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The Development of "Long-Distance Anaphora": A Cross-Linguistic Comparison With Special Reference to Icelandic

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INTRODUCTION

The development of lexical anaphors and pronouns and the binding conditions that govern the relationship of these elements to their antecedents have been a prominent area of language acquisition research in recent years. There have been numerous experimental studies of binding in the early grammars of English-speaking children (Jakubowicz, 1984; McDaniel, Cairns, & Hsu, 1987; Otsu, 1981; Wexler & Chien, 1985; among others). More recently, there have been a number of studies of children acquiring languages other than English. Of particular interest are those languages with binding properties that are distinct from English, such as Chinese (Chien & Wexler, 1987b), Korean (Lee & Wexler, 1987), and Danish (Jakubowicz & Olsen, 1988).

The acquisition studies have proceeded in tandem with research on binding in adult languages. Recent investigation of the binding properties of anaphors and pronouns across a number of different languages strongly suggests that the binding theory (Chomsky, 1981) is a parametrized system (Johnson, 1984; Wexler & Manzini, 1987; Yang, 1984; and others). Although the precise nature of the parametrization is open to some debate, the empirical facts seem to show, among other things, that there are

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languages in which an anaphor may be bound by an antecedent in a nonlocal domain. Icelandic is one such language. Under certain conditions, the third person, gender neutral reflexive *sig* can take either a local NP as antecedent, *Pétur,* or a "long-distance" antecedent, *Jón,* as illustrated in (1).

(1) Jón_i segir að Pétur_j raki $\text{sig}_{i/j}$
'John says that Peter shaves (SUBJUNCTIVE) himself'

The parametrization of binding theory has obvious implications for language acquisition. If binding domains are invariant across languages (and we assume, innate), then the acquisition task could reduce to simply learning what the anaphors and pronouns (and R-expressions, i.e., names and variables) are in the particular language the child is acquiring. Each of these elements plugs into the appropriate principle and the child has an adultlike grammar, at least with respect to binding. (We abstract away from the issue of maturation of innate principles.) The hypothesis that the child must learn only the lexical properties associated with particular pronouns and anaphors is referred to by Wexler and Manzini (1987) as the lexical learning hypothesis.

Within a parametrized system, however, in addition to learning the referential properties of different lexical items, the child must determine what the appropriate binding domain is for each element, for example, whether it is the minimal S or NP, as in English, or whether it is some larger domain, as in Icelandic. Thus, the parametrization of binding theory, though apparently motivated on empirical grounds, clearly adds a degree of complexity to the learning task that is not present in the alternative nonparametrized case.

In addressing the parameter-setting problem, Wexler and Manzini (1987) propose that the development of binding domains is constrained by the subset principle (Berwick, 1982), according to which the child in the early stages of acquisition might be expected to choose an antecedent for an anaphor in a local domain, even in those languages that allow long-distance binding of anaphors, such as Chinese, Korean, Danish, and Icelandic. In languages of the latter sort, the child will eventually reset the parameter based on positive evidence in the input data. Experimental studies of binding by young Chinese, Korean, and Danish children seem to confirm this hypothesis. Thus, Chien and Wexler (1987b) found that Chinese-speaking children from approximately the age of 4 years through the age of 6 years, 6 months (the oldest children tested) overwhelmingly prefer the local antecedent for the reflexive. Similar results were obtained with Korean children (Lee & Wexler, 1987) and with Danish children (Jakubowicz & Olsen, 1988). This parallels the results obtained in a number of different studies of English-speaking children (Chien & Wexler, 1987a; McDaniel et

al., 1987; Wexler & Chien, 1985) and of Dutch-speaking children (Koster & Koster, 1986), who also prefer to locally bind reflexive pronouns. In the case of English and Dutch, the local antecedent is the only grammatical one.

As noted earlier, Icelandic is another language with long-distance anaphora. Thus, the subset principle, coupled with the results from the other languages just discussed, lead us to expect that Icelandic children will initially prefer a local antecedent for the long-distance reflexive. This turns out not to be the case. In an experimental study of binding by 105 Icelandic children, we found that there is no point at which these children prefer a local antecedent for *sig*. Even the youngest children (age 2 years, 6 months) overwhelmingly prefer the long-distance antecedent.

A second result concerns the development of pronouns in Icelandic. A number of studies have shown that English-speaking children perform significantly worse with pronouns than with anaphors. This has led a number of researchers to suggest reformulations of Principle B and/or developmental explanations for the delay. Once again, our data fail to support the notion that the binding condition associated with pronouns develops later than those associated with anaphors in Icelandic children.

Let us return to the anaphor result discussed earlier, that is, to the fact that Icelandic children fail to locally bind the long-distance reflexive. A priori, there are a number of possible explanations for this state of affairs. First, it could be that the developmental interpretation of the subset principle is wrong and that there is no reason to expect a stage in which children locally bind anaphors. Alternatively, it might be that the binding theory is not parametrized in the manner suggested by Wexler and Manzini. If so, there is no reason to expect subset principle effects. Finally, it is possible that the long-distance anaphor is something other than an anaphor, in which case we might also not expect subset principle effects.

In this article, we suggest that at least the second and third points are correct, that is, the binding theory is not parametrized in the manner suggested by Wexler and Manzini and, moreover, that Icelandic *sig* and the so-called long-distance anaphors in certain other languages are something other than pure anaphors. For these reasons, we fail to find subset principle effects. We also propose that the children's behavior with respect to long-distance anaphors is directly related to their performance with pronouns.

The article is organized as follows: First, we outline the basic facts concerning Icelandic anaphors and pronouns. We then outline the parametrized binding theory proposed by Wexler and Manzini and the implications of parametrization for actual grammatical development in Icelandic and in other languages. In this context, we briefly review a number of experimental studies that test the child's knowledge of the binding conditions. Following that, we present the design and results of our Icelandic

binding study. Our results are compared to those of the other experiments already discussed. Finally, we present our analysis of Icelandic *sig* and other anaphors and our explanation for the various developmental facts we have discussed.

ICELANDIC: THE BASIC BINDING FACTS

Before turning to the Icelandic facts, let us briefly review the standard binding theory (SBT). Chomsky (1981) proposes that the interpretation of pronouns, anaphors, and R-expressions is governed by the conditions given in (2).

(2) a. An anaphor must be bound in its governing category.
b. A pronoun must be free in its governing category.
c. An R-expression must be free.

Bound/free mean bound to (i.e., c-commanded and coindexed with) or free from an element in an A(rgument) position, and *governing category* is defined roughly as the minimal S or NP containing the anaphor, pronoun or name and a governor, and a subject. Thus, restricting our attention to anaphors and pronouns, we have the following array of data:

(3) a. $John_i$ shaved $himself_{i,*j}$/$him_{*i,j}$
b. $John_i$ said that $Paul_j$ loved $himself_{*i,j}$/$him_{i,*j}$

The anaphor *himself* in (3a) must be bound in its containing S; the pronoun must be free in the same domain. In (3b), *himself* must be bound within the lower S; *him* must be free in this domain, though it can corefer with the matrix NP outside its governing category.

Consider next some of the effects of Condition C.

(4) a. He loves John
(≠ John loves himself)
b. He said that Mary loves John
(≠ John said Mary loves him John)
c. Who_i did he see [t_i]
(≠ For which x, x saw x)
d. Who_i did Mary say he saw [t_i]
(≠ For which x, Mary say x saw x)
e. Who said he loves Mary
(= For which x, x said that x loves Mary)

Condition C specifies that R-expressions, which include names and variables, must be A-free in all domains. Thus, *John* cannot be bound to *he* in (4a, 4b). Similarly, the trace of the *wh*-operator, a variable in government binding (GB) terms, in (4c, 4d) cannot be bound by the c-commanding pronoun *he*. Compare the sentence in (4e), in which the variable can be interpreted as *he* because the pronoun is not in a c-commanding position and hence is not bound in the sense intended by the binding conditions. In Icelandic, a very different picture emerges. First, we should note that Icelandic has three anaphoric elements: One is a reciprocal anaphor and the other two are reflexives. The reciprocal anaphor *hvor annar* 'each other' behaves in all relevant respects like the English reciprocal. In other words, it must take an antecedent within its clause, hence the ungrammaticality of (5c), where the anaphor is coindexed with *mennirnir* 'the men', and the antecedent may be either the subject or a c-commanding object, as illustrated in (5a and 5b).

(5) a. Þeir$_i$ rökuðu hvorn annan$_{i,*j}$
'They shaved each other'
b. Ég sendi Þeim$_i$ gallabuxur á hvorn annan$_{i,*j}$
'I sent them bluejeans for each other'
c. Mennirnir$_i$ telja að strákarnir$_j$ hati hvorn annan$_{*i,j}$
'The men believe that the boys hate each other'

Turning to the reflexive elements, we have a compound and a simple form, *sjálfan sig* (self REFL) and *sig* (REFL), respectively. *Sig* is third person and invariant for gender and number, though it has three different case forms: accusative *sig,* dative *sér,* and genitive *sín;* there is no nominative form.[1] The first part of the compound anaphor (i.e., the *sjálfan* part), on the other hand, bears features for gender and number, for example, *sjálfan sig* (masc., sing., acc.), *sjálfa sig* (masc., plu., acc.; or fem., sing., acc.), and *sjálfra sín* (masc., fem., neut., plu., gen.). For ease of exposition, we refer to these simple and compound reflexive forms as SIG and SJÁLFAN SIG, respectively, except in example sentences and in those instances where the different morphological forms are crucial to the discussion.

As with the reciprocal, the compound anaphor SJÁLFAN SIG must take a local antecedent, thus *Pétur,* but not *Jón* in (6c). And as with the reciprocal, its antecedent can be either subject or c-commanding object, as in (6a and 6b).

[1]SIG can appear in subject position only with those verbs that select a nonnominative (i.e., dative or accusative) subject, for example, *dreyma* 'to dream' (acc.), *líka* 'to like' (dat.), *vanta* 'to lack, need' (acc.), *finnast* 'to have an opinion, think' (dat.).

(6) a. Jón$_i$ elskar sjálfan sig$_{i,*j}$
'John loves himself'
b. Ég sendi Haraldi$_i$ föt á sjálfan sig$_{i,*j}$
'I sent Harold clothes for himself'
c. Jón$_i$ segir að Pétur$_j$ elski sjálfan sig$_{*i,j}$
'John says that Peter loves (SUBJ) himself (= Peter/ ≠ John)'

Finally, we come to SIG, which is the most interesting of the three cases.[2] As noted earlier, SIG may take a local antecedent. This is illustrated in the single clause sentence in (7).

(7) Jón$_i$ rakaði sig$_{i,*j}$
'John shaved himself'

In sentences with complement clauses, SIG may also take a long-distance antecedent if the clause containing SIG is subjunctive or infinitive, as in (8a and 8b). However, when the clause is in the indicative mood, SIG must be locally bound, as in (8c).

(8) a. Jón$_i$ segir að Pétur$_j$ raki sig$_{i,j}$
'John says that Peter shaves (SUBJ) himself'
b. Jón$_i$ skipaði Pétri$_j$ að raka sig$_{i,j}$
'John ordered Peter to shave (INF) himself'
c. Jón$_i$ veit að Pétur$_j$ rakar sig$_{*i,j}$
'John knows that Peter shaves (IND) himself'

There are also lexical constraints on when SIG can take a long-distance antecedent. With certain verbs it is much more natural for SIG to take a long-distance antecedent, for example, the verb *elska* 'to love'. Thus, there is a strong preference for SIG to take *John* as antecedent in (9a). If the speaker intends *Peter* as the object of the verb *love,* he or she would use the local reflexive form SJÁLFAN SIG, as in (9b).

(9) a. Jón segir að Pétur elski sig
'John says that Peter loves (SUBJ) himself (= John)'
b. Jón segir að Pétur elski sjálfan sig
'John says that Peter loves himself (= Pétur)'

[2]The binding properties of SIG have been described in great detail in Anderson (1986), Maling (1984), Rögnvaldsson (1986), Sigurðsson (1986), Thráinsson (1976, 1987, in press), among others.

We henceforth refer to such verbs as long-distance verbs or *gefa* verbs. The strength of the long-distance bias varies for particular long-distance verbs. For example, the verb *gefa* 'to give' is also a long-distance verb, but it will more easily accept a local antecedent than the verb *elska.* Thus, parallel to (9a), we have (10a), where there is a strong preference for *Jón* to be the antecedent of SIG (*sér* in the dative case), but the effect is judged less strong than in (9a). As with *elska,* if a local antecedent is intended, the sentence would be more natural with SJÁLFAN SIG, as in (10b).

(10) a. Jón segir að Pétur gefi sér bók í jólagjöf
'John says that Peter gives (SUBJ) himself (= John) a book for Christmas'
b. Jón segir að Pétur gefi sjálfum sér bók í jólagjöf
'John says that Peter gives himself (= Peter) a book for Christmas'

Not all verbs exhibit this pattern. Other verbs impose a slight bias toward a local antecedent. When used with the verb *raka* 'to shave', for example, SIG would be more commonly construed as taking a local antecedent. However, this is not a very strong effect. Thus, in the examples in (8a and 8b), with the verb *raka,* both the local and long-distance antecedent are grammatical, as noted earlier. There is, however, a slight preference for *Pétur* to serve as antecedent to SIG. With verbs such as *raka,* which we refer to as local verbs or *raka* verbs, using the local reflexive SJÁLFAN SIG lends the sentence an emphatic interpretation, as in (11).

(11) Pétur rakar sjálfan sig
'Peter shaves HIMSELF'

As far as we can tell, there are no verbs that are completely neutral with respect to the local/long-distance antecedent effect. A verb either imposes a preference one way or another. However, the *raka* verbs readily allow a long-distance antecedent as long as the verb is subjunctive or infinitive (cf. (8a and 8b)), whereas the *gefa* verbs impose a very strong preference for the long-distance antecedent.[3] Because these lexical effects have rather direct implications for our experimental design and the interpretation of the results, they are discussed further when we turn to the experimental study.

Another property of SIG is that it can be arbitrarily far from its antecedent as long as all the intervening clauses are in the subjunctive

[3]We are grateful to Höskuldur Thráinsson for pointing out these lexical effects to us.

mood. Thus, in (12), SIG can take the matrix subject *Jón* as its antecedent. It can also be bound to any of the intermediate subjects.

(12) Jón$_i$ segir að Pétur$_j$ voni að Haraldur$_k$ vilji að Siggi$_l$ raki sig$_{i,j,k,l}$
'John says (IND) that Peter hopes (SUBJ) that Harold wants (SUBJ) that Siggi shaves (SUBJ) himself'

A final fact to note is that the antecedent to SIG must be a subject. Thus, in (13a and 13b) SIG cannot be bound to *John* or *Harold,* and (13c) is ungrammatical for some speakers.[4]

(13) a. *Ég sagði Jóni$_i$ að María hefði boðið sér$_i$
'I told John that Maria had (SUBJ) invited himself'
b. *Ég lofaði Haraldi$_i$ að raka sig$_i$
'I promised Harold to shave (INF) himself'
c. Ég sendi Haraldi$_i$ föt á sig$_i$
'I sent Harold clothes for himself'

Let us sum up the facts so far. Icelandic has three referentially dependent elements, the reciprocal and a compound and simple form of the reflexive. The first two behave like English anaphoric elements, that is, they must be bound within a local domain and there is no restriction on their antecedent beyond the standard c-command requirement. In contrast, the third element, SIG, departs from the SBT in at least two respects. First, SIG may take a nonlocal antecedent when it is contained in a subjunctive or infinitive clause or when there is a chain of subjunctive or infinitive clauses between SIG and its antecedent. Second, the antecedent to SIG must be a subject. This is uniformly true in the long-distance case and for some speakers in the local case as well (cf. footnote 4). We henceforth refer to this as the subject condition. These basic facts suffice for our present purposes. Let us turn briefly to the behavior of pronouns and R-expressions in Icelandic.

As far as we can tell, R-expressions in Icelandic adhere to Condition C of the SBT (cf. (2)). Thus, they must be A-free, as in English. We have little more to say about this class of nominals.

As for pronouns, they too behave as specified by Condition B of the SBT (with one notable exception, which we discuss later). Thus, in (14a, 14b, and 14c) the pronouns *hann* 'him' and *hana* 'her' must be A-free in the minimal clause containing them.[5] Also, as illustrated in (14b and 14c), they

[4]There is some dialectal variation in the local antecedent case. Thus, some speakers accept (13c) (cf. Thráinsson, 1976, in press). However, the prohibition against object antecedents in the long-distance case holds across dialects.

[5]As in English, this requirement is sometimes relaxed when the pronoun occurs inside

may freely co-refer with an appropriate NP outside the minimal S, if the complement clause containing the pronoun is indicative or subjunctive.

(14) a. Jón$_i$ rakaði hann$_{i,j}$
'John shaved him'
b. Jón$_i$ veit að María$_j$ elskar hann$_i$/*hana$_j$
'John knows that Maria loves (IND) him/her'
c. Jón$_i$ segir að María$_j$ elski hann$_i$/*hana$_j$
'John says that Maria loves (SUBJ) him/her'

As we noted earlier, there is one case in which Icelandic pronouns appear to depart from the SBT. When the pronoun is contained in an infinitival complement, speakers prefer it to be free from the matrix subject, as in (15a), though no such restriction seems to hold against the matrix object, as in (15b).

(15) a. ??Jón$_i$ skipaði mér að raka hann$_i$
'John ordered me to shave (INF) him'
b. Ég lofaði Haraldi$_i$ að raka hann$_i$
'I promised Harold to shave (INF) him'

Notice that there is a perfect symmetry between SIG and the pronouns in infinitive complement clauses. Comparing the sentences in (15a and 15b) to those in (8b and 13b), we see that where SIG is grammatical, the pronoun

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prepositional phrases or picture NPs. Thus, we have the following grammatical sentences parallel to the English examples:

(i) Ég sendi Jóni$_i$ föt à hann$_i$
'I sent John clothes for him'
(ii) Ég gaf Pétri$_i$ mynd af honum$_i$
'I gave Peter a photo of him'

In Icelandic, however, there is a further restriction: The pronoun in such sentences cannot refer to the subject, contrary to the situation in English.

(iii) *Jón$_i$ sendi mér föt á hann$_i$
'John sent me clothes for him'
(iv) *Pétur$_i$ gaf mér mynd af honum$_i$
'Peter gave me a photo of him'

As we soon see, there are also antisubject effects in infinitivals. However, there seem to be at least two differences in the antisubject effect as it shows up in simple clauses and in embedded infinitivals. First, the effect is much stronger in simple sentences. Thus, the examples in (iii) and (iv) are ungrammatical, whereas the sentence in (15a) is dispreferred by speakers but not ungrammatical. Second, there is complementarity between SIG and the pronouns in the embedded infinitival case, as noted in the text. Thus, all speakers allow SIG to refer to the matrix subject in embedded infinitivals (cf. 8b) and dispreferr the pronoun (cf. 15a). However, in the sentences in (i) and (ii) there are speakers who allow SIG, as well as the pronoun, to refer to the object (see footnote 4 and related discussion in the text).

is dispreferred. We should also point out that sentences such as (15a) are far more acceptable than standard Condition B violations like those in (14), and the preference for the pronoun not to take the matrix subject as antecedent can be overcome given an appropriate pragmatic context. For these reasons we take the unacceptability of (15a) to be a pragmatic rather than grammatical effect. We return to this point when we discuss the experimental results.[6] This is in contrast to Wexler and Manzini (1987), for example, who propose that the binding domain for pronouns is different in Icelandic than in English. We discuss their formulation of a parametrized binding theory in the next section.

To sum up, there are three respects in which Icelandic appears to depart from the requirements of the SBT. First, SIG can take a long-distance antecedent when it occurs in a subjunctive or infinitival complement. Second, the antecedent to SIG must be a subject (but cf. footnote 4) and not just any c-commanding NP. Third, a pronoun in an infinitival complement cannot freely refer to the matrix subject; SIG is preferred in this context.

PARAMETRIZING BINDING THEORY: IMPLICATIONS FOR ACQUISITION

In order to account for the apparent diversity of languages with respect to binding properties—for example, cases such as Icelandic SIG—Johnson (1984), Koster (1984), Wexler and Manzini (1987), and Yang (1984) propose

[6]One possibility is that the unacceptability of the pronoun is due to a pragmatic strategy of the sort proposed in Reinhart (1983), according to which speakers prefer to use bound anaphora when they intend co-reference because it is more explicit, provided the structure is one that permits bound anaphora. Thus, because SIG is permitted in (8b), the pronoun is unacceptable in that same structure, as in (15a).

Note, however, that this complementarity between SIG and the pronouns does not hold throughout the language. For example, in subjunctive complement clauses both SIG and the pronouns can refer to the matrix subject, as in (8a) and (14c), and both the possessive reflexive *sinn* 'his own' and possessive pronouns can take the matrix subject as antecedent when they occur in subjunctives, for example, (i):

(i) Jón$_i$ segir að Pétur$_j$ elski móður sína$_{i,j}$/hans$_{i,*j,k}$
'John says that Peter loves (SUBJ) SÍNA/his mother'

We also find both SIG and the pronouns referring to the local c-commanding object in simple clauses, such as (ii), in the dialect that does not show a subject condition effect for SIG in simple sentences (cf. footnote 4 and related discussion in the text).

(ii) Ég sendi Jóni$_i$ föt á sig$_i$/hann$_i$
'I sent John clothes for SIG/him'

It is possible that there are subtle differences in meaning (or point of view) between the bound anaphora (i.e., SIG sentences) and the corresponding pronoun sentences, which would preempt Reinhart's strategy in these cases, but such differences are not immediately apparent to us.

that the notion governing category be parametrized.[7] Wexler and Manzini, in particular, propose the governing category parameter as in (16).

(16) γ is the governing category for α iff γ is the minimal category that contains α and a governor for α and has
a) a subject; or
b) an INFL; or
c) a tense; or
d) a "referential" tense (=indicative mood); or
e) a "root" tense.

Languages choose from among these five governing categories. Thus, English *him* and *himself* assume value (a), whereas Icelandic SIG assumes value (d), and Japanese *zibun* takes value (e), and so on. Interestingly, the languages generated by the different values of the parameter fall into a nested, that is, subset relation. Thus, a language that chooses value (a) as the governing category for anaphors will be properly contained in a language that chooses value (b), and so on down the list. As Wexler and Manzini show, the subset relation also exists for pronouns, though the order is reversed. Thus, the smallest pronoun language is the one that chooses value (e) as a governing category. The subset principle, which Wexler and Manzini propose as the fundamental principle of learnability, seems to be a necessary condition to assure learning without negative evidence in the case in which languages fall into a subset relation.[8] The subset principle is informally stated in (17).

(17) The learner selects the value of the parameter that generates the smallest language compatible with the data.

Following Berwick (1982) and others, Wexler and Manzini further propose that the subset relations defined by the parameter translate into a markedness hierarchy, with the parameter value that generates the smallest language representing the default or unmarked case. This is the value that all children should start out with, irrespective of their particular target language, and one that may be revised on the basis of positive disconfirming evidence in the input. Incorporating this proposal into a developmental theory, we derive a further prediction: In actual development, children will pass through a stage in which they locally bind anaphors. Thus, their

[7]The proposal concerning the English versus Icelandic governing categories, which is our main concern here, is due originally to Johnson (1984).

[8]Wexler and Manzini (1987) must also assume that parameters are independent of one another. See their article for the precise formulation of the independence principle.

language may differ in fundamental respects from the adult language. It is important to understand that as a learning principle the subset principle does not require that the child actually pass through a local binding stage because the counterevidence may be so robust that the child immediately rejects the unmarked parameter setting. However, there has been an implicit (often explicit) assumption in much of the acquisition literature and some empirical evidence (which we discuss shortly) to support the developmental interpretation of the subset principle.

As noted earlier, in general, the experimental evidence shows that by approximately age 4 children do prefer a local antecedent for reflexive pronouns when given an act-out task with sentences such as those in (18).

(18) a. Snoopy/Kitty says that [child's name] should give himself/herself a toy.
b. Snoopy/Kitty says that [child's name] should point to herself/himself.

This result holds for English-speaking children (Chien & Wexler, 1987a; Jakubowicz, 1984; McDaniel et al., 1987; Solan, 1987; Wexler & Chien, 1985) and, more interestingly, for children acquiring languages that either allow or require long-distance anaphora, such as Korean, Chinese, and Danish.

Comprehension tasks with children acquiring Chinese (Chien & Wexler, 1987b) show that by age 4 they strongly prefer the local antecedent for the reflexive *ziji,* an anaphor that under certain circumstances also allows a long-distance antecedent in the adult language. However, it is not possible to construe the Chinese results as direct support for the developmental interpretation of the subset principle because a control group of Chinese adults also chose the local antecedent for *ziji* 90% of the time. Thus, it may be that whatever factor (grammatical or pragmatic) is biasing the adults toward a local response is also responsible for the children's preference.

The Korean results are less ambiguous. Lee and Wexler (1987) show that Korean children strongly prefer the local antecedent for the reflexive *caki.* This preference increased from a 65% level at age 3 years, 6 months to almost 100% by age 4 years, 6 months, where it remained until age 6 years, 6 months (the oldest children tested). In contrast, the adult controls choose the local antecedent only about 38% of the time. The Korean results can be explained under the assumptions of the subset principle. According to this hypothesis, Korean children at age 6 years, 6 months have still not broadened the governing category for the reflexive to the correct value for the target language, value (e).

Finally, Jakubowicz and Olsen (1988) report that Danish-speaking children strongly prefer the local antecedent for Danish *sig*. This result is indeed striking because, unlike the previous cases, Danish *sig* requires a long-distance antecedent; the local option is ungrammatical. Whereas a control group of Danish adults chose the correct long-distance antecedent 100% of the time, the children's responses rose from 7% correct long-distance responses between the ages of 3 years and 3 years, 5 months to 70% correct in the oldest age group (9 years to 9 years, 5 months). As we see later, where the results of our experimental study are discussed, Icelandic children behave quite differently.

DEVELOPMENTAL DELAY OF CONDITION B

Another important finding that has emerged from the various studies of binding is that children have greater difficulty with pronouns than with anaphors, which is to say that they seem to develop Principle A before Principle B of the binding theory. The strength of this finding varies from language to language. For English, the finding is quite robust. Thus, Wexler and Chien (1985) and Chien and Wexler (1987a) found that whereas children's correct (local) responses to sentences like those in (18) with the reflexive grew steadily from the 50% chance level to approximately 90% correct by age 6 years, 6 months, correct (nonlocal) responses to the pronoun sentences in (19) did not increase at the same rate and remained at the 60%–65% correct level, just above chance, even for the oldest children tested. Thus, some 35%–40% of the time children chose a local antecedent for the pronoun in violation of Principle B.

(19) a. Snoopy/Kitty says that [child's name] should point to her/him.
b. Snoopy/Kitty says that [child's name] should give him/her a toy.

This discrepancy between pronouns and anaphors has been found in a number of other studies on English-speaking children, for example, Jakubowicz (1984), McDaniel et al. (1987), and Solan (1987). Similar results were obtained by Koster and Koster (1986) in their study of (somewhat older) Dutch-speaking children and by Jakubowicz and Olsen (1988) for Danish-speaking children. Whereas young Danish-speaking children perform perfectly with the local reflexive *sig selv* (not to be confused with the long-distance reflexive discussed earlier), their performance with pronouns is only correct roughly 70% of the time. Moreover, Korean children through age 6 years, 6 months do very badly with pronouns, locally binding the pronoun about 30% of the time (Lee & Wexler, 1987). Thus, the results

in Danish and Korean are very similar despite the fact that the languages are typologically quite distinct.[9]

In other languages, the delay is much weaker. Thus, Chien and Wexler (1987b), in their Chinese study, found that the level of correct responses for pronoun sentences fluctuated around 75%–85%, reaching 90% for the oldest children. This is comparable to the results they obtained with anaphors.[10] Crain and McKee (1987), in a judgment task with Italian-speaking children, found no significant delay in the development of pronouns versus anaphors, although there was some evidence that the Italian child's knowledge of Principle B was not quite as steady as his knowledge of Principle A.

These cross-linguistic studies reveal two basic findings concerning the child's development of binding. First, even in those languages that allow long-distance reflexivization, children from roughly age 4 on increasingly prefer the anaphor to be bound by its local antecedent. Thus far, the strongest subset principle effect, if that is what it is, comes from Korean children (Lee & Wexler, 1987), where children older than 4 years, 6 months choose the local antecedent almost 100% of the time, whereas the adult controls show a marginal preference for the long-distance antecedent.[11] A second important finding is that there seems to be a developmental delay in the appearance of Condition B relative to Condition A, the most significant case being English.[12]

[9]In contrast to the adult controls in the English and Danish studies, the Korean adult controls violated Principle B about 20% of the time. Lee and Wexler (1987) suggest that this might be due to the fact that pronouns are hardly ever used in speech in Korean and hence their properties may be difficult for the language learner to uncover. We return to this issue in the section on the acquisition of pronouns and long-distance anaphora.

[10]However, Chien and Wexler also found that they could manipulate the experiment such that the children would choose a local antecedent for the pronouns (in violation of B), but that the same kind of experimental manipulation would not easily induce the child to choose a long-distance antecedent for the anaphor. Thus, Chien and Wexler conclude that the Chinese-speaking child's knowledge of Condition B is not as stable as his or her knowledge of Condition A because the child's interpretation of pronouns is more easily influenced by extragrammatical factors.

[11]The Danish results also suggest a subset principle effect, although this is less clear because local binding is not a grammatical option in the adult language. Thus, strictly speaking, the adult language, consisting of strings with nonlocally bound *sig,* and the child language, consisting of strings with locally bound *sig,* form disjoint sets. We discuss this issue further in the section on the acquisition of pronouns and long-distance anaphora. For discussion of the binding properties of Danish *sig,* see Vikner (1985).

[12]Adopting the distinction between (anaphoric) binding and pragmatic co-reference proposed in Reinhart (1983), Montalbetti and Wexler (1985) propose that children do have Condition B, which rules out binding between a pronoun and a local antecedent. However, they do not have the pragmatic principle that blocks accidental co-reference between a pronoun and a local argument antecedent. Thus, children allow a pronoun to co-refer to a local antecedent, though by hypothesis they do not allow binding between the two positions. This hypothesis predicts that although children allow a pronoun to refer to a local argument

Before we turn to Icelandic, we find it of interest to consider what the developmental interpretation of the subset principle predicts regarding the development of pronouns. Recall that the markedness hierarchy is reversed for pronouns; the unmarked case for a pronoun is to be free in the root sentence as specified by value (e) in (16). Thus, the child should initially prefer the pronoun to take an antecedent that is outside the sentence, and positive evidence will inform the child when the pronoun can be bound within S. None of the experimental results obtained thus far confirms this prediction. On the contrary, children initially assume either that the pronoun may be locally bound, as is the case for English-speaking children, for example, or that it must be locally free (i.e., within the minimal S), as do the Chinese children. As we discuss later, however, in connection with the Icelandic results, there is probably a strong pragmatic bias to choose a sentence-internal antecedent, and thus it is difficult to test for the unmarked setting for pronouns.

DEVELOPMENTAL PREDICTIONS FOR ICELANDIC

Given the various experimental results already discussed, we can formulate two predictions concerning the Icelandic child's development of anaphors and pronouns. First, we would fully expect Icelandic children to initially prefer a local antecedent for the long-distance reflexive SIG, as was the case in the other languages discussed and as is predicted by the developmental interpretation of the subset principle. Second, we expect to find the development of pronouns lagging to a greater or lesser degree behind SIG. With these hypotheses in mind, let us turn to the Icelandic study.

THE DEVELOPMENT OF BINDING IN ICELANDIC

In this section, we report on an experimental study of the interpretation of SIG and lexical pronouns by Icelandic-speaking children.

The experiment was carried out in the summer of 1987 in Reykjavík, Iceland. We tested 105 Icelandic children (age 2 years, 6 months to 6 years)

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antecedent, as in (i), they should not allow a pronoun to be locally bound to a quantifier, as in (ii), because the quantifier–pronoun relation is subject only to Condition B and not to the pragmatic strategy.

(i) *Mickey* loves *him*.

(ii) **Everybody* loves *him*.

Chien and Wexler (1988) tested this hypothesis experimentally; their results show that children do not allow local binding by a quantified antecedent, as predicted.

and 15 adult controls on anaphor resolution in three sentence types: those with indicative, subjunctive, and infinitival complements. Examples of the sentences used are given in (20)–(25).

(20) Kermit$_i$ segir að Jón$_j$ gefi (SUBJ) sér$_{i/j}$ bíl
'Kermit says that John gives SIG a car'

(21) Kermit$_i$ segir Jóni$_j$ að gefa (INF) sér$_{i/j}$ disk
'Kermit tells John to give SIG a plate'

(22) Kermit$_i$ sér að Jón$_j$ gefur (IND) sér$\cdot_{i/j}$ flautu
'Kermit sees that John gives SIG a whistle'

(23) Svínka$_i$ segir að Sara$_j$ gefi (SUBJ) henni$\cdot_{j/i/k}$ bíl
'Miss Piggy says that Sarah gives her a car'

(24) Svínka$_i$ sér að Sara$_j$ gefur (IND) henni$\cdot_{j/i/k}$ bíl
'Miss Piggy sees that Sarah gives her a car'

(25) Svínka$_i$ segir Söru$_j$ að gefa (INF) henni$\cdot_{j/??i/k}$ bíl
'Miss Piggy tells Sarah to give her a car'

In the experiment, the names *John* and *Sarah* were replaced by the name of the child who was being tested.

We used an act-out task, the Party Game, developed by Chien and Wexler (1987a), in which the child is at a party with four puppets, two female and two male, and is asked to perform an action given in a sentence. For example, the child hears the sentence "Miss Piggy says that John gives SIG a truck" and then has to select a truck from several toys on the table and give it either to himself (or herself) or to one of four puppets present. If the child did the former, this was scored as a local antecedent response. If the child gave the toy to the puppet mentioned in the (matrix) sentence, this was a long-distance response. If the child gave the toy to a puppet present in the experimental setting but not mentioned in the sentence, this was scored as an outside-NP response.

The children were divided into seven groups of six-month intervals based on their ages. Each group included 15 children. Each child received a total of 24 test sentences. All test sentences contained the verb *gefa* 'to give'. We discuss the choice of verb in the following section.

The experimental results with sentences containing the anaphor SIG are represented in Figures 1–3. In each figure, the age group is listed along the abscissa and the frequency along the ordinate. The line with squares indicates a local antecedent response; the line with crosses indicates a long-distance antecedent response; the line with diamonds indicates choice of an outside NP; and the line with triangles indicates no response (NR).

The results show that Icelandic children consistently prefer the long-distance antecedent over the local antecedent, $F(1, 98) = 96.48$, $p < .01$. Even the youngest children chose the long-distance antecedent twice as often

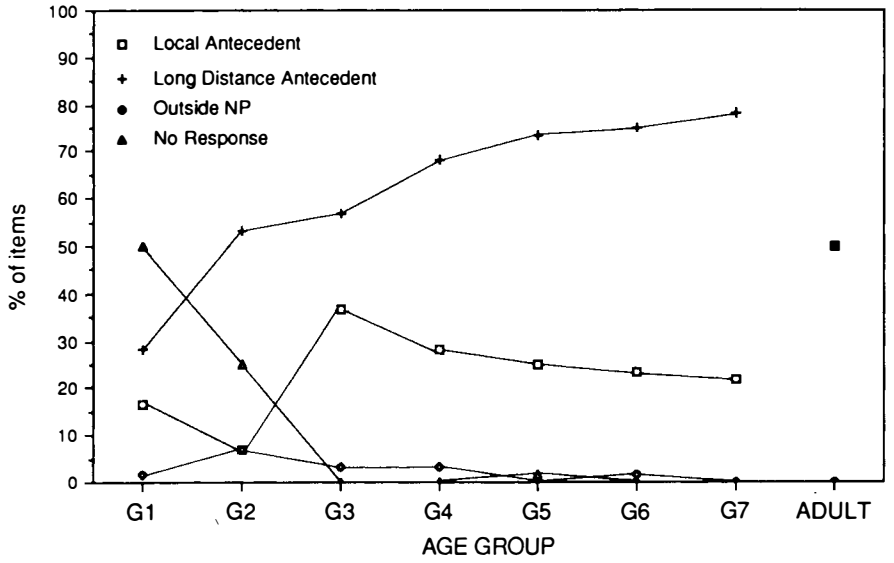

FIGURE 1 Choice of antecedent for SIG in indicative sentences.

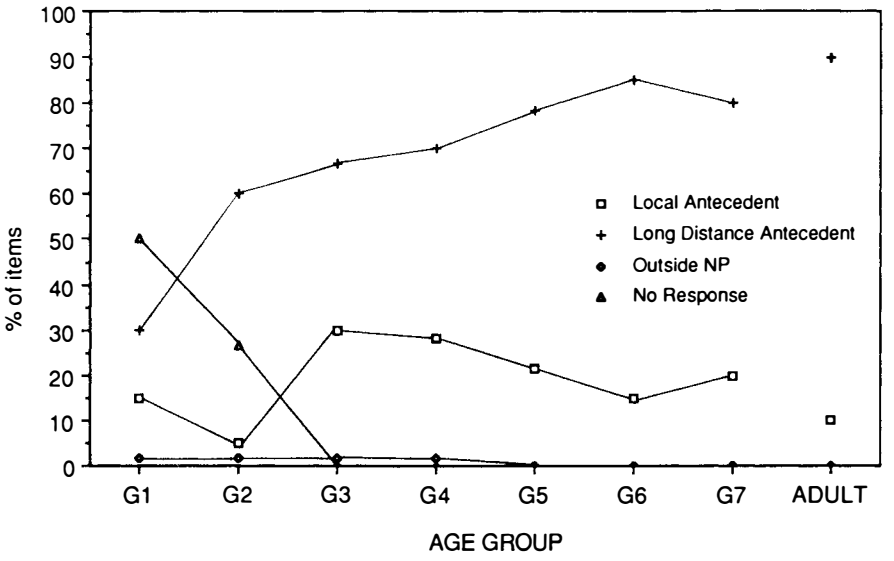

FIGURE 2 Choice of antecedent for SIG in subjunctive sentences.

as the local one, although many of the children in the first two age groups, represented by G1 and G2, failed to respond. Interestingly, this result is obtained across all sentence types—subjunctive, infinitive, and indicative—despite the fact that when SIG is contained in an indicative clause, only a

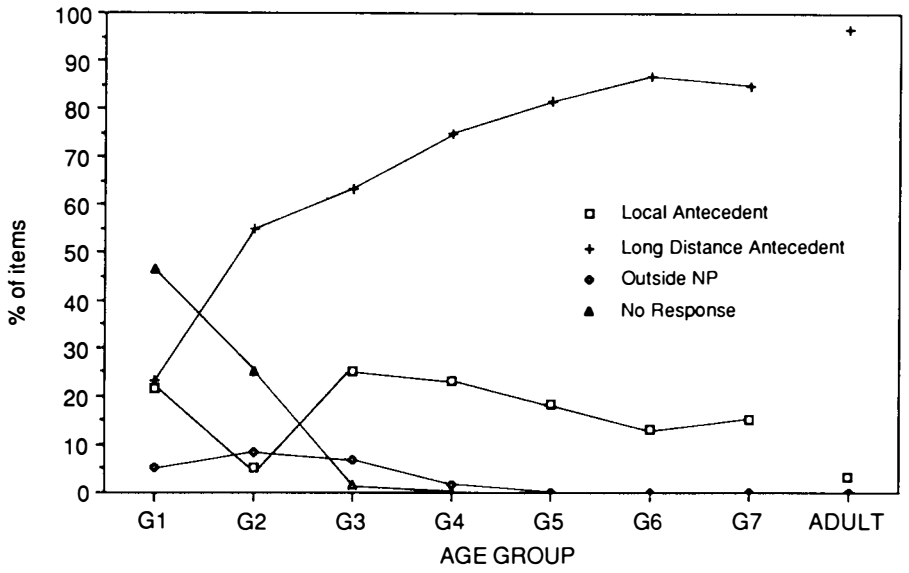

FIGURE 3 Choice of antecedent for SIG in infinitive sentences.

local antecedent is judged grammatical by adult speakers. We return to this point in the section on long-distance responses in indicative clauses.

In summary, the Icelandic children and the adults strongly prefer a long-distance antecedent for SIG, and this preference gets stronger as the children get older. Thus, our first hypothesis is disconfirmed; Icelandic children do not initially assume local binding for SIG. This result is in marked contrast to the results obtained by Chien and Wexler (1987b) for Chinese and by Lee and Wexler (1987) for Korean, and it appears to disconfirm the developmental interpretation of the subset principle.

Turning to the results of the pronoun sentences, we see in Figures 4–6 that the Icelandic children do quite well on pronouns. They consistently prefer the nonlocal antecedent for the pronoun, and this preference becomes very strong by G4 (mean age 4 years, 3 months), where the long-distance antecedent is chosen 83% to 93%.

Very few children allow the pronoun to refer to the extraclausal referent, that is, to the puppet that was present in the experimental setting but not mentioned in the test sentence, which would be expected if they started out with the unmarked setting of the governing category parameter for pronouns, as mentioned in the section on the developmental delay of Condition B. Recall that the subset principle predicts that the unmarked setting for a pronoun (which all children should start out with) is to be free in the root sentence, as specified by value (e) of the governing category parameter in (16).

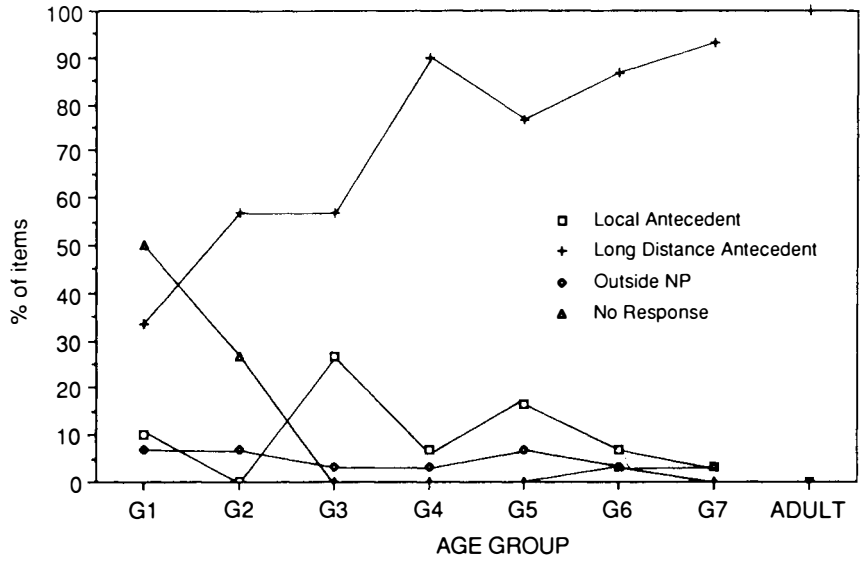

FIGURE 4 Choice of antecedent for pronoun in indicative sentences

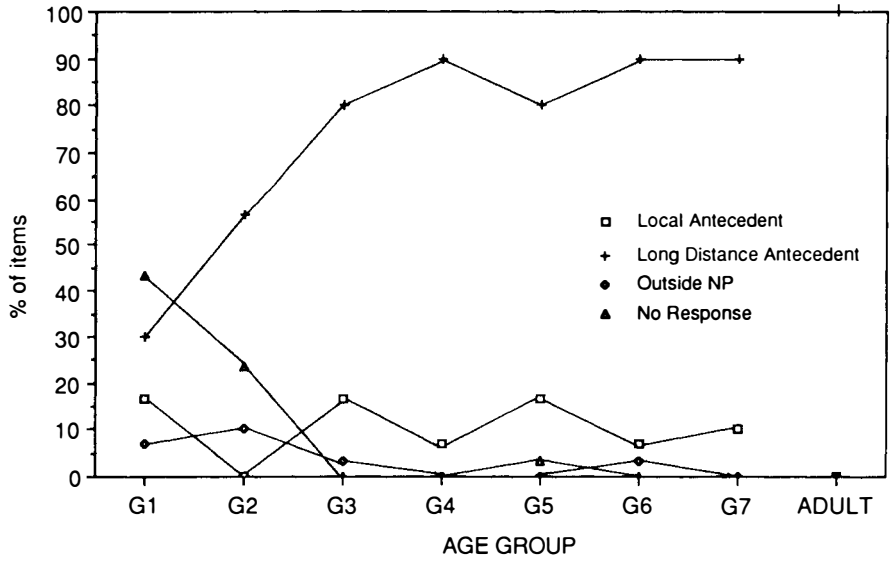

FIGURE 5 Choice of antecedent for pronoun in subjunctive sentences.

The fact that children do not choose the external referent may be due to the fact that it is pragmatically more felicitous for a pronoun to refer back to a previously mentioned NP. This same factor may be responsible for the results obtained in the infinitive sentences, given in Figure 6, where the

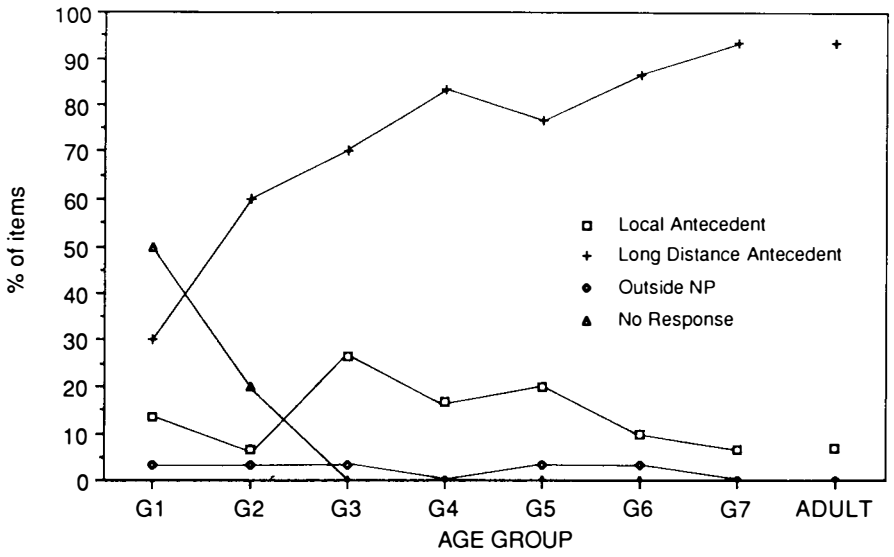

FIGURE 6 Choice of antecedent for pronoun in infinitive sentences.

children and the adults prefer the doll mentioned rather than the outside NP. This is a rather unexpected result in that adult judgments on infinitive sentences of this type usually indicate a strong preference for extraclausal antecedent (cf. (15a) and discussion in the section on the basic binding facts in Icelandic). Our experimental results, which show that even for adults this preference can be easily overcome given an appropriate context, support the idea that the intuition of unacceptability associated with sentences like (15a) (repeated in (26)) is a pragmatic rather than grammatical effect.

(26) ??Jón$_i$ skipaði mér að raka hann$_i$
'John ordered me to shave him'

To sum up the results of the pronoun sentences, Icelandic children show a steady increase in performance with pronouns as a function of age, reaching 90% correct across all sentence types by age 5. Thus, with respect to pronouns, Icelandic children behave very much like their Chinese counterparts, who do significantly better than English-speaking children. At the age of 6, English-speaking children still appear to violate Principle B about 35% of the time.

In our experiment, we did not test the local anaphor SJÁLFAN SIG (see the section on the basic binding facts in Icelandic). Moreover, as we just noted, Icelandic children do not treat SIG like a local anaphor; instead, they

prefer the long-distance antecedent. Thus, strictly speaking, we cannot directly address the issue of whether Principle A emerges prior to Principle B. However, we can say that Icelandic children do not show the kind of difficulties English-speaking children do with respect to pronouns.

SIG: THE PREFERENCE FOR LONG-DISTANCE ANTECEDENTS

The main result of our study is that Icelandic children strongly prefer the nonlocal antecedent for SIG, and this raises the question of why there is no stage, however brief, during which Icelandic children assume the unmarked value of Principle A, that is, local binding of anaphors, as is predicted by the subset principle.

One factor to consider in this regard is that our experiment biased the children toward a long-distance antecedent by using a verb for which this is the only natural response. Recall that there are lexical constraints on long-distance binding of SIG. Certain verbs impose a strong preference for a nonlocal antecedent. The verb we used in our experiment, *gefa* 'give', is one such verb, and our adult controls also overwhelmingly preferred the long-distance antecedent. Could it be simply that no subset principle effects (i.e., local binding) were observed because of the experimental bias?[13] We do not believe so.

Consider first that the basis of the experimental bias is a lexical/grammatical one and not pragmatic. Thus, if the children are sensitive to the bias (i.e., to the fact that with *gefa*-class verbs SIG takes a long-distance antecedent), then they have converged on the adult grammar. Thus, the fact of an experimental bias does not answer our original question of why these children fail to show subset principle effects. It simply presents the question in a different form, namely: Why do these children exhibit adultlike

[13]In order to test for subset principle effects in Icelandic, it is necessary to induce a bias in the manner that we did in our experiment. To see why this is so, consider the alternative possibility. If we had used a local verb, such as *raka* 'to shave', and the children preferred a local antecedent, we would not know whether the preference was due to the effect of the subset principle, as is arguably the case for the Korean children, or whether the Icelandic children were being influenced by the same lexical factors which make the local antecedent preferable for adults with such verbs. In short, we would have an uninterpretable result, similar to the result obtained by Chien and Wexler (1987b) with Chinese speaking children.

Further experiments are being designed using both *raka* and *gefa* verbs, as well as the local reflexive SJÁLFAN SIG. The results of these studies should provide further insight into the nature of the children's preference for long-distance responses. We are grateful to Höskuldur Thráinsson for first bringing to our attention the fact that the choice of verbs in Icelandic induces a particular bias.

knowledge with respect to SIG so much more quickly than children acquiring Korean do with *caki,* for example?

Notice, moreover, that the logic of the subset principle dictates that the child start out with the unmarked value of a parameter or rule, whether or not this is the correct value for the adult language. Thus, as discussed earlier, from a developmental perspective, we expect to find an initial stage during which the child's language/grammar deviates from the adult language/grammar, as a function of the subset principle. This is precisely what occurs in Korean, as noted earlier. Korean children overwhelmingly prefer the local antecedent for *caki* (100% local response at ages 4 years, 6 months–6 years, 6 months) despite the fact that the long-distance response is the preferred one for adults. Thus, the fact that the experiment biased children toward a long-distance response does not explain the absence of subset principle effects in Icelandic children.

Another possible explanation for the lack of a local binding stage for SIG is that Icelandic children categorize SIG as a pure pronoun, and thus they use SIG in accordance with Principle B of the Binding Theory, which requires that pronouns be locally free.[14] This would provide an explanation for the preponderance of long-distance responses for SIG. In order to test this hypothesis, we need to compare the children's SIG responses to their pronoun responses. If they identify SIG as a pronoun, the pattern of responses should be identical. Our results show, however, that although the children preferred the long-distance antecedent for both SIG and the pronouns, the proportion of long distance versus local responses differs for SIG and the pronouns. Thus, the children chose the local antecedent for SIG significantly more often than for the pronouns ($p < .001$), and they chose the long-distance antecedent for the pronouns significantly more often than for SIG ($p < .001$).[15] In short, our results show that children not only treat SIG and the pronouns differently, but also that the differences tend in the right direction, that is to say, in the direction predicted by the binding theory (i.e., the anaphor is locally bound and the pronouns locally free).[16]

Finally, we can compare children's outside NP responses. If children take SIG to be a pronoun, they should allow it to occur freely (i.e., take an

[14]We thank Peter Sells for first suggesting this possibility to us.

[15]Note that the long-distance response for SIG in the indicative sentences is ungrammatical, an issue which we take up in the next section.

[16]We abstract away here from the fact that with the *gefa* class of verbs, SIG does not like a local antecedent and hence that, strictly speaking, the children's local antecedent responses for SIG are ungrammatical. We return to this issue when we present our reanalysis of SIG as a pronominal anaphor. For our present purposes it is sufficient to note that in giving more local responses for SIG than for the pronouns, children are showing their sensitivity to the fact that SIG has anaphoric properties and is hence distinct from the pronouns.

outside NP) to the extent that they allow pronouns to do so. In our study, children (and adults) rarely chose an outside NP as antecedent under any condition, most likely due to pragmatic factors. However, pronouns took an outside NP as antecedent more often than did SIG. Once again, this result, which approached significance ($p = .08$), is in the direction predicted by binding theory; pronouns, in contrast to anaphors, need not have sentence internal antecedents.

Thus, our evidence does not support the notion that children (mis-)analyze SIG as a pure pronoun. Considerations of learnability also make this hypothesis unlikely. If the children take SIG to be a pronoun, they would allow it to occur freely, and there is no positive evidence which would inform them that this is not a grammatical option.

It does not appear, then, that Icelandic children prefer the long-distance antecedent for SIG because they misanalyze SIG as a pure pronoun. However, our basic result remains; children (like the adults) overwhelmingly prefer the long-distance antecedent both for SIG and for the pronouns, and this suggests to us that the two classes of nominals are more closely related than the standard analysis of Icelandic assumes. Shortly, we will propose that SIG (along with certain other long-distance anaphors) has both pronominal and anaphoric features. This analysis will explain the preponderance of long-distance responses for SIG. It will also allow us to account for the array of cross-linguistic results, which seem at first to be contradictory. Before turning to this, we briefly discuss the long-distance responses in indicative clauses.

LONG-DISTANCE RESPONSES IN INDICATIVE CLAUSES

Returning for a moment to Figure 1, we see that the children also prefer the long-distance antecedent in the indicative condition, though SIG cannot typically take a long-distance antecedent in this case. (cf. (8c)). Notice, however, that the children are not alone in making this mistake, as the adults also allow SIG to refer to the long-distance antecedent 50% of the time in the indicative sentences. We believe that there are two factors that contribute to this particular result. First, as we noted earlier, the verb *gefa* 'to give' is a long-distance verb, therefore a local-antecedent interpretation is very unnatural. Thus, in choosing the long-distance antecedent—even in the ungrammatical indicative context—the adults and children may be reacting to this strong lexical property.[17] In short, the local antecedent is

[17]It also seems to be the case that for some speakers indicative complements to semifactive verbs like *sjá* 'see' (cf. (22)), behave like subjunctive clauses in allowing long-distance

infelicitous because of the choice of verb, whereas the long-distance antecedent is ungrammatical. This dilemma is reflected in the chance performance of adults. Notice, however, that the children's preference for the long-distance antecedent in the indicative condition is much stronger than the adults'. Thus, there seems to be some additional factor that contributes to the children's preference. We want to suggest that the high percentage of long distance responses given by the children has to do with their developing knowledge of the mood, tense, and aspectual properties of the different sentence types.

It is well known that young children do not have perfect knowledge in this domain (Clahsen, 1986; Hyams, 1985; among others). It follows that if children fail to distinguish indicatives from tenseless clauses (i.e., subjunctives and infinitives), they will not adhere to the constraint against long-distance binding of SIG in the indicative sentences.[18] Rather, they would initially treat all three sentence types in the same fashion, that is, as tenseless, and there would be a trend away from long-distance responses in indicatives only as children learn that these clauses are tensed.[19] A Wilcoxon Signed Ranks Test for Matched Pairs indicates that the trend of children's long-distance responses to indicative SIG sentences is significantly different from their long-distance responses to subjunctive SIG sentences ($p = .02$) and to infinitive SIG sentences ($p = .03$), whereas the difference in long-distance responses between subjunctives and infinitives is not significant. This result shows that, over time, children do tease apart the tensed and tenseless clauses with respect to long-distance binding.

We assume that the constraint against long-distance binding of SIG in indicatives follows from principles of universal grammar (UG) and hence need not be learned. Indeed, it could not be otherwise because the level of logical form (LF), the level at which this principle holds, is largely inaccessible to the child. Thus, all the child needs to learn is that certain clauses are tensed.[20] Moreover, there is independent syntactic evidence that

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antecedent (see, e.g., Sigurðsson, 1986). Unfortunately, we were unaware of this dialect variation when we designed the test sentences. It is possible that among the children and adults tested there were at least some speakers of this less restrictive dialect.

[18]We follow Picallo (1984) in taking subjunctive clauses to be [−tense, +AGR]. Thus, they are like infinitives with respect to the tense feature, though they show agreement morphology.

[19]The proposal that children initially treat all clauses as [−tense] has a number of empirical consequences. For example, we predict that they will not have verb movement. Clahsen (1986) and others have shown that this is indeed the case for German-speaking children. Similarly, English-speaking children do not initially have auxiliary inversion in questions. This would also follow on the hypothesis that the clause is tenseless. Clahsen proposes that children initially lack the [+/−finite] distinction, and hence in his analysis children's clauses are underspecified with respect to tense. However, the Icelandic SIG facts, discussed in the text, support the hypothesis that children initially treat all clauses as tenseless.

[20]It is likely that children do not distinguish the three sentence types prior to G3 or G4 (ages

long-distance LF movement is blocked from indicatives. Picallo (1984) and others have noticed that negative quantifiers cannot take wide scope in indicatives in contrast with subjunctive and infinitive clauses, as is illustrated by the following French sentences. The particle *ne* marks the scope of the negation.[21]

(27) a. Je n'exige qu'il aille nulle part
'I do not demand that he go (SUBJ) anywhere'
b. *Je ne pense qu'il va nulle part
'I do not think that he goes (IND) anywhere'
c. Je n'exige d'aller nulle part
'I do not demand to go (INF) anywhere'

Thus, whatever LF principle handles the contrast in (27) will also block long-distance binding of SIG indicatives.[22]

SUMMARY

There are two main results that emerge from our study. First, Icelandic-speaking children overwhelmingly prefer the long-distance antecedent to SIG with those verbs, such as *gefa* 'to give', for which Icelandic adults also choose the long-distance antecedent. This is in contrast to the results obtained with Korean and Danish children and seems to run counter to the developmental interpretation of the subset principle, namely, the notion that children will pass through a developmental stage in which they adopt the unmarked value of the governing category parameter, proposed by Wexler and Manzini (1987).

Our second result concerns the children's performance with pronouns. Icelandic children show a steady increase in correct nonlocal responses for pronouns as a function of age, reaching 90% correct performance across all sentence types by age 5. In this respect as well, they differ markedly from Danish-, Korean-, and English-speaking children.

In the section that follows, we propose that these two results are directly related to each other. We show that the fact that Korean and Danish children fail to obey Condition B with pronouns directly predicts their

3 years, 6 months to 4 years, 6 months). This is roughly the age at which English-speaking children begin to mark subordinate clauses for tense distinctions by using complementizers and the infinitival *to*. See Hyams (1985) and references cited there for further discussion.

[21]We are grateful to Dominique Sportiche for providing us with these examples.

[22]In the section on LF movement of anaphors and the identity of SIG we propose, following Pica (1987), that SIG undergoes LF movement. Hence, it is subject to the same constraint as quantifiers that undergo Q(uantifier) R(aising).

choice of a local antecedent for the long-distance anaphors in those languages. In contrast, the Icelandic children, who do obey Condition B, are predicted to prefer the long-distance antecedent for SIG.

LF MOVEMENT OF ANAPHORS AND THE IDENTITY OF SIG

Following Chomsky (1986) and Lebeaux (1983), we assume that anaphors undergo movement to INFL at the level of logical form. Pica (1987) extends the LF-movement analysis to Icelandic SIG.[23] In Icelandic, and other languages with long-distance anaphors, the movement is not clause bound, that is, the anaphor appears able to escape the local clause and move to higher INFL positions. Pica proposes that this is done through successive cyclic movement from INFL to INFL through the head position C of COMP. Moreover, he proposes, that COMP can serve as an escape hatch only when it is empty or when its content can delete at LF. He assumes that this is the case for subjunctive and infinitive clauses because the COMP position in such clauses is "semantically empty."[24] Thus, long-distance anaphora is possible from subjunctive and infinitive clauses but not from indicatives. The fact that SIG takes a subject antecedent follows from the LF-movement hypothesis in that once in INFL, SIG is c-commanded only by the subject position.[25] Thus, we have the LF representations in (28) (irrelevant details are omitted):

(28) a. [Jón [segir [[Pétur [SIG [raki t]]]]]]
'John says (that) Peter shaves himself'
b. [Jón [SIG [segir [t [Pétur [t] [raki t]]]]]]
'John says (that) Peter shaves himself (= John)'

Pica (1987) does not discuss the distinction between those verbs that allow both local and long-distance binding of SIG (e.g., *raka* 'shave' and *greiða*

[23]A number of people have proposed the movement analysis for long-distance reflexives in other languages. See Sakaguchi (1988) and Katada (1988) for an LF-movement analysis for Japanese *jibun,* Battistella (1987) and Huang and Tang (1988) for similar analyses of Chinese *ziji,* and Hestvik (1989) for Norwegian *seg.* We discuss Hestvik's analysis in more detail shortly.

[24]We do not necessarily agree with this detail of Pica's analysis. As discussed in the section on long-distance responses in indicative clauses, we assume that the restriction against long-distance movement of SIG in indicatives follows from some general constraint at the level of logical form that also blocks long-distance extraction of quantifiers.

[25]Following ideas of Chomsky (1986), we assume that for those speakers of Icelandic who allow SIG to be bound by the object, as well as by the subject, in the local domain, there is an option to adjoin SIG to the local VP, where it will be c-commanded by the verb, under an appropriate formulation of c-command.

'comb') and those verbs for which long-distance binding is strongly preferred (e.g., *gefa* 'give' and *elska* 'love'). However, assuming the LF movement analysis for SIG, we would have to stipulate that long-distance LF movement is obligatory with some Icelandic verbs. It is obviously undesirable to introduce obligatory movement rules, especially at LF, a level of grammar which is largely inaccessible to the language learner. We propose, in contrast, that the long distance verbs, such as *gefa,* have the lexical property of assigning a pronominal feature to SIG, which is otherwise a pure anaphor. Under the reformulated binding theory of Chomsky (1986), which we present later, the almost obligatory long-distance character of SIG with these verbs then follows from the fact that SIG is a lexical pronominal anaphor.

Our analysis of SIG is based on Hestvik (1989), who proposes the pronominal anaphor analysis for the Norwegian long-distance anaphor *seg;* and on Lee (1986), who proposes the same analysis for Korean *caki.* There are, however, differences among the Norwegian, Korean, and Icelandic cases, which we discuss in the section on cross-linguistic variation in long-distance anaphora. Following that, we consider the implications of our analysis for the child's acquisition of long-distance anaphora and pronouns.

BT-COMPATIBLE BINDING THEORY AND THE PRO THEOREM

Chomsky (1986), following ideas of Huang (1983), proposes a reformulation of the binding conditions in terms of the notion *complete functional complex* (CFC). A CFC is defined roughly as follows (based on the formulation proposed in Johnson, 1987):

(29) β is a CFC if all grammatical functions θ-marked by a head dominated by β are contained in β.

The binding conditions for anaphors and pronouns are formulated as in (30) (adapted from Chomsky, 1986):[26]

(30) Where I is an indexing, β a domain, α a nominal, I is BT (binding theory) compatible with (α,β) if:
   a. α is an anaphor and is bound under β in I
   b. α is a pronoun and is free in β under I.

[26]Condition C is not included because it is irrelevant to our discussion. See Chomsky (1986) for details.

The definition of domain is as in (31):

(31) For some β, I is BT compatible with (α,β) if α is an anaphor or pronominal and β is the least CFC containing γ for which there is an indexing j BT compatible with (α,β).

Informally, the binding domain or governing category for pronouns and anaphors is the minimal CFC in which the binding theory can be satisfied under some indexing. In certain instances, this results in a different governing category for an anaphor and pronoun in the same structural position. This is one respect in which the new binding theory differs empirically from previous ones, for example, Chomsky (1981). For example, in the sentence in (32) NP constitutes the governing category for the pronoun, whereas IP is the domain in which the anaphor must be bound.

(32) [$_{IP}$ The children like [$_{NP}$ each other's/their friends]]

NP constitutes the governing category for the pronoun because it is the least CFC in which the pronoun can be free. The governing category for the anaphor is IP because the latter is the least CFC containing a potential antecedent, that is, the minimal domain in which the anaphor could be bound.

Huang (1983) and Kayne (1989) note that under this formulation of binding theory, the feature combination [+anaphor, +pronominal] no longer entails that such an element cannot have a governing category (the PRO theorem) because the binding requirements of each feature can be satisfied under different domains. Following the analysis of Hestvik (1989) for the Norwegian long-distance anaphor *seg,* exemplified in (33a), and of Lee (1986) for Korean *caki* (33b) (examples from Hestvik and Lee, respectively), let us see how the binding theory given in (29) through (31) allows us to derive the long-distance binding of SIG with the *gefa*-class of verbs.

(33) a. John$_i$ bad Marit$_j$ om ikke å hate seg$_{i,*j}$
'John asked Mary to not hate SEG'

b. John$_i$-Un Bill$_j$-eke [$_{S'}$ [$_S$ Mary$_k$-ka caki$_{i,*j,*k}$-IUI sihoðha-n -ta] -ko]
'John said to Bill that Mary doesn't like CAKI'

As noted earlier, we assume that the *gefa*-class of verbs in Icelandic is lexically specified as assigning the feature [+pronominal] to SIG. SIG is otherwise a pure anaphor, which can take either a local or long-distance antecedent, along the lines proposed by Pica. Moreover, we assume, again

following Hestvik (1989), that Condition A of the binding theory must be satisfied at LF, whereas Condition B is satisfied at S-structure.[27] Consider now the sentence in (34).

(34) Jón telur að Pétur gefi sér bíl í jólagjöf
'John thinks that Peter gives (SUBJ) SIG (= John) a car for Christmas'

In (34), *gefi* assigns SIG (*sér* in the dative case) the feature [+pronominal]. By Condition B, then, at S-structure it must be free in the least CFC with a BT-compatible indexing, namely, the lower IP. Hence, it must be disjoint from *Pétur*. However, being [+anaphoric], it must also be bound. Condition A is thus satisfied, following LF movement, only if SIG is bound to the matrix subject *Jón*.

In our analysis, then, SIG functions in some contexts as pure anaphor, bound by either a local or long-distance subject antecedent. However, with the *gefa*-class of verbs, SIG is a pronominal anaphor and consequently, under the assumptions given earlier, it takes a long-distance antecedent. We find subject orientation effects (*modulo* footnote 4) with both the pure anaphor SIG and the pronominal anaphor SIG because it undergoes LF movement in both cases.

CROSS-LINGUISTIC VARIATION IN LONG-DISTANCE ANAPHORA

Our analysis of SIG follows that proposed by Hestvik (1989) for Norwegian *seg*. However, according to Hestvik, Norwegian *seg* is uniformly a pronominal anaphor, that is, it can never be locally bound. We would argue that in this respect Norwegian differs from Icelandic, where the pronominalization of SIG occurs only with a lexically specified class of verbs.[28] Vikner (1985) also proposes that Danish *sig* takes an obligatory long-distance antecedent, that is, it cannot be locally bound (see footnote 28). This can be accounted for under the assumption that the long-distance anaphor in Danish, as in Norwegian, is a pronominal anaphor, rather than a pure anaphor.

Finally, as noted earlier, Lee (1986) proposes that Korean *caki* is a pronominal anaphor. In Lee's description of Korean, *caki* cannot be locally

[27]Though sufficient for our purposes, this is an overly simplified presentation of Hestvik's analysis. The reader is referred to his paper for a more detailed discussion.

[28]Hestvik notes that apparent cases of locally bound *seg*, as in *John vasket seg* 'John washed himself', involve a lexical rule of detransitivization and that *seg* is expletive in these cases. A similar proposal is made by Vikner (1985) for apparent cases of local *sig* in Danish. We discuss Danish shortly.

bound. Thus, it patterns like Norwegian and Danish. However, there appears to be a certain amount of dialect variation with respect to this matter. Lee and Wexler (1987) claim that *caki* can take either a local or a long distance antecedent, and in fact the adult controls in their experiment allow both possibilities, though there was a preference for the long-distance antecedent (see the section on parametrizing binding theory for discussion). Thus, it may be the case that in one dialect of Korean, *caki* is a pronominal anaphor, whereas in another (that described by Lee & Wexler), it is a pure anaphor.[29]

It seems, then, that languages vary not only with respect to whether an anaphor can be bound to a long-distance antecedent but also with respect to the feature composition of such long-distance anaphors. In certain cases, the long-distance anaphor is a pure anaphor. Icelandic SIG is one such case, abstracting away from the *gefa*-class of verbs and their lexical property. Chinese *ziji* would be another case of a pure anaphor. Recall from the discussion in the section on parametrizing binding theory that Chinese *ziji* can take a local or long-distance antecedent, though according to the results of the Chien and Wexler (1987b) study, adults, as well as children, show a strong preference for the local antecedent. Although there are specific conditions under which *ziji* can take a long-distance antecedent (see Huang & Tang, 1988, for discussion), as far as we know there is no instance in which it must do so.

On the other hand, there are languages in which the long-distance anaphor is a pronominal anaphor and thus requires a nonlocal antecedent. This is the case in Norwegian, Danish, and in at least one dialect of Korean. In Icelandic, this option is represented by a lexically specified class of verbs, which assign the feature [+pronominal] to SIG, otherwise a pure anaphor.

THE ACQUISITION OF PRONOUNS AND LONG-DISTANCE ANAPHORA

Returning to the developmental questions, we noted at the end of the section on the development of binding in Icelandic that Icelandic children differ from Korean and Danish children in two respects. First, Icelandic

[29]We should note that the adult results (which are group data) in the Lee and Wexler study do not really allow us to determine which dialect of Korean these speakers belong to. The long-distance responses may represent the grammar in which *caki* is a pronominal anaphor or the grammar in which it is a pure anaphor that has undergone LF movement. In order to tease apart the two possibilities, we would need to examine the response patterns of the individual adults; those who allowed both local and long-distance binding or only local binding would presumably be of the second grammar type, and those who uniformly chose a long-distance antecedent would be arguably of the first type.

children overwhelmingly prefer the long-distance antecedent for SIG, whereas the Korean and Danish children prefer to bind *caki* and *sig,* respectively, to the local antecedent. Second, the Icelandic children perform very well with respect to Condition B (90% correct by age 5), whereas Korean and Danish children do significantly worse, locally binding the pronoun about 30% of the time through age 6 and older. We are now in a position to at least partially explain this pattern of results.

We have evidence that in the adult grammars of Danish, Korean, and Icelandic, the so-called long-distance anaphors are not always pure anaphors. Thus, Icelandic SIG in the sentences presented in the experiment, with the verb *gefa* 'to give', is a pronominal anaphor by our hypothesis. This is also true of Danish *sig* in the test sentences in the study by Jakubowicz and Olsen (1988). The Korean case is less straightforward, but we know that at least for some speakers *caki* is a pronominal anaphor (see footnote 29). Let us assume that the children know that these elements are pronominal anaphors. We saw earlier that the binding properties of these elements follow from the application of *both* Condition A and Condition B of the binding theory. But we know quite independently, from the results of the pronoun studies, that in Korean and Danish children do not respect Condition B, that is, they allow local binding of pronouns. It follows that for those children pronominal anaphors may be locally bound as well. Consider the schema in (35).

(35) $[_{S1} \ldots . [_{S2} \ldots . \alpha \ldots .]]$

If α is a pronominal and α can be locally bound in S2 (i.e., Condition B fails to apply), then if α is a pronominal anaphor, it can also be bound in the lower S. Condition A is also satisfied if α is bound in S2.[30] Thus, in the absence of Condition B, a pronominal anaphor functions like a pure anaphor. It is to be expected then that children who allow local binding of pronouns will locally bind elements that are pronominal and anaphoric.

The opposite pattern is also expected. Thus, children who perform well with respect to pronouns (i.e., who eschew a local binder) will also choose the long-distance antecedent for a pronominal anaphor. This is the Icelandic child. Recall that the Icelandic child obeys Condition B at a rate of about 90% by age 5. Thus, this same child will apply both Condition A and Condition B to SIG, assuming that he or she knows its features, and will correctly choose a long-distance antecedent. Thus, our analysis of long-distance anaphora predicts the patterns we observe in the cross-linguistic acquisition studies.

[30]Of course, in (35) Condition A is also satisfied if α raises to S1 at LF. We return to this possibility shortly.

Let us consider an alternative hypothesis, namely, that children analyze *caki, sig,* and so forth, as pure anaphors, but fail to raise them out of the embedded clause. They need positive evidence to learn that such long-distance movement is possible in their language, and thus their initial assumption is that such movement is ungrammatical. This would follow directly from the developmental interpretation of the subset principle.[31] There are two problems with this analysis of these obligatory long-distance anaphors that we can see. First, it predicts that Icelandic children should strongly favor local binding of SIG over long-distance binding at some early stage, contrary to fact. Second, it fails to account for the fact that, cross-linguistically, children's behavior with these "anaphors" is entirely parallel to their behavior with pronouns—a result that follows from our analysis.

Thus, in the general case, children correctly analyze SIG as a pronominal anaphor and bind it to the long-distance antecedent as required by principles A and B of binding theory. Recall, however, that there are significantly more local antecedent responses for SIG than for the pronouns (and correspondingly less long-distance responses). This result also follows from our analysis. If the pronominalization of SIG is associated with a lexically specified class of verbs, as we have proposed, then children need to learn which verbs have the property of pronominalizing SIG. Lexical learning takes time and lexical idiosyncracies (e.g., went) are often subject to overgeneralization by a more regular process (e.g., goed). Thus, we expect to find that some children treat SIG as a pure anaphor with the *gefa* verbs, and thus choose a local antecedent. This pattern of response will persist until the children learn the relevant lexical property of this verb.[32]

Let us sum up by outlining how the analysis proposed in this article

[31]This is the most likely analysis for the Chinese results (Chien & Wexler, 1987b). We assume that Chinese *ziji* is a pure anaphor, which can undergo long-distance movement, in certain contexts (see Huang & Tang, 1988). Thus, it follows from the logic of the subset principle that children would initially assume local binding and would allow long-distance movement of the anaphora upon presentation of positive evidence. We also believe that this would be the Icelandic children's treatment of the pure anaphoric SIG, that is, when it occurs with verbs other than the *gefa* class. This hypothesis will be tested in future experiments. However, we have the problem, noted in the text (see the section on the basic binding facts in Icelandic) that the *raka*-class verbs impose a slight pragmatic preference for a local antecedent, and hence if children do prefer the local antecedent with these verbs, it cannot be unambiguously interpreted as a subset principle effect.

[32]Although we have not addressed the general issue of how children determine whether a referentially dependent element is an anaphor, a pronoun, or a pronominal anaphor, we do have a proposal for how Icelandic children determine when SIG is lexically marked as a pronominal anaphor. Recall from the section on the basic binding facts in Icelandic that there is a local anaphor SJÁLFAN SIG in Icelandic. As we noted there, SJÁLFAN SIG is used with the *gefa*-class verbs to refer to a local antecedent, as in (i).

(i) Jón_i elskar sjálfan sig_i
'John loves himself'

handles the developmental data in each of the languages we have discussed. Icelandic SIG is a pronominal anaphor with the verb *gefa* 'to give', used in the study. We hypothesize that Icelandic children know the feature composition of SIG. They also respect Condition B. Thus, they do not locally bind pronouns and they choose the long-distance antecedent for SIG.

Danish children also know that *sig* is a pronominal anaphor, but they do not obey Condition B. Thus, they locally bind pronouns and choose the local antecedent for *sig,* in marked contrast to Danish adults. Korean children may belong to one or two dialects. In one dialect, *caki* is a pronominal anaphor; in the other, it is a pure anaphor that undergoes long-distance LF movement. These children fail to respect Condition B and locally bind pronouns. For the dialect in which *caki* is a pronominal anaphor, the children will choose the local antecedent for *caki* for the same reasons that Danish children do. In the dialect where *caki* is a pure anaphor, they will choose the local antecedent as an effect of the subset principle, and their response in this case is unrelated to their performance with Condition B.

This brings us to the Chinese- and English-speaking children. Recall that English-speaking children perform relatively poorly with respect to Condition B, whereas Chinese-speaking children do quite well by age 6. The anaphors in Chinese and English are not pronominal, however, and thus we do not expect any particular relationship to emerge between the children's performance with pronouns and their treatment of anaphors. In fact, no relationship emerges. English-speaking children and Chinese-speaking children both locally bind anaphors, though they differ markedly in their behavior with respect to pronouns, as noted earlier. The local binding of anaphors we take to be a subset principle effect: Children assume local binding until presented with evidence of long-distance movement of the anaphors. In Chinese, such evidence will be forthcoming, whereas in English it will not. Our analysis predicts that there are two patterns of results that should not occur in languages with a pronominal anaphor. All

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In this respect, these verbs differ from the *raka*-class verbs, which take SIG to refer to a local antecedent, as in (ii).

(ii) Jón$_i$ rakaði sig$_i$
'John shaved himself'

Thus, children would be able to distinguish the *gefa* verbs from the others on the basis of their behavior with anaphors in relatively simple sentences such as (i). We may assume that these verbs assign a pronominal feature, which is either lexicalized as SJÁLFAN (or one of its morphological variants) or not. When it is not lexicalized, SIG is realized as a pronominal anaphor. Thus, the child would be able to deduce from the occurrence of a sentence, such as (i), that *elska* is a verb that assigns a pronominal feature and hence that in a sentence such as (iii), SIG is a pronominal anaphor. The choice of antecedent then follows from his or her knowledge of the binding principles.

(iii) Jón$_i$ segir að Pétur elski sig$_i$
'John says that Peter loves himself (= John)'

else being equal, we should not find nonlocal binding of pronouns alongside the local binding of the pronominal anaphor, or local binding of pronouns alongside long-distance binding of the anaphor.

We notice from the description given that children respect Condition B in some languages, for example, Icelandic and Chinese, though not in others, such as Korean, Danish, and English. We have no immediate explanation for this phenomenon. Lee and Wexler (1987) propose that Korean children do poorly with pronouns because lexical pronouns are hardly ever used in speech in Korean, and hence their properties are difficult for the language learner to uncover. However, it seems unlikely that the difficulty with pronouns is directly related to frequency in the input. Danish and English children also locally bind pronouns despite the fact that in these languages pronouns occur in the input in abundance. Conversely, Chinese children do well on Condition B, though Chinese is a null argument language, in which lexical pronouns are relatively infrequent.

Kaufman (1987) and Grimshaw and Rosen (1990) have argued that children may have greater knowledge of Condition B than is evidenced by their performance on the various binding experiments. Grimshaw and Rosen, in particular, propose that children's local binding of pronouns is in large measure an artifact of the experimental designs used in the various studies. Using a modified judgment task, Kaufman and Grimshaw and Rosen found that children were able to reliably discriminate grammatical from ungrammatical sentences involving Condition B. Thus, Grimshaw and Rosen suggest that children know Condition B, though they fail to obey it in certain situations. Our experimental results do not speak directly to the issue of knowledge versus obedience because Icelandic children appear to both know and obey Condition B. We have shown, however, that children's behavior with respect to pronouns in the various experimental studies, whether a matter of knowledge or performance, is directly related to the results obtained with anaphors.[33]

CONCLUSION

The Icelandic acquisition results, which on the surface directly conflict with the Korean, Chinese, and Danish findings, can be partially explained within the reformulated binding theory (Chomsky, 1986) under the assumption

[33]In their paper, Grimshaw and Rosen argued that it is a logical error to take children's performance on Condition A as a baseline measure against which to assess their performance on Condition B because the two principles are independent. We agree with this position in the general case, but it seems clear that Grimshaw and Rosen's objection does not hold for those languages in which the anaphor is a pronominal. In this case, we expect a direct relationship between performance on pronouns and on the anaphor, as shown in the text.

that Icelandic SIG (with a specific class of verbs) and other long-distance anaphors are actually pronominal anaphors. Our analysis leads us to reject the parametrization of governing categories, proposed by Wexler and Manzini (1987) and others. We assume that the binding theory is in some sense parametrized in that certain anaphors optionally undergo long-distance movement, for example, Chinese *ziji* (see footnote 31), and this fact must be learned on the basis of positive evidence. However, this does not seem to be the appropriate description of Icelandic SIG, when it occurs with *gefa*-class verbs, nor of Danish *sig,* nor Korean *caki,* in all cases. Thus, we do not predict subset principle effects with these elements. That Korean and Danish children strongly prefer local binding of *caki* and *sig* follows from the fact that they do not respect Condition B of the binding theory, as evidenced by their performance with pure pronominals.

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