word.

## Subjects and Method

Subjects were 48 4-7-year-old children, 12 in each level (year). Table 3 lists the mean ages of the subjects in each group. An act-out paradigm was used, following Chomsky

TABLE 3

SUBJECTS

| Age | N | Mean Age (Yrs.; Mos.) |
|---|---|---|
| 4 years | 12 | 4; 6 |
| 5 years | 12 | 5; 5 |
| 6 years | 12 | 6; 3 |
| 7 years | 12 | 7; 6 |

1969 and others. The experimenter read the test sentences to the child, and s/he acted out the sentence with a set of props, described below. Up to two repetitions of each sentence were allowed, if the child did not initially respond. The child was first given three active declarative sentences (e.g., 'The cow kicks the horse') and then was given a battery of sentences of the types listed in Tables 1 and 2. Details of the questionnaires are given in the next section. Props for the experiment consisted of two sets of three model animals, approximately 1-1½ inches high (the set comprised: a cow, a dog, a horse; a camel, a donkey, a zebra) and a pirate doll. The two animal groups were placed apart from one another between the child and the experimenter. The pirate doll was positioned to one side. The experimenter checked that the child knew the names of the animals before beginning the experiment, and made the child aware that the doll was a pirate. For relative clause sentences, the main clause was always 'The pirate watches...' and the pirate doll was turned to face the animals; for cleft sentences the main sentence was 'It's...' and the pirate doll faced away from the animals. Before each sentence, the experimenter reminded the child whether or not the pirate was 'watching'. The child was required to act-out only the subordinate clause for the relative and cleft constructions, manipulating the animals. Sessions were tape recorded.

## Materials

Each child responded to three tokens of each of the test sentence types listed in Tables 1 and 2, for a total of 45 test

sentences. Four questionnaires were constructed to equalize the frequency of each animal in subject, object, and indirect object position in and across conditions. In the non-dative conditions, 12 transitive verbs were used; in the dative conditions, 6 different verbs were used. These are listed in Table 4. Across the questionnaires, each verb occurred with equal frequency in

TABLE 4

PREDICATES

| |
|---|
| Dative conditions:<br>give, push, bring, throw, take, carry |
| Non-dative conditions:<br>push, kick, tickle, slap, hit, scratch,<br>bump, knock, pat, kiss, hug, punch |

each condition. The three simple dative sentences (1-1) were presented following the simple active sentences and before the remaining sentence types. Otherwise the remaining sentence types were intermixed, with the constraint that the first two sentences of the body of the test were selected from conditions (1-2--1-5) and that the test battery was organized into three blocks of one token of each sentence type. Within these constraints, order of presentation was randomized individually for each child.

## Scoring

The child's act-out response to the sentences in Tables 1 and 2 (the main, and only, clause for sentence type (1-1) and the subordinate clause for the remaining sentence types) was scored as to which of the animals was made subject, object, and (for dative sentences) indirect object. A clear indication of these roles was required for the response to be included in the appropriate response categories (see the analysis below), but a representation of fine points of meaning of the different predicates was not required (for example, the child's act-outs were not required to distinguish between sentences identical except for the particular dative verb). Responses that did not involve an adequate representation of the meaning of the predicate were also noted. Fourteen responses were lost through experimental error.

Results: Simple Sentences

The mean percentages correct for the sentence types listed in Table 1 are given in Table 5.

TABLE 5

MEAN PERCENTAGE CORRECT: SIMPLE SENTENCES

| Ages: | | 4 | 5 | 6 | 7 | $\bar{X}$ |
|---|---|---|---|---|---|---|
| 1-1 | (simple datives) | 64 | 89 | 94 | 100 | 87% |
| 1-2-A | (non-dative subject relative that) | 83 | 100 | 97 | 97 | 95% |
| 1-2-B | (non-dative subject relative which) | 89 | 92 | 86 | 94 | 90% |
| 1-3-A | (non-dative subject cleft that) | 81 | 97 | 100 | 97 | 94% |
| 1-3-B | (non-dative subject cleft which) | 94 | 100 | 90 | 100 | 96% |
| 1-4-A | (non-dative object relative that) | 75 | 67 | 67 | 86 | 74% |
| 1-4-B | (non-dative object relative which) | 47 | 61 | 69 | 86 | 66% |
| 1-5-A | (non-dative object cleft that) | 58 | 50 | 55 | 83 | 62% |
| 1-5-B | (non-dative object cleft which) | 50 | 47 | 72 | 83 | 63% |

Performance on simple, non-embedded dative sentences was very good; the overall percentage correct for the 48 children in acting out sentences such as 'The dog pushes the horse to the cow' (1-1) was 87%, with an improvement over age from 64% to 100% correct (there was a significant effect of age group, $F(3,44) = 5.20$, $p < .004$).

For non-dative subject relatives and clefts (1-2A/B; 1-3A/B) performance was also high, with a mean of 90% or more correct for each sentence type.

Performance on object relatives and clefts (1-4A/B; 1-5A/B) was lower than for subject relatives and clefts, with

means between 62% and 74% correct. The difference in scores for the subject relative/cleft constructions combined vs. the object relative/cleft constructions is highly significant ($p < .000$) and interacts with age ($F(3,44) = 3.30$, $p < .03$). Object relatives were easier than object clefts ($F(1,44) = 4.20$, $p < .05$ for the difference between conditions (1-4A and B) versus (1-5A and B)). The major error for the object relatives and clefts was to interpret the NP in the embedded clause as direct object, converting the gap from object to subject position--thus a sequence such as '..the horse that/which the cow pushes' would be interpreted as '..the horse that/which pushes the cow'. (Errors of this type account for 79% (149/189) errors on simple object relative and cleft sentences combined.)

Performance on simple datives and non-dative relatives and clefts thus shows that the children have a fair degree of competence with the component constructions (dative, relativization and clefting) for dative relatives and clefts. The overall high performance on simple datives of the type we tested replicates the results of previous studies (e.g., Fischer 1971; Roeper, Bing, Lapointe, & Tavakolian 1981). The amount correct on simple relatives was considerably higher than in some previous studies, and the advantage of subject over object relatives also runs counter to some previous findings (e.g., Tavakolian 1981). These differences can be attributed to the fact that in this study children were required to act-out one as opposed to two clauses; effects of task-requirements are returned to in the discussion section below.

## Results: Dative Relatives and Clefts

The mean percentages correct for dative relatives and clefts are given in Table 6.

TABLE 6

MEAN PERCENTAGE CORRECT: DATIVE RELATIVES AND CLEFTS

| Ages: | | 4 | 5 | 6 | 7 | $\bar{X}$ |
|---|---|---|---|---|---|---|
| 2-1-A | (dative relatives--stranded--that) | 14 | 25 | 36 | 42 | 29% |
| 2-1-B | (dative relatives--stranded--which) | 28 | 42 | 39 | 39 | 37% |
| 2-2 | (dative relatives--pied-piped) | 15 | 25 | 25 | 31 | 24% |
| 2-3-A | (dative clefts--stranded--that) | 17 | 11 | 28 | 22 | 19% |
| 2-3-B | (dative clefts--stranded--which) | 16 | 8 | 24 | 29 | 19% |
| 2-4 | (dative clefts--pied-piped) | 19 | 14 | 19 | 14 | 17% |

As the percentages in Table 6 reveal, performance for both constructions was overall quite poor, with approximately 25-35% correct for relatives and less than 20% for clefts. Relatives were significantly easier than clefts ($F(1,44) = 12.71$, $p < .001$); age was not significant in this or any other comparison among the embedded dative sentence types.

The figures in Table 6 show that there are only quite small differences between the sentence types (_that_, _which_, _to which_) for relatives, and virtually no difference for clefts. For relatives, stranded wh-sentences (2-1-B) are easier than pied-piped wh-sentences (2-2), with 37% versus 24% correct ($F(1,44) = 9.04$, $p < .004$). There were no other significant differences between the sentence types within each construction type (relative, cleft).

To the extent that there was any difference in performance for the different complementizer configurations (_that_, _which_, _to which_), the difference thus appeared to favor the restricted interpretation theory, whereby stranded forms are easier than pied-piped forms. What is more salient than the small differences between complementizers in the different complementizer configuration conditions in Table 6 is, however, the overall low level of performance on both dative relatives and clefts. For clefts, the percentages correct are at the level of chance if one interprets the child's task as manipulating three animals in the dative action. The possibility that the combination of relativization and clefting with the dative construction is sufficiently challenging for the child that the absolute range of his rule system is to a degree obscured should not be dismissed (see below). But it is mistaken to conclude that the material was so difficult that children paid little or no attention to the stimulus sentence in making their responses. The overall facilitation for relatives as opposed to clefts suggests that this would be unfairly dismissive, and an analysis of the errors for dative constructions also reveals systematic error patterns that are sensitive to the stimulus conditions.

## Error Analysis for Datives

Subjects were divided _post hoc_ into an upper and a lower group with respect to their performance on dative relatives and clefts. The criterion for being placed in the upper group was a score of 3 or more out of 6 correct for _that_ and (stranded) _which_ relatives combined, with at least one correct on both _that_ and _which_ and/or the same level of performance on _that_ and _which_ clefts. Twenty of the 48 children passed criterion as "upper"

(of which only two passed criterion on clefts alone). The upper group comprises two 4 year olds, five 5 year olds, six 6 year olds, and seven 7 year olds. The mean age of the upper group is 75 months and the mean age of the lower group is 68 months. This difference is not significant ($t_{46} = 1.54$).

Tables 7 and 8 show a breakdown of response types for dative sentences for the upper and lower group children. The responses in Tables 7 and 8 are listed in order of frequency for

TABLE 7

UPPER AND LOWER GROUPS: DATIVE RELATIVES

NUMBER OF RESPONSES BY RESPONSE CATEGORY

| Sentence type: | that | which | to which |
|---|---|---|---|
| Upper (n = 20) | COR 37 | COR 35 | COR 28 |
| | H/O 12 | H/O 16 | H/S 15 |
| | H/S 9 | H/S 6 | H/O 11 |
| | OT 2 | OT 3 | OT 6 |
| Lower (n = 28) | H/S 31 | H/S 23 | H/S 26 |
| | H/O 18 | COR 18 | H/O 7 |
| | COR 6 | H/O 14 | COR 6.5 |
| | OT 29 | OT 29 | OT 44.5 |

Fractional figures result from adjustments to compensate for missing data points.

Abbreviations: COR = correct; H/S = head as subject; H/O = head as object; OT = other

TABLE 8

UPPER AND LOWER GROUPS: DATIVE CLEFTS
NUMBER OF RESPONSES BY RESPONSE CATEGORY

| Sentence type: | that | which | to which |
|---|---|---|---|
| Upper (n = 20) | H/S 29 | H/S 23.5 | H/S 28 |
| | COR 20 | COR 18 | COR 13 |
| | H/O 9 | H/O 16.5 | H/O 10 |
| | OT 2 | OT 2 | OT 9 |
| Lower (n = 28) | H/S 41 | H/S 42 | H/S 35 |
| | H/O 10 | H/O 15 | COR 11 |
| | COR 8 | COR 10 | H/O 10 |
| | OT 25 | OT 17 | OT 28 |

those response types in which the three animals mentioned in the stimulus sentence were manipulated in a dative action. One such response is of course the correct response. Incorrect responses involving the three mentioned animals are divided into two types of response. The first is 'head-as-object' errors, in which the head is misconstrued as subject of the relative/cleft. For the example sentences in Table 1, which all have the sequence

$[_{NP}$the horse$]...[_{S}$the cow pushes the dog (to)$]$

this means that either the horse pushes the cow to the dog or that the horse pushes the dog to the cow (these subtypes of head-as-subject error respectively account for 170.5 and 138 out of a total of 308.5 head-as-subject errors for the six dative relative and cleft conditions combined). The second response category for errors involving the three mentioned animals in a dative action is 'head-as-object' errors, in which the head is misconstrued as direct object. For the examples in Table 1, this means that either the cow pushes the horse to the dog or the dog pushes the horse to the cow (only the former of these two subtypes of head-as-object error occurs with any frequency, accounting for 126.5/148.5 head-as-object errors for the six dative conditions combined).

A range of other error types occur, that do not involve the three mentioned animals in a dative action. These include: use of only two animals in the act-out; use of an unmentioned animal or of the pirate doll as recipient of the dative action; and failure to respond. These errors and failures to respond are grouped together in the category 'other', listed as the last row for each group in Tables 7 and 8.

An inspection of the data in Tables 7 and 8 shows clear differences in error patterns for dative relatives and clefts for the children classed as upper and lower on the basis of their score for number correct. Lower children account for the great majority of 'other' responses for all three relative and cleft types. Such responses are plausibly the mark of lesser abilities and their distribution thus confirms the classification of children made on the basis of number correct for _that_ and _which_. Table 7 shows also that most of the disadvantage of pied-piped over stranded forms for relatives derives from the lower children; 'other' responses make up 50% (44.5/84) of the responses of lower children to pied-piped forms, as compared to 34% (29/84) for stranded _wh_-relatives. The equivalent figures for upper-group children are 10% (6/60) and 5% (3/60). Thus pied-piping is particularly difficult for children who are performing less well on stranded forms (_that_ and _wh_) and promotes incomplete responses and failures to respond. This supports the view that pied-piped forms may cause difficulty for a child learning English, despite their unmarked status cross-linguistically.

The error responses in which all three mentioned animals are included in a dative action (head-as-subject and head-as-object errors) also show a distinction between upper and lower children. For lower children, head-as-subject errors predominate; for upper children, head-as-object errors gain ground, and become the majority error for _that_ and _which_ relative constructions (see Table 7). If head-as-subject errors do indeed decrease as the child becomes more skilled (scores more correct) and this is accompanied by an increase in head-as-object errors, we expect a greater number of children in the upper group as compared to the lower group for whom their total number of head-as-subject responses is smaller than their total number of head-as-object responses. This is in fact the case. Table 9 shows the distribution of children with plus and minus difference scores on the number of head-as-subject scores they give minus the number of head-as-object scores for relatives by upper and lower group (the data for the three dative constructions--_that_, _which_ and _to which_--were collapsed for the purposes of this analysis).

TABLE 9

DATIVE RELATIVES: DISTRIBUTION OF CHILDREN WITH PLUS AND MINUS DIFFERENCE SCORES ON H/S — H/O RESPONSES

| | Number of Children with: | |
|---|---|---|
| | + difference | - difference |
| Upper Group | 5 | 11 |
| Lower Group | 17 | 7 |

$\chi^2 = 6.14$, $p<.02$

For clefts, Table 8 shows that head-as-subject errors predominate over head-as-object errors even for the upper group children; this suggests that head-as-subject errors occur not merely when the child is overall less advanced but also when s/he is dealing with particularly challenging material (recall that dative clefts are overall more difficult than dative relatives, as shown by the figures in Table 6).

(The division of children into upper and lower groups based on number correct with stranded constructions also reveals that lower children do better with which than that stranded relatives, with three times as many correct for the which than that. Of the fourteen lower children who have a non-zero difference score for their responses on which minus that dative relatives, 11 have plus difference. In addition, the error analysis shows that for the upper children with relatives and both groups with clefts there are more head-as-object errors with stranded which than that. It is tempting to put this together with the fact that which promoted correct responses for relatives for the lower children and hypothesize that which is associated with (direct or indirect) object position. However, note that in simple object relatives (where the correct response is to interpret the head/pronoun as object) performance with which was poorer than with that for 4 year olds (see Table 5, which shows 75% correct for non-dative object relative that vs. 47% correct for which). Poorer performance with which for simple object relatives is also found for (18) 3-4 year olds in a separate experiment with 27 children (footnote 1, below). Moreover in that experiment, facilitation with which on stranded dative relatives was not found; rather there was a trend in the reverse direction of more correct with that for younger children. Altogether there is too little

data at present to interpret these partially conflicting trends.)

Summary

Dative relatives and clefts are difficult for children, the latter especially so. There are systematic patterns in children's responses in the act out task. Children who score relatively high in terms of number correct on stranded dative relatives and/or clefts tend to consistently use the three mentioned NPs in their responses; when they do make an error such children are less likely than those who score poorly in terms of correct responses to commit the error of interpreting the head of a dative construction as the subject rather than the direct object of the embedded clause, particularly in the case of relatives. Children whose performance is overall less good in terms of number correct responses are more prone to give 'other' responses (including responses that do not involve all three mentioned animals in a dative action), and where all three NPs are involved these children tend towards head-as-subject errors more than children with a higher success rate.

## 3. Discussion

At least three separate factors are relevant to our discussion of markedness in development. The first is markedness values themselves, assigned either on the basis of superficial facts such as cross-linguistic frequency or on the basis of an account of the rule systems from which those frequency facts may follow. The second factor is familiarity of particular forms for the child, based on another kind of frequency--the frequency of forms in the speech the child hears (input frequency). A third variable, not considered in the introduction section above, is difficulty of the constructions in which children's performance with marked and unmarked forms is evaluated (difficulty of the host environment).

The kind of picture we would like to see as support for a rapid-projection picture (where unmarked forms are established early in the child's rule system) is one where an unmarked form is easier for the child than the corresponding marked form, despite the fact that the unmarked form is less frequent than the marked form in the input. That would be strongly supportive of the child actively forming rules that take him beyond the constructions for which he has direct evidence. This study failed to provide a case of that kind. Pied-piping is unmarked, and infrequent in the speech around the child, meeting our conditions for good evidence for rapid projection. But pied-piping did not show up as easier than stranding. Rather pied-piping was more difficult than stranding, in dative relatives. (Although in clefts performance was on a par for the two forms,

the overall success level was low, suggesting that all the results are telling us is that dative clefts are very difficult).

The disadvantage of pied piping in dative relatives might appear to support a restricted-interpretation account of development, where the child initially eschews pied-piped forms. However, I think the correct conclusion to draw is that the results of this study are neutral with respect to whether the child's grammar is input-bound in this way. One reason that no conclusion can be drawn lies with the third factor above--difficulty of the host environment. In overall difficult constructions, less familiar forms in the input may have a last-straw effect, causing the child to make errors or fail to respond, despite the fact that the construction is one that his grammar in fact generates. Although the child may have a rule system that allows for pied-piping, the fact that such forms are rarely encountered in the speech around the child may make the relevant analysis procedures less accessible to the child's processor; that inaccessibility may be exacerbated when the child's processor is faced with a difficult host environment.

A recent study by French (1984) supports the idea that the difficulty of dative constructions may have obscured ability with pied-piped forms. She tested act out performance on pied-piped and stranded relatives on sentences such as (3a-b), where the relative has no direct object.

3. a. Show me the box in which the boy hides.

b. Show me the box which the boy hides in.

French found no significant difference in amount correct for pied-piped and stranded forms (and a non-significant advantage for pied-piped forms among 3 and 4 year olds), in contrast to the significantly poorer performance for pied-piped than for stranded relatives in this study. French's study can be taken as (weak) support for the rapid-projection picture of the development of pied-piping, insofar as the pied-piped forms are no more difficult for the child, despite their presumed infrequency in the input.

In short, the evidence from these two studies offers no serious challenge to the rapid-projection hypothesis with respect to pied-piping and stranding, if the effects of input-frequency on the processor's ability to handle pied-piping and the difficulty of host constructions is taken into account. (An alternative to input-frequency in determining the processing difficulty of pied-piping is raised in the conclusion section, below.)

Although the data do not bear directly on the markedness questions that are the focus of the discussion above, performance on simple relatives/clefts and the error patterns on dative relatives/clefts also deserve some comment. We saw above that (i) in simple constructions, there is a higher level of success with sentences with a gap in subject position than with sentences with a gap in object position (Tables 1/5); and (ii) in dative constructions a predominant error was to misconstrue the head NP as subject of the embedded clause, particularly among less advanced children and with the more difficult (pied-piped and cleft) forms (Tables 7/8). In terms of both amount correct and direction of error therefore, subject gaps appear to have a favored status. There is some evidence that this is not merely a linear-order effect, whereby the first NP in the relative/cleft construction is interpreted as subject of the embedded verb. Rather a more active use of grammatical structure may be at work (at least in some proportion of responses), whereby the child readjusts the input to convert a non-subject-gap construction to a subject-gap construction (cf. Shipley, Smith & Gleitman 1969 and Roeper 1978 for discussion of the notion readjustment).

The evidence for readjustment comes from spontaneous and elicited production. Occasionally, children repeated the stimuli when acting out sentences and their repetitions sometimes involved retention of the sentence structure, with conversion of the position of the gap to subject position. For example, one 4 year old repeated the stimulus sentence "The pirate watches the camel to which the donkey carries the sheep" as "The pirate watches the camel which carries the donkey to the sheep." In a separate experiment, fifteen 3-5 year old children repeated simple (non-dative) subject-gap relatives such as

4. John sees a car that hits a truck

and object gap relatives such as

5. John sees a car that a truck hits.

For the (12) 4-5 year olds, performance was overall good, with 92% (33/36) correct responses for subject-gap relatives and 86% (31/36) correct responses for object-gap relatives. Three-year olds did less well. Of the errors made, none were gap-conversion errors in the case of subject-gap relatives--i.e., a sentence such as (4) was never repeated as (5). For object gap relatives, there were four potential gap-conversion errors (committed by three 4-5 year olds), of which two errors were clear errors in which a sentence such as

(5) was repeated as (4). Thus the direction of conversion errors in the elicited production task was uniformly towards the subject-gap relative form. (The amount of error is of course very small; an earlier repetition experiment in which we attempted to elicit dative relatives with object and indirect object gaps had the opposite drawback, producing a large proportion of fragmentary repetitions in which the position of the gap was difficult to determine; the data was however consistent with the idea that conversion to subject gaps was the most frequent type of gap-location error.)

Subject gaps may thus represent 'readjustment targets'. We hypothesize that the child retains component parts of the input (relative structure, dative structure, etc.) and recombines them into a construction with those elements plus (in this case) a subject gap. The well-known asymmetries between subject gaps and gaps in other positions (see Keenan & Comrie 1977 for an early discussion) are consistent with the idea that readjustment is driven by grammatically-based principles.

Finally, the higher level of success with simple subject-gap relatives than object-gap relatives runs contrary to some previous studies (Sheldon 1974; Tavakolian 1981), where the opposite order of difficulty was found in terms of proportion correct for relative clauses modifying a direct object. This difference can be attributed to the fact that in this study the child was asked to act-out only the subordinate (relative) clause, whereas in Sheldon and Tavakolian's study both the main and subordinate clauses were acted out. Sheldon and Tavakolian's stimuli were of the form in (6) and (7).

6. The cow hits the pig that kicks the horse. (Subject-gap relative)

7. The cow hits the pig that the horse kicks. (Object-gap relative).

It is reasonable to suppose that the requirement of acting out both clauses focused the child on the main as well as subordinate clause in such a way as to promote 'conjoined clause' or 'higher-S' attachment analysis in the case of subject-gap relatives (see Solan and Roeper 1978; Tavakolian 1981; Goodluck and Tavakolian 1982). In this analysis the embedded clause is interpreted as conjoined or adjoined to the main clause S node rather than as a constituent of the object NP. The parallelism between surface string and/or structure for a subject gap relative and a true conjoined clause such as (8),

8. The cow hits the pig and kicks the horse.

is hypothesized to promote this misanalysis and hence the use of

interpretive rules and procedures that determine that the missing subject in the second clause is construed as referring to the main clause subject in conjoined and adjoined clauses. The higher error rate for subject-gap relatives such as (6) than object-gap relatives such as (7) in Sheldon's and Tavakolian's studies can thus be put down to the fact that the task-requirements of the experiment promoted an error type to which subject-gap, but not object-gap, relatives are prone.

## 4. Conclusion

The fact that the principles of grammatical theory isolate some constructions as normal, or unmarked, and others as more peripheral is potentially a rich source of developmental hypotheses. Other things being equal, we might expect unmarked forms to be the first-mastered and for this to show up in children's performance. Where unmarked forms cause the child difficulty, as in the case of pied-piping in this study, the situation is more ambiguous. It was proposed above that input-freqeuncy may tune the processor to marked forms of a construction, although the child's grammar in fact generates both forms; the child's ability with unmarked forms may also be dependent on the complexity of the input. This does not mean that performance mechanisms are always input-bound in such a way that markedness values are overridden. Subject gaps in relatives and other constructions are arguably an unmarked form of relative (though 'unmarked' may require a different type of specification in terms of rules of grammar to the case of pied-piping and stranding); as we saw above, children favor subject-gap forms in their readjustment of input, despite the fact that object gaps are perhaps more frequent in the input than subject gaps (cf. discussion and data in Limber 1973; 1976).

The possibility that input-frequency has poor predictive potential in terms of ability to override markedness values suggests we might look for alternatives in determining when unmarked forms will cause difficulty. The relation between levels of grammatical representation and the operation of performance mechanisms is one possible hunting ground. For example, if we think of the task of the comprehension and production devices as (respectively) mapping back from surface structure to some representation of propositional content (a logical form) and forward from logical form to surface structure, those cases where marked forms are at a disadvantage may be those where the logical form and the surface structure are sufficiently distinct to tax the processor/producer. Pied-piped forms--though unmarked in terms of the formulation of grammatical rules (cf. the discussion of 'move$\alpha$' in the introduction)--may nonetheless require the construction of a logical form where the questioned element is isolated from its preposition (a representation along the lines, for which x.....P x). Thus the logical form and surface structure may be more distinct for pied-piped constructions than for

stranded constructions, assuming the two constructions have the same logical form. Where a greater disparity between levels of representation occurs for unmarked than marked constructions, the unmarked constructions may be more difficult, and particularly vulnerable to the effects of capacity limitations in the performance mechanisms, including sensitivity to host construction complexity. Whether in general difficulty that on the face of it is attributable to rarity in the input will be reducable to the effects of mismatch between levels of representation in this way is a matter for research.[1]

## FOOTNOTE

[1]Not included in the discussion in this paper is a study of relative clause interpretation conducted by M. Krause, which contained the same relative clause conditions as those in this study, and some additional ones (presented in a paper by Krause & Goodluck in Studies in Generative Grammar and Language Acquisition, edited by Y. Otsu, Monbusho Grant for Scientific Research, no. 56122016, Tokyo, 1983). Mean correct responses of 50% or higher for dative relative constructions, with low level of 'other'/head-as-subject responses and an advantage of pied-piped over stranded constructions at 4 years onwards, did not replicate in this study or in an additional experiment with 27 3-5 year olds (11 of whom were tested by an experimenter blind to the purposes of the experiment). This latter experiment was designed to match more closely the experimental sentence types and props used in Krause's experiment; however, the outcome was comparable with that in the main study reported in this paper rather than her reported result. Seven children from the main experiment here were also retested with a set of sentences of the same types as those used in the Krause study, with no change in the direction of the outcome she reported. The findings of the experiment reported in this paper thus appear to be replicable in a way that those reported by Krause do not, and we give priority to them. Details of the additional tests carried out in attempting to replicate Krause and of the repetition tests briefly reported in the body of this paper are available on request.

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