

# Reflexivization and Logophoricity: Evidence From the Acquisition of Icelandic

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In this article, we report the results of an experimental study on the interpretation of the local anaphor *sjálfan sig*, the so-called long-distance anaphor *sig*, and pronouns by Icelandic-speaking children. We tested 55 Icelandic children between the ages of 3;3 and 6;0, and 10 adult controls on 72 sentences in the indicative, subjunctive, and infinitive moods, using both an act-out task and a modified judgment task (see Crain and McKee (1985)). We also looked at the lexical effects of two different verb classes, the *raka* 'shave' class of verbs, which allows *sig* to take either a local or a long-distance antecedent, and the *gefa* 'give' class of verbs, which strongly biases toward the long-distance antecedent. The results of our study support the hypothesis that children have early knowledge of Principles A and B of the Binding Theory but have difficulty with the pragmatic rule governing coreference (Avrutin and Wexler (this issue), Chien and Wexler (1988; 1990), Grodzinsky and Reinhart (1993), Montalbetti and Wexler (1985), Wexler and Chien (1985)). Moreover, various aspects of the development of Icelandic anaphors and pronouns lend support to the recent Binding Theory proposed in Reinhart and Reuland (1989; 1991; in press). In particular, our results show: first, that the long-distance anaphor *sig* patterns like the pronouns with respect to Principle B of the Binding Theory; second, that the developmental patterns associated with the long-distance use of *sig* out of subjunctives and infinitives are different, supporting the proposal that long-distance use of *sig* out of subjunctives is logophoric, whereas long-distance binding out of infinitives is governed by structural principles; and third, that Icelandic children are attuned to the lexical differences between the *raka* 'shave' and *gefa* 'give' class

of verbs at an early age. All of these results are explainable within the Reinhart and Reuland framework and illustrate the strongly modular character of binding and its development.

## 1. INTRODUCTION

The goal of linguistic theory is to explain the apparent rapidity, ease, and uniformity of language acquisition in the face of impoverished data—the so-called logical problem of language acquisition (see Hornstein and Lightfoot (1981)). The task of an acquisition theory is to square the logical problem with facts of development. That is to say, given the linguistic-theoretic assumptions of a rich initial state and unrestricted access to triggering data, an acquisition theory must explain why language acquisition takes as long as it does. What are those factors that extend the developmental process beyond the idealized “instantaneous acquisition” of linguistic theory and give rise to gradual, stage-wise acquisition?

The conception of language as a modular system provides a key to understanding the “noninstantaneity” of language acquisition and thus its developmental aspects. If particular aspects of language arise through the interaction of various principles and components, and if each of these components grows independently, then we expect that development will be piecemeal. Development in the lexicon obviously proceeds according to different principles than development in the syntax, the pragmatic component, or those aspects of cognition related to language processing, and so on. Thus, much of what we characterize as development arises through the interaction and/or uneven maturation of the various modules involved in language.

Nowhere is this better illustrated than in the development of binding phenomena. There are at least three different components of grammar implicated in binding: the syntax (Binding Principles A and B of the Binding Theory, e.g., Chomsky (1981; 1986), Reinhart and Reuland (1989; 1991; in press)); the lexicon—to the extent that binding domains vary for particular lexical elements (e.g., Pica (1987), Wexler and Manzini (1987)); and pragmatics (e.g., Reinhart (1983) and Grozinsky and Reinhart’s (1993) Rule I or Chien and Wexler (1988; 1990) and Avrutin and Wexler’s (this issue) Principle P, which governs coreference relations rather than binding, to be discussed in Section 5). In a language such as Icelandic, the language under investigation here, the picture is even more complex because there are additional factors affecting binding relations, for example, mood distinctions (indicative, subjunctive, infinitive), inherent properties of different verb classes (the so-called *raka* ‘shave’ and *gefa* ‘give’ class of verbs), and the logophoric (see Clements (1975)) or discourse dependent use of *sig*. Finally,

Icelandic is a language with a long-distance anaphor, *sig*, which has generated considerable interest in linguistic theory ever since it was first discussed in Thráinsson (1976).<sup>1</sup>

In this article, we examine these various components of binding and their interaction in the adult and developing grammars of Icelandic. We chart a course of development and show that the particular developmental patterns arise as a direct consequence of the modularity of the language faculty, thus providing strong support for the modularity thesis, particularly as it applies to binding. This is the first comprehensive study of the development of binding in Icelandic, following up on an earlier study reported in Sigurjónsdóttir, Hyams, and Chien (1988) and Hyams and Sigurjónsdóttir (1990). Our previous study used only an act-out task to access children's interpretation of *sig* and pronouns with one lexical class of verbs, the *gefa* 'give' class. In the present study, we use both an act-out task and a modified judgment task (see Crain and McKee (1985)), and test children's interpretation of all three elements, *sjálfan sig*, *sig*, and pronouns. We also look at the children's performance on two different verb classes, the *raka* 'shave' class and the *gefa* 'give' class, which induce different effects on the interpretation of *sig* and *sjálfan sig*.

The article is organized as follows: First, in Section 2, we outline the basic binding facts concerning Icelandic anaphors and pronouns. In this context, we briefly review the Binding Theory proposed in Reinhart and Reuland (1989; 1991; in press), which we assume in this article. In Section 3, we present the design of our Icelandic binding study. Following that, in Section 4, we discuss the results of the study. There are four specific issues that we address. In Section 4.1, we consider the so-called developmental delay of pronouns, that is, the finding that children have greater difficulty with pronouns than with local anaphors, which a number of cross-linguistic acquisition studies have reported, for example, Jakubowicz (1984), Wexler and Chien (1985), and Chien and Wexler (1987) for English-speaking children; Lee and Wexler (1987) for Korean-speaking children; Jakubowicz and Olsen (1988) for Danish-speaking children; and Avrutin and Wexler (this issue) for Russian-speaking children. Thus, children acquiring these languages allow pronouns to take a local antecedent in apparent violation of principles of grammar, although they respect the grammatical constraints on local anaphors analogous to *himself/herself* in English. In this study, we see that this difference in performance with local anaphors and pronouns also shows up with Icelandic-speaking children.

In Section 4.2, we look at children's interpretation of the so-called

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<sup>1</sup>The binding properties of *sig* have been described in great detail in Anderson (1986), Maling (1984; 1986), Rögnvaldsson (1986), Sigurðsson (1990), Thráinsson (1976; 1990; 1991), among others.

long-distance anaphor *sig*. Our concern is to determine if the long-distance binding of *sig* out of subjunctives and infinitives obeys similar syntactic constraints, as is proposed in Pica (1987) and Wexler and Manzini (1987), or whether the long-distance use of *sig* in the two moods is governed by different mechanisms. Reinhart and Reuland (1989; 1991; in press), following Maling (1984), Sigurðsson (1990), Thráinsson (1991), and others, proposed that the long-distance use of *sig* out of subjunctive complements is logophoric, that is, is discourse-dependent in the sense that the antecedent of the logophor has to be the individual (other than the speaker/narrator) whose thought, speech, point of view, and so forth, is represented in the sentence. According to Reinhart and Reuland, however, long-distance binding of *sig* out of infinitive complements is purely structural and is regulated by syntactic principles. We see that our results support Reinhart and Reuland's proposal over Pica/Wexler and Manzini's approach, because the adults' and the children's pattern of responses in subjunctives and infinitives is very different.

Also in Section 4.2, we look at the lexical effects of two different verb classes in Icelandic, one of which allows *sig* to take either a local or a long-distance antecedent (the *raka* 'shave' class) and another one that virtually requires *sig* to take a long-distance antecedent (the *gefa* 'give' class). Our results show that Icelandic adults treat *sig* differently depending on the verb that governs it and that Icelandic children are attuned to these lexical differences at an early age.

In Section 4.3, we discuss the pronominal nature of the morphologically simple anaphor *sig*. One of the most salient results of our previous study (see Hyams and Sigurjónsdóttir (1990)) was that the children's responses to the *sig* sentences matched their responses to the pronoun sentences in certain crucial respects. This result lends support to Binding Theories in which long-distance anaphors like *sig* are treated as pronominal in some sense, as argued in Hestvik (1989; 1990), and more recently, Reinhart and Reuland (1991; in press). The results of our present study replicate this finding and show that individual Icelandic-speaking children treat *sig* and pronouns in a similar manner.

Finally, in Section 5, we address the question of why children have greater difficulty with pronouns and *sig* than with local anaphors. Our results strongly support the hypothesis that children have early knowledge of Principles A and B of the Binding Theory but have difficulty with the pragmatic rule governing coreference, as proposed by Wexler and Chien (1985), Montalbetti and Wexler (1985), Chien and Wexler (1988; 1990), Avrutin and Wexler (this issue), and Grodzinsky and Reinhart (1993). The Icelandic data are particularly revealing in this respect because the binding and coreference possibilities show a complex pattern of interaction with the

two lexical verb classes and the logophoric use of *sig*. In Section 6, we offer some concluding remarks.

## 2. SOME ICELANDIC BINDING FACTS

Abstracting away from the reciprocal, Icelandic has two anaphoric elements. The complex anaphor *sjálfan sig* and the simple anaphor *sig*. Following Reinhart and Reuland (1991; in press), Chomsky (1986), Keenan (1987), and others, we define an anaphor as a referentially defective NP, that is, an NP that does not project an argument that can be interpreted independently. Thus, anaphors need antecedents to be interpreted. The two anaphoric elements (*sjálfan sig* and *sig*) differ in their lexical structure and in the type of content that they are missing. The Icelandic complex anaphor *sjálfan sig* (*sjálfan* = 'self') is what Reinhart and Reuland referred to as a Self anaphor. Following Pica (1987), Reinhart and Reuland assumed that Self anaphors are relational nouns that contain two arguments on their theta grid. One argument is discharged by a pronoun or a simple anaphor such as *sig* that occupies the determiner position (see Higginbotham (1983)). The structure of a Self anaphor is given in (1).

- (1) [<sub>NP</sub> pronoun/sig [<sub>N</sub> Self ( $\nu, x$ )]]

The second argument of Self is saturated by an antecedent that needs to be found. Thus, it is this missing argument that accounts for the anaphoric nature of Self anaphors, and hence *sjálfan sig*.

The morphologically simple anaphor *sig*, on the other hand, lacks phi-features, specifically number and gender features, and it is the absence of these features that accounts for the referentially defective nature of *sig*.<sup>2</sup> To be interpreted as an argument, *sig* must find an antecedent that supplies the missing phi-features. Following Pica (1987) and Reinhart and Reuland (1991; in press), we assume that *sig* adjoins to Infl (Agr) at Logical Form (LF) and undergoes head movement with the verb. As is well known, in its long distance use *sig* can only take a subject antecedent. The subject orientation of simple anaphors such as *sig* follows from their association with Infl. Thus, *sjálfan sig* and *sig* are anaphoric, that is, referentially defective, although the specific missing content and the procedures needed

<sup>2</sup>*Sig* is a 3rd person form that is invariant for gender and number. However, it has three different case forms: accusative *sig*, dative *sér*, and genitive *sín*. There is no nominative form; see Everaert (1990) for a discussion of this fact.

to obtain this content differ in the two cases.<sup>3</sup>

Although *sig* is anaphoric in the sense just described, it has the lexical structure of pronouns. Thus, *sig* and pronouns both occupy determiner position and project as full NPs, as in (2).<sup>4</sup>

- (2) a. [<sub>NP</sub> sig [<sub>N'</sub> . . . e . . . ]]  
 b. [<sub>NP</sub> pronoun [<sub>N'</sub> . . . e . . . ]]

Moreover, as first noted in Everaert (1986; 1991), the similarity in structure of *sig* and pronouns correlates with a similarity in grammatical function. Within Reinhart and Reuland's analysis, both *sig* and pronouns are subject to Principle B of the Binding Theory in that neither is reflexive-marked (we return to this shortly). In this respect, Reinhart and Reuland's theory differs markedly from Chomsky (1981; 1986), Pica (1987), and Wexler and Manzini's (1987) Binding Theories, for whom *sig* is purely anaphoric and subject to Principle A. Thus, *sig* is both anaphoric and pronominal: anaphoric in requiring phi-features, and pronominal with regard to its internal structure and Principle B of the Binding Theory (see Everaert (1986; 1991)).<sup>5</sup>

One final point concerns a crucial distinction between the complex anaphor *sjálfan sig* and *sig*. *Sjálfan sig* is a reflexive marker, whereas *sig* is not. As we discuss shortly, Reinhart and Reuland's Principle A applies to reflexives (or more precisely reflexive-marked predicates) and not anaphors as in the Standard Binding Theory (see Chomsky (1981)). Thus, *sjálfan sig* is subject to Principle A, whereas *sig* and the pronouns are subject to Principle B. As is discussed in Sections 4.3 and 5, the results of our developmental study fully support this analysis of *sig*.

## 2.1 The Binding Principles

Having described the inherent properties of anaphors and pronouns in Icelandic, let us now discuss the antecedent possibilities of these elements

<sup>3</sup>The defective nature of these elements entails that they cannot be used deictically (see Reinhart and Reuland (1991; in press)).

<sup>4</sup>*Sig* and the pronouns differ from each other, however, in that *sig* requires phi-features, whereas pronouns are fully specified in this respect. It is worth noting at this point that although a lack of phi-features entails referential defectiveness as in the case of *sig*, having a fully specified set of features does not preclude an element from functioning as a bound variable (in Reinhart's (1983) sense).

<sup>5</sup>Hestvik (1989; 1990), Lee (1986), and Hyams and Sigurjónsdóttir (1990) have proposed that Norwegian *seg*, Korean *caki*, and Icelandic *sig* (with one class of verbs), respectively, are pronominal anaphors. However, these analyses are based on Huang's (1983) and Chomsky's (1986) reformulated Binding Theory and are couched in somewhat different terms than Everaert's (1986; 1991) proposal.

and in more detail how these elements function with regard to Reinhart and Reuland's Binding Theory.

First, the complex anaphor *sjálfan sig* must take a local antecedent, as is illustrated in (3), and hence, behaves in all relevant respects like the English anaphor *himself/herself*.

- (3) Jón<sub>i</sub> segir [að Pétur<sub>j</sub> elksi sjálfan sig<sub>j, \*i</sub>]  
 John says that Peter loves self sig  
 'John says that Peter loves himself.'

Following Reinhart and Reuland (1991; in press), we assume that *sjálfan sig* reflexive-marks its predicate, making it subject to Principle A of their Binding Theory. Principle A as formulated by Reinhart and Reuland (in press) is given in (4).

- (4) *Principle A*: A reflexive-marked predicate is reflexive.

There are two ways a predicate can be reflexive-marked. These are given in (5a), and the definition of a reflexive prediction in (5b).

- (5) a. A predicate (of P) is *reflexive-marked* if and only if either P is lexically reflexive or one of P's arguments is a Self anaphor.  
 b. A predicate is *reflexive* if and only if two of its arguments are coindexed.

*Sjálfan sig* in (3) is a Self anaphor, and hence, reflexive-marks its predicate, so by Principle A, this predicate's arguments *Pétur* and *sjálfan sig* must be coindexed. In Reinhart and Reuland's terms, coindexation of *sjálfan sig* with a coargument saturates the second position on the theta grid of *sjálfan* 'self', satisfying its anaphoric requirements.

We turn now to *sig* and the pronouns. As noted previously, within Reinhart and Reuland's theory, the morphologically simple anaphor *sig* has the same internal structure as pronouns. Moreover, both *sig* and the pronouns are subject to Principle B. Principle B is given in (6) (from Reinhart and Reuland (in press)).<sup>6</sup>

- (6) *Principle B*: A reflexive predicate is reflexive-marked.

<sup>6</sup>Later in their article, Reinhart and Reuland (in press) proposed that Principles A and B are not precisely symmetric. Following a line in Ben-Shalom and Weijler (1990), Reinhart and Reuland assumed that Principle A applies to syntactic predicates, whereas Principle B operates on semantic predicates, that is, at a level where syntactic predicates are translated into semantic ones. We do not go into this distinction here, as it is irrelevant to our discussion.

Principle B specifies that a predicate in which two arguments are coindexed (i.e., a reflexive predicate) has to be reflexive-marked. *Sig* and the pronouns do not reflexive-mark their predicates. Hence, by Principle B they cannot be bound to a coargument unless the predicate is intrinsically marked as reflexive on its theta grid (i.e., lexically reflexive). We turn to this possibility shortly.

Reinhart and Reuland's Binding Principles differ from the Standard Binding Theory (as introduced in Chomsky (1981)) in several respects. First, these Principles only apply in the argument (thematic) domain of the verb, that is, to predicates, where this term is assumed to include the external argument (subject) of the predicate and all internal arguments that are either theta-marked (or case-marked) by the verb.<sup>7</sup> Second, whereas the Standard Binding Theory draws a distinction between anaphors and pronouns, this theory distinguishes between predicates that are reflexive-marked and those that are not. Thus, as noted earlier, in Icelandic, the local anaphor *sjálfan sig*, which is a Self anaphor and hence is reflexive-marked, is subject to Principle A, whereas pronouns and *sig* are grouped together in that neither reflexive-marks its predicate, and hence both obey Principle B.

Reinhart and Reuland's Principles A and B account straightforwardly for the behavior of the anaphoric elements *sjálfan sig* and *sig* with one class of verbs in Icelandic. As we noted earlier, there are two verb classes in Icelandic, and *sig* behaves differently depending on which kind of verb (*raka* 'shave' or *gefa* 'give') governs it.<sup>8</sup> Thus, with one class of verbs, which we refer to as the *gefa* 'give' class of verbs, it is entirely unnatural to use *sig* to refer to the local antecedent, as can be seen in (7a).<sup>9</sup> If the speaker intends the local subject, *Pétur* in (7), as the recipient of the verb *gefa* 'give', we would use the Self anaphor *sjálfan sig*, as in (7b).

- (7) a. Jón<sub>i</sub> vildi [að Pétur<sub>j</sub> gæfi<sub>(subj.)</sub> sér<sub>7\*/j/i</sub> bók  
 John wanted that Peter gave sig (= John) a book  
 í jólagjöf] (gefa verb)  
 for Christmas  
 'John wanted Peter to give sig a book for Christmas.'

<sup>7</sup>According to Reinhart and Reuland (in press), case marking is relevant to syntactic predicates that Principle A applies to, but not to semantic predicates that Principle B operates on. As we noted in footnote 6, the distinction between syntactic and semantic predicates is irrelevant to our discussion and is not addressed further here.

<sup>8</sup>We are grateful to Höskuldur Thráinsson for first pointing out these lexical effects to us. Similar lexical effects have been discussed by Everaert (1986) for Dutch and by Hellan (1988) for Norwegian.

<sup>9</sup>Recall from footnote 2 that *sig* has three different forms. *Sig* is the accusative form, whereas *sér*—which appears in example (7)—is the dative form.

- b. Jón<sub>i</sub> vildi [að Pétur<sub>j</sub> gæfi<sub>(subj.)</sub> sjálfum sér<sub>j/i</sub>  
 John wanted that Peter gave Self sig (= Peter)  
 bók í jólagjöf]  
 a book for Christmas  
 'John wanted Peter to give himself a book for Christmas.'

In fact, 80% of the adult controls in our study rejected the local antecedent as ungrammatical for *sig* with this class of verbs in sentences like (7a), even when the experimental setup strongly biases them toward such a reading. Hence, in order for a predicate of this class to be reflexive in Icelandic, one of its arguments must be a Self anaphor. When a *gefa* verb takes *sig* or a pronoun as an argument, as in (7a) and (8) respectively, the predicate is not reflexive-marked and Principle B rules out local binding.

- (8) Jón<sub>i</sub> vildi [að Pétur<sub>j</sub> gæfi<sub>(subj.)</sub> honum<sub>\*j/i/k</sub> bók  
 John wanted that Peter gave him a book  
 í jólagjöf]  
 for Christmas  
 'John wanted Peter to give him a book for Christmas.'

Thus, Reinhart and Reuland's Principle B captures the behavior of *sig* with this class of verbs in Icelandic.

With the second class of verbs, on the other hand, for 80% of our adult controls, *sig* may take both the local and the long-distance antecedent, as is illustrated in (9).

- (9) Jón<sub>i</sub> vildi [að Pétur<sub>j</sub> rakaði<sub>(subj.)</sub> sig<sub>j/i</sub> á  
 John wanted that Peter shaved sig (= John/Peter) on  
 hverjum degi] (raka verb)  
 every day  
 'John wanted Peter to shave sig everyday.'

In line with a proposal by Everaert (1986; 1991) for Dutch, we assume that verbs of this class, which we refer to as the *raka* 'shave' class of verbs, have two lexical entries: one in which they are intrinsically marked as reflexive on their theta grid (i.e., lexically reflexive), and one in which they are not. Thus, when *sig* occurs with the reflexive-marked lexical entry of the verb, *sig* is subject to Principle A and must be locally bound, as in (10).

- (10) Jón<sub>i</sub> sagði Pétri<sub>j</sub> [að Pro<sub>j</sub> raka<sub>(inf.)</sub> sig<sub>j/i</sub>]  
 [+ reflexive]  
 'John told Peter to shave sig.'

On the other hand, when *sig* occurs with the transitive (i.e., nonreflexive-marked) lexical entry of the verb, it is subject to Principle B, which rules out a local binding. Hence, *sig* must get its phi-features from the long-distance antecedent, as in (11).<sup>10</sup>

- (11) Jón<sub>i</sub> sagði Pétri<sub>j</sub> [að Pro<sub>j</sub> raka<sub>(inf.)</sub> sig<sub>\*j/i</sub>]  
 [+transitive]  
 'John told Peter to shave sig.'

Hence, Reinhart and Reuland's Principles A and B account straightforwardly for the behavior of the 3rd person anaphoric forms *sjálfan sig* and *sig* with the two verb classes in Icelandic.

Whereas Icelandic has three 3rd person forms—the pronouns, the Self anaphor *sjálfan sig*, and *sig*—the 1st and 2nd person have only two forms, the pronouns and a Self anaphor. Interestingly, the distribution of the 1st and 2nd person forms is entirely predicted by Reinhart and Reuland's theory. With verbs of the *raka* class, reflexive predicates are formed with the oblique case forms of the 1st and 2nd person pronouns, *ég* 'I' (*mig* in the accusative, *mér* in the dative, *min* in the genitive) and *þú* 'you' (*þig* in the accusative, *þér* in the dative, *þin* in the genitive), as in (12).

- (12) a. Ég raka mig á hverjum degi.  
 [+reflexive]  
 I shave me on every day  
 'I shave myself every day.'  
 b. Þú rakar þig á hverjum degi.  
 [+reflexive]  
 You shave you on every day  
 'You shave yourself every day.'

Recall that verbs of the *raka* class have a reflexive-marked lexical entry, and thus, the predicates in (12) are reflexive-marked, satisfying Principle A of the Binding Theory. The *gefa* verbs, in contrast, have no such reflexive-marked lexical entry, and hence, in order to form reflexive predicates in the 1st and 2nd person, they require a Self anaphor, as in (13).

<sup>10</sup>We assume, following Reinhart and Reuland, that when *sig* is long-distance bound out of infinitives, it undergoes head movement at LF with its governing verb to a higher Infl position, where it inherits the phi-features of the subject through Spec-head agreement (see Chomsky (1986), Lebeaux (1983), Pica (1987)). However, as we discuss shortly, this kind of long-distance structural binding is only available in infinitives.

- (13) a. Ég gaf sjálfri mér bók.  
 [+transitive]  
 I gave Self me a book  
 'I gave myself a book.'
- b. Þú gafst sjálfum þér bók.  
 [+transitive]  
 You gave Self you a book  
 'You gave yourself a book.'

Notice that with a 3rd person subject, the sentences in (12a,b) would take *sig* as an object, whereas in (13a,b), they would require *sjálfan sig*. Thus, *sig* patterns like the 1st and 2nd person pronouns, providing further evidence of the pronominality of *sig* and support for the Binding Principles as formulated by Reinhart and Reuland.

## 2.2 The Chain Condition

Note now that in a language like Icelandic in which both pronouns and *sig* are subject to Principle B, Reinhart and Reuland's Binding Theory predicts both *sig* and pronouns to be grammatical in contexts such as (14), in which a verb like *raka* 'shave' reflexive-marks its predicate. Thus, with verbs that are lexically reflexive, both the pronoun and *sig* should be able to bind to the subject. However, as demonstrated by the contrast in (14), only *sig* is, in fact, grammatical.

- (14) a. Jón<sub>i</sub> rakar sig<sub>i</sub>.  
 [+reflexive]  
 John shaves sig
- b. \*Jón<sub>i</sub> rakar hann<sub>i</sub>.  
 [+reflexive]  
 John shaves him

To account for this difference between *sig* and the pronouns, Reinhart and Reuland introduced an additional principle, the Chain Condition, which draws on the fact, discussed earlier, that *sig* and the pronouns differ in terms of their referential "completeness." Informally, the Chain Condition specifies that the tail of an A-chain must be referentially defective. Recall that in Reinhart and Reuland's terms *sig* is referentially defective in that it lacks phi-features; hence, by the Chain Condition, *sig* may form part of an A-chain whose head is *Jón*, as in (14a). The pronouns, in contrast, are fully specified with respect to features, and hence, A-chain formation, as in

(14b), is blocked.<sup>11</sup> Thus Reinhart and Reuland's Binding Principle B successfully rules in *sig* sentences such as (14a), although it fails to block the ungrammatical (14b). Rather, the ungrammaticality of (14b) is accounted for by the Chain Condition. Note that in this respect as well, Reinhart and Reuland's theory differs significantly from the Standard Binding Theory. In Section 4, we return briefly to the Chain Condition, though it is largely irrelevant to the results of our acquisition study.

### 2.3 Long-Distance *Sig*

Let us now consider the long-distance use of *sig*. Reinhart and Reuland argued that there are two structural binding domains, that is, domains regulated by the Binding Theory. First, there is the local domain, that is, the argument (thematic) domain of the verb, and second, there is the domain of the first finite (indicative or subjunctive) Infl in which morphologically simple anaphors like *sig* can be structurally bound to a higher antecedent. Thus, when *sig* is long-distance bound out of an embedded infinitive, as in (15), it is structurally bound to its antecedent.

- (15) Jón<sub>i</sub> skipaði mér<sub>j</sub> [að Pro<sub>j</sub> lemja<sub>(inf.)</sub> sig<sub>i</sub>]  
'John ordered me to hit sig (= John).'

Essentially following Pica (1987), Reinhart and Reuland proposed that this structural binding involves verb restructuring at LF, in which *sig* adjoins to (or incorporates into) its governing (infinitive) verb and moves with it from Infl to Infl, as long as no finite Infl intervenes. This follows from restrictions on verb movement, that is, verbs cannot raise over finite (indicative or subjunctive) clause boundaries, and hence, the verb-anaphor complex can only move out of infinitives.<sup>12</sup> This account predicts that *sig* in

<sup>11</sup>The Chain Condition is formally presented as in (i) (Reuland and Reinhart (1992,13)).

- (i) General condition on A-chains  
A maximal A-chain ( $\delta_1, \dots, \delta_n$ ) contains exactly one link  $-\delta_1-$  which is fully specified for phi-features.

<sup>12</sup>Extending Reinhart and Reuland's theory to Icelandic, we propose that infinitives in Icelandic undergo restructuring at LF, in which case the matrix clause and the infinitival complement count as one clause for syntactic processes. Languages like Italian and Dutch have long been assumed to contain restructuring of certain infinitive clauses (see Burzio (1986), Evers (1975), Manzini (1983), Reuland (1983), Rizzi (1982), Rutten (1991), etc.). In these languages there exists overt evidence for this mechanism. In Italian, these structures exhibit clitic climbing in which a pronominal clitic "climbs" out of the infinitival complement into the matrix clause, as is illustrated in (i), whereas in Dutch, the infinitival verb itself ends up in the higher clause, as is shown in (ii) (see Rutten (1991, 61, 83)).

- (i) a. Maria vuole [mandargli questa lettera]  
 Maria wants send-him that letter  
 'Maria wants to send him that letter.'
- b. Maria gli<sub>i</sub> vuole [mandare<sub>-i</sub> questa lettera]  
 Maria him wants send that letter  
 'Maria wants to send him that letter.'
- (ii) a. \*... dat Anna [<sub>inf.</sub> Jan een lied zingen horen<sub>(inf.)</sub> heeft  
 ... that Anna John a song sing hear has
- b. ... dat Anna [<sub>inf.</sub> Jan een lied *t<sub>i</sub>* *t<sub>j</sub>* heeft horen<sub>(inf.)</sub> zingen<sub>i</sub>  
 ... that Anna John a song has heard sing  
 '... that Anna heard John sing a song.'

Icelandic does not have overt evidence of this kind for verb restructuring. However, the referential properties of pronouns in infinitive clauses in Icelandic do provide evidence for restructuring. Thus, pronouns in infinitive sentences have the same antecedent possibilities as pronouns in local clauses. In both the local domain and out of infinitive complements, the pronouns (*hann* 'he', *hún* 'she', and *það* 'it') cannot take subject antecedents (see Anderson (1986), Thráinsson (1979), etc.). This is illustrated in (iii) and (iv).

- (iii) a. \*Jón<sub>i</sub> raker hann<sub>i</sub> á hverjum degi.  
 'John shaves him every day.'
- b. \*Haraldur<sub>i</sub> sendi mér buxur á hann<sub>i</sub>.  
 'Harold sent me trousers for him.'
- c. \*Petúr<sub>i</sub> gaf mér mynd af honum<sub>i</sub>.  
 'Peter gave me a photo of him.'
- (iv) Jón<sub>i</sub> segir Pétri<sub>j</sub> [að Pro<sub>j</sub> klappa<sub>(inf.)</sub> honum<sub>\*/?\*/k</sub>  
 John tells Peter to pat him (= Extra-Clausal (EC) NP)  
 á hverjum degi]  
 on every day  
 'John tells Peter to pat him every day.'

This sharply contrasts with subjunctive and indicative complement clauses, which do not undergo restructuring. In these cases, the matrix subject can serve as an antecedent, for instance, *Jón* in (v,a,b).

- (v) a. Jón<sub>i</sub> segir [að Pétur<sub>j</sub> klappi<sub>(subj.)</sub> honum<sub>\*/j/k</sub>  
 John says that Peter pats him (= John or EC NP)  
 á hverjum degi]  
 on every day  
 'John says that Peter pats him every day.'
- b. Jón<sub>i</sub> veit [að Pétur<sub>j</sub> klappar<sub>(ind.)</sub> honum<sub>\*/j/k</sub>  
 John knows that Peter pats him (John or EC NP)  
 á hverjum degi]  
 on every day  
 'John knows that Peter pats him every day.'

The parallel behavior of pronouns in the local and infinitive domain supports the hypothesis that infinitives undergo restructuring and become "monoclausal" at some level.

infinitive clauses should only be able to refer to a matrix subject and not to an object, because due to the restructuring process, *sig* in infinitives will always end up in Infl at LF where it is in Spec-head agreement with a c-commanding subject. This prediction is borne out in Icelandic. As we saw in example (15), *sig* in an infinitive clause can bind to the matrix subject, *Jón*, but as we see in (16), *sig* cannot bind to the matrix object, *Pétur*.

- (16) \*Ég<sub>i</sub> hótaði Pétri<sub>j</sub> [að Pro<sub>i</sub> lemja sig<sub>j</sub>]  
'I threatened Peter to hit sig (= Peter).'

Reinhart and Reuland assumed that, in addition to the two domains that are regulated by the structural Binding Theory, there is a logophoric domain that falls outside the scope of the Binding Theory. The logophoric domain is governed by discourse principles that are not part of the syntactic component and presumably constitute a separate module of UG. Icelandic linguists have long argued that the long-distance use of *sig* in subjunctives is ruled by semantic (discourse) conditions rather than syntactic principles (see Maling (1984), Rögnvaldsson (1986); Sigurðsson (1990), Thráinsson (1976; 1990; 1991), see also Sells (1987)). Maling (1984) argued that the long-distance use of *sig* in subjunctives has the same semantic characteristics as logophoric pronouns have in Ewe and some other West African languages (as described in Clements (1975)). The essence of the logophoric use of *sig* is that the antecedent of the logophor must be an individual (other than the speaker–narrator) whose thought, speech, feeling, or point of view is reported on in the sentence (see Maling (1984)).<sup>13</sup> Because verbs of thinking, saying, and perceiving normally take subjunctive complements in Icelandic, the logophoric use of *sig* shows up most clearly in subjunctives.<sup>14</sup>

When *sig* is a logophor, it is not subjective to the same structural principles as *sig* in infinitives. As we illustrated in (15) and (16), due to the restructuring process, *sig* in infinitive clauses can only bind to a matrix subject and not to a matrix object. However, as a logophor, *sig* can refer to a matrix object when the object is the individual whose perspective or point of view is represented in the sentence. This is shown in (17).

<sup>13</sup>Reinhart and Reuland (1991, 316) noted that there is a fair amount of variation in the logophoric use of anaphors and pronouns in different languages. Thus, Dutch only allows its Self anaphors to be used logophorically, whereas Icelandic uses *sig*.

<sup>14</sup>However, some Icelandic speakers allow a relaxation of the subjunctive mood requirement and also allow *sig* to have a logophoric role in indicative complements to semifactive verbs, for example, *sjá* 'see', *vita* 'know', and so on (see Maling (1984), Sigurðsson (1990)). An example from this dialect given in (i), which is taken from Maling (1984, fn. 5).

- (i) Hann<sub>i</sub> vissi . . . hvað henni þótti<sub>(ind.)</sub> vænt um sig<sub>i</sub>.  
He knew . . . what her thought fond of sig  
'He knew how fond of sig she was.'

- (17) ?Jón er masókisti. Það gleður Jón<sub>i</sub> [að ég muni<sub>(subj.)</sub>  
 John is a masochist. It pleases John that I will  
 lemja sig<sub>i</sub> í hausinn með spýtu á morgun].  
 hit sig (= John) in the head with a stick tomorrow.

Moreover, logophoric *sig* can take as its antecedent even a non-c-commanding NP, as demonstrated in (18).<sup>15</sup>

- (18) a. [<sub>NP</sub> Skoðun Önnu<sub>i</sub>] er [<sub>CP</sub> að sig<sub>i</sub> vanti<sub>(subj.)</sub>  
 opinion Anna's is that sig (= Anna) lacks  
 hæfileika].  
 talents  
 'Anna's opinion is that sig lacks talents.'  
 b. Jón sagði Ara [frá ósk þórs<sub>i</sub>] um [<sub>CP</sub> að Pétur  
 John told Ari PP about wish þór's about that Peter  
 sýndi<sub>(subj.)</sub> sér<sub>i</sub> virðingu].  
 showed sig (= þór) respect  
 'John told Ari about þór's wish that Peter showed sig respect.'

In (18a,b) the antecedent of *sig* does not c-command *sig*, but it represents the person (distinct from the speaker) whose opinion or wish is reported on in the sentence.<sup>16</sup>

Although logophoric *sig* is not subject to the structural Binding Theory, the grammar still requires that *sig* receive phi-features in order to be interpreted. Hence, in a subjunctive complement clause, *sig* will either associate with a local Infl (modulo principles of grammar) and hence take a local subject antecedent, as in (19a), or it can find a logophoric antecedent outside of the local domain, as in (19b).

- (19) a. Jón<sub>i</sub> segir [að Pétur<sub>j</sub> raki<sub>(subj.)</sub> sig<sub>j/\*i</sub> á  
 [+ reflexive]  
 John says that Peter shaves sig (= Peter) on  
 hverjum degi].  
 every day  
 'John says that Peter shaves sig every day.'

<sup>15</sup>As previously mentioned, *sig* does not have a nominative form. Thus, *sig* can appear in subject position only with those verbs that select a nonnominative subject, that is, the so-called "quirky subjects" in Icelandic. The verb *vanta* 'to lack, need' in (18a) is one of these verbs and takes an accusative subject.

<sup>16</sup>The lack of c-command entails that in sentences such as (18a,b), *sig* is not functioning as a bound variable but rather is coreferent with its antecedent. As we discuss at length in Section 5, logophoric *sig* can enter into both binding and coreference relations.

- b. Jón<sub>i</sub> segir [að Pétur<sub>j</sub> raki<sub>(subj.)</sub> sig<sub>\*j/i</sub> á  
 [+ transitive]  
 John says that Peter shaves sig (= John) on  
 hverjum degi].  
 every day  
 'John says that Peter shaves sig every day.'

To sum up the discussion of long-distance *sig*, we assume that infinitives in Icelandic undergo restructuring at LF and thus that *sig* can associate with a higher Infl and take a long-distance subject antecedent. In this case, it is regulated by structural principles. No such restructuring exists in subjunctives and indicatives, and hence long-distance structural binding is ruled out in these cases. However, in subjunctive complements, *sig* has a logophoric use that is regulated by discourse mechanisms that are not part of the syntax proper.<sup>17</sup> As we soon see, our acquisition results provide further support for the proposal that the long-distance use of *sig* out of subjunctives and infinitives is governed by different principles.

### 3 THE EXPERIMENTAL DESIGN

In our study, which was carried out in Reykjavík, Iceland, in the spring of 1991, we tested 55 Icelandic-speaking children between the ages of 3;3 and 6;0 and 10 adult controls on their interpretation of *sjálfan sig*, *sig*, and pronouns. A description of the subjects tested is given in Table 1.

The subjects were tested on both an act-out task and a modified judgment task, developed by Crain and McKee (1985). In both tasks, the children heard the same target sentences. The types of sentences tested are given in Table 2. As outlined in Table 2, there were three factors in the experimental design. First, we varied the mood of the complement clause and tested complex sentences with indicative, subjunctive, and infinitival complements. Second, we tested the local anaphor *sjálfan sig*, *sig*, and pronouns. Finally, we tested verbs of both the *raka* class ('shave') and the *gefa* class ('give'). Four verbs of each class were tested and varied over the different conditions.<sup>18</sup>

<sup>17</sup>The claim that the long-distance use of *sig* out of infinitives and subjunctives is governed by different mechanisms is supported by the fact that pronouns in infinitive complement clauses cannot take a long-distance subject antecedent (as discussed in footnote 12), whereas pronouns in subjunctives can. The pronoun facts support the idea that infinitives differ from subjunctives in that infinitive sentences restructure at LF and become "monoclausal," forcing the pronoun to find an extracausal antecedent. This is discussed in more detail in Sigurjónsdóttir (1992).

<sup>18</sup>The verbs tested were: *þvo* 'wash', *þurrka* 'dry', *greiða* 'comb', and *klóra* 'scratch' of the *raka* class; and *klappa* 'pat', *lemja* 'hit', *gefa* 'give', and *benda á* 'point to' of the *gefa* class. All of these verbs appear in the first transcripts from three Icelandic children who were followed

TABLE 1  
Description of Subjects

Age Group	Age	Mean Age	Number of Subjects		
			Girls	Boys	Total
G1	3;03;01-4;00;00	3;07:16	8	7	= 15
G2	4;00;01-4;06;00	4;03:12	5	5	= 10
G3	4;06;01-5;00;00	4;09:21	5	5	= 10
G4	5;00;01-5;06;00	5;03:00	5	5	= 10
G5	5;06;01-6;00;00	5;09:13	5	5	= 10
Adults	Adults	41;03:13	5	5	= 10
			33	32	65

Note. Age is given as years; months; weeks.

TABLE 2  
Types of Sentences Tested in the Study

	<i>raka Verbs</i>			<i>gefa Verbs</i>		
	<i>sjálfan sig</i>	<i>sig</i>	<i>Pronoun</i>	<i>sjálfan sig</i>	<i>sig</i>	<i>Pronoun</i>
Indicative	x	x	x	x	x	x
Subjunctive	x	x	x	x	x	x
Infinitive	x	x	x	x	x	x

The act-out task was the Simon-Says-Game developed by Wexler and Chien (1985) in which children are asked to perform an action given in a sentence. Each child was asked to act out one token of each of the conditions in Table 2, or 18 complex sentences. Each target sentence was preceded by an introductory sentence, as in (20).<sup>19</sup>

(20) Introductory sentence: *Döndald Duck, Fred Flintstone and [child's name (boy)] are very dirty because they were outside playing in the mud.*

Test sentence: *Andrés Önd segir [nafn barns] að þvo<sub>(inf.raka verb)</sub> honum.*  
'Donald Duck tells [child's name (boy)] to wash him.'

longitudinally from the age of 2;0 to 3;2, 4;0, and 5;10, respectively. (The longitudinal natural production data were obtained from Hrafnhildur Ragnarsdóttir at the Icelandic University College of Education.)

<sup>19</sup>In our study, we modified Wexler and Chien's (1985) task slightly and included an introductory sentence. This was intended to provide a plausible contextually appropriate extrasentential antecedent for the pronoun (see Grimshaw and Rosen (1990)). For ease of exposition, we provide only the English translation of the introductory sentences.

TABLE 3  
Types of Sentences and Scenarios Tested in the Judgment Task

	<i>raka Verbs</i>									<i>gefa Verbs</i>								
	<i>sjálfan sig</i>			<i>sig</i>			<i>Pronoun</i>			<i>sjálfan sig</i>			<i>sig</i>			<i>Pronoun</i>		
	<i>Loc</i>	<i>LD</i>	<i>EC</i>	<i>Loc</i>	<i>LD</i>	<i>EC</i>	<i>Loc</i>	<i>LD</i>	<i>EC</i>	<i>Loc</i>	<i>LD</i>	<i>EC</i>	<i>Loc</i>	<i>LD</i>	<i>EC</i>	<i>Loc</i>	<i>LD</i>	<i>EC</i>
Indicative	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Subjunctive	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Infinitive	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

*Note.* Loc = local scenario; LD = long-distance scenario; EC = extraclausal scenario.

Thus, in (20), the child had to wash either himself (the local antecedent), Donald Duck (the long-distance antecedent), or Fred Flintstone (the extraclausal referent).

As previously mentioned, the sentences outlined in Table 2 were also tested in a truth-value judgment task, which was developed by Crain and McKee (1985). As illustrated in Table 3, in the judgment task the child hears the same sentence three times following three different scenarios, a local scenario, a long-distance scenario, and an extraclausal one.

In the judgment task, one experimenter manipulated a puppet, while a second experimenter staged an event, using props, in front of the child and the puppet. After each scenario the puppet "described" the staged event with a sentence and the child had to judge whether the puppet's sentence was a correct or an incorrect description of the staged scenario. Thus, in the judgment task, judgments are elicited from children by asking them if a sentence (that is uttered by a puppet) can have the particular meaning corresponding to the scenario acted out by a second experimenter. Note that this task not only requires children to accept certain sentence-meaning pairs but also to reject them, and children will often say "no" to the puppet's description of the staged scenario (the test sentence). Hence, in the judgment task, the child has the opportunity to tell the experimenter which interpretations of a sentence are grammatical for the child and which are not. Thus, the judgment task accesses multiple interpretations, whereas the act-out task allows the child to act out only one interpretation of a sentence.<sup>20</sup>

<sup>20</sup>The real advantage of the judgment task shows up in sentences that have two or more grammatical interpretations, because the child is asked to judge the grammaticality of the ambiguous sentence under each interpretation. In the act-out task, on the other hand, the child must choose one interpretation to act out from among the multiple grammatical interpretations. In the case where children are consistent in acting out one particular interpretation, it is an interesting question as to why they choose to act out the interpretation they do. We turn briefly to this issue in Section 5.

An example from the judgment task, using the local anaphor *sjálfan sig*, is given in (21).<sup>21</sup>

- (21) Dino, Batman, and the Dog were swimming in the Vesturbæjarswimming pool. Dino and the Dog didn't have any clothes on, but Batman went swimming in the Batman costume. The Batman costume was all wet and Dino feared that the costume would be destroyed. Dino said to Batman: "Oh, I want you to dry you (yourself)," and look what Batman did!  
 Scene (Local): Batman dries himself. (Match)  
 Test sentence: Dínó vildi að Batman þurrkaði<sub>(subj. raka verb)</sub>  
 (= Puppet's Dino wanted that Batman dried  
 description) sjálfum sér.  
 Self sig  
 'Dino wanted Batman to dry himself.'

In this example, the scene matches the puppet's description, and a child who knows that *sjálfan sig* reflexive-marks its predicate and thus requires a local antecedent in accordance with Principle A should judge the puppet's description of the scenario as correct. In (22), the same sentence is tested (*sjálfan sig* in a subjunctive complement clause with a *raka* verb), now following a long-distance scenario. Note that the characters and the four verbs of each verb class were varied across the sentences so that the children would not be bored and so that they would not perceive some of the sentences as contrasting with others previously presented.

- (22) Donald Duck, Jerry, and Pluto were playing in the yard. Jerry sprayed water on Donald Duck. Donald Duck started to cry, and said to Jerry: "Oh, I want you to dry me," and look what Jerry did!  
 Scene (Long distance): Jerry dries Donald Duck. (Mismatch)

<sup>21</sup>Recall from Section 2.1 that Icelandic uses the oblique case forms of the pronouns *ég* 'I' and *þú* 'you' to refer back to 1st and 2nd person pronouns. In the experiment, we used these pronouns in their nonreflexive-marked forms in describing the scenarios: *ég* 'I'; *mig* (accusative), *mér* (dative) 'me'; *þú* 'you'; *þig* (accusative), and *þér* (dative) 'you'. Typically, pronominal forms are not used in context sentences in binding experiments. We feel confident, however, that these forms did not interfere with the children's performance in the experiment. First, longitudinal records of Icelandic children show a correct use of 1st and 2nd person pronouns by age 2;3 to 2;6 (see Pálsdóttir (1983)), which is younger than the youngest children in our study, who were 3;3. Also, an informal interview following each child's judgment of a test sentence clearly established that the children correctly understood the reference of *ég* 'I' and *þú* 'you'.

Test sentence: Andrés Önd vildi að Jenni  
 (= Puppet's Donald Duck wanted that Jerry  
 description) þurrkaði<sub>(subj. raka verb)</sub> sjálfum sér.  
 dried Self sig  
 'Donald Duck wanted Jerry to dry himself.'

In this case, the staged event does not match the puppet's description, and a child who obeys Principle A of the Binding Theory should judge the puppet's description of the staged scenario as incorrect, because the local anaphor *sjálfan sig* cannot take a long-distance antecedent (Donald Duck in (22)). This same sentence was also tested following an extraclausal scenario, which is exemplified in (23).

- (23) Mickey Mouse, Daddy Bear, and the little Pony were sunbathing in Heiðmörk. Suddenly a big fly came and pricked the little Pony in the leg. The little Pony screamed because his leg was itching. Mickey Mouse said to Daddy Bear: "Oh, I don't want to stand up, but I wish that you would scratch the little Pony in the leg so he would stop screaming," and look what Daddy bear did!  
 Scene (Extraclausal): Daddy bear scratches the little Pony. (Mismatch)

Test sentence: Mikki vildi að Bangsapabbi  
 (= Puppet's Mickey wanted that bear's-daddy  
 description) klóraði<sub>(subj. raka verb)</sub> sjálfum sér.  
 scratched Self sig  
 'Mickey Mouse wanted Daddy bear to scratch himself.'

As was the case in (22) where the local anaphor *sjálfan sig* took a long-distance antecedent, in (23) the scene does not match the puppet's description. Thus, the anaphor *sjálfan sig* has to be bound to a coargument and cannot refer to an extraclausal antecedent (the little Pony in (23)). As was outlined in Table 3, the subjects were tested on 18 triplets such as (21), (22), and (23). Thus, in the judgment task, each child was tested on 54 sentences. The sentences with indicative and infinitive complement clauses were of the same format as the subjunctive sentences illustrated in (21)–(23), and each test sentence was preceded by a different story. Let us now turn to the results.

#### 4. RESULTS

In this section, we present the results of our study. We emphasize that in this section we present an analysis of individual subjects and that subjects

are classified according to grammar type. This kind of analysis allows us to compare the performance of individual children across different sentence types. For example, we are interested in comparing children's performance on pronouns and *sig* (with the *gefa* verbs), because the Binding Theory that we assume predicts similar results for these two conditions. In Section 5, when we consider the question of whether children are assigning a bound variable or a coreference interpretation to *sig* and the pronouns, we are more interested in patterns of responses across children and, hence, we use group data.

A related matter concerns the selection of subjects. For the purpose of our analyses, we excluded those children who did not know that *sjálfan sig* and *sig* are anaphors and *hann* 'he' / *hún* 'she' pronouns. Thus, in order to test a child on Principles A and B, for example, we must first be certain that the individual child knows whether a particular lexical item is an anaphor or a pronoun. If a child has not figured out that a lexical element, such as *sjálfan sig*, is an anaphor then that child is not an appropriate subject to test for Principle A. The test for this lexical knowledge was based on the experimental stimuli described in Table 3, that is, on the children's judgments in the judgment task. Recall that the crucial property of anaphors is that they must have an antecedent to be interpreted, that is, anaphors cannot be used deictically (see footnote 3). As we saw in Table 3, there were six conditions in which a child was presented with an extraclausal scenario for *sjálfan sig*, that is, where *sjálfan sig* was used deictically: in indicative, subjunctive, and infinitive complement clauses with both *raka* and *gefa* verbs. In order to be classified as knowing that *sjálfan sig* is an anaphor, the child had to reject five out of the six test sentences where *sjálfan sig* was used to describe an extraclausal referent. If a child judged more than one such sentence as grammatical, we concluded that he or she did not know that *sjálfan sig* was an anaphor and the child's data were excluded from the results for *sjálfan sig*.

The same criterion was used to determine if a child knew the anaphoric properties of *sig*. Again, as was illustrated in Table 3, the children were presented with six extraclausal scenarios for *sig*: in indicative, subjunctive, and infinitive complement clauses with both *raka* and *gefa* verbs. The children were required to reject five out of six such sentences, otherwise we concluded that they did not know the anaphoric properties of *sig* and their data were not included in our analyses for *sig*.

Similarly, in order to be categorized as knowing that *hann* 'he' and *hún* 'she' are pronouns, a child had to know that a pronoun can be used referentially, that is, that the pronoun can take an extraclausal referent. Recall from Table 3 that the children were tested on six conditions involving an extraclausal scenario for pronouns (i.e., with *raka* and *gefa* verbs in the indicative, subjunctive, and infinitive moods). In order to be classified as

knowing that a pronoun is a pronoun, a child had to accept five out of the six test sentences where a pronoun takes an extraclausal antecedent. However, because a number of adults consistently rejected the extraclausal antecedent for the pronoun in the judgment task, we included another test for the pronoun sentences. Because we believed that this response pattern was due to the fact that the extraclausal referent of the pronoun was not mentioned in the test sentence, although it was present in the staged scenario, we included sentence (24) in the task, where the test sentence is preceded by a context sentence that provides a plausible discourse antecedent for the pronoun.

- (24) The Octopus Lady, the Smurf Girl, and Snow White were going to a party. Snow White had dirt spots on her dress. The Octopus Lady didn't think Snow White looked good enough like this. The Octopus Lady said to the Smurf Girl: "Wash Snow White!" and look what the Smurf Girl did!

Scene (Extraclausal): The Smurf Girl washes Snow

White.

(Match)

Test sentence: Mjallhvít var með svarta bletti í kjólnum.  
(= Puppet's Snow White was with black spots on the dress.  
description)

Kolkrabbakonan sagði Strumpastelpunni  
The Octopus Lady told the Smurf Girl

að þvo<sub>(inf. raka verb)</sub> henni.  
to wash her.

'Snow White had dirt spots on her dress. The  
Octopus Lady told the Smurf Girl to wash her.'

Subjects who accepted the sentence in (24) were included in our analyses of pronouns even if they did not meet the previous requirement of accepting five out of six pronoun sentences. Our hypothesis that the subjects rejected the extraclausal interpretation for the pronoun because of a lack of a plausible discourse antecedent was confirmed by the fact that all the adult controls who failed the previous test accepted the sentence in (24), which included a discourse antecedent for the pronoun.

The number of children in each age group who, according to our criterion, know that *sjálfan sig* and *sig* are anaphors and that *hann* 'he'/'*hún* 'she' are pronouns are given in Table 4. Note that because children learn individual lexical items separately (i.e., a child may know that *sjálfan sig* is an anaphor but not know the pronominal status of *hann* 'he'/'*hún* 'she'), we did not require a child to pass both the anaphor test for *sjálfan sig* and for *sig* as well as the pronoun test in order to be included in our analyses. Rather, if a child passed the tests for *sjálfan sig* and pronouns, but not for *sig*, his or her data were included in the analysis of *sjálfan sig* and pronouns, but not of *sig*. Hence, in Table 4, the percentages in each column reflect the

TABLE 4  
 Number of Children in Each Age Group Who Know That *sjálfan sig* and *sig*  
 are Anaphors and Pronouns are Pronouns

	<i>sjálfan sig</i>		<i>sig</i>		Pronouns	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
G1	8/15	53	6/15	40	11/15	73
G2	10/10	100	7/10	70	9/10	90
G3	10/10	100	9/10	90	9/10	90
G4	9/10	90	8/10	80	10/10	100
G5	10/10	100	10/10	100	9/10	90
Adults	10/10	100	10/10	100	10/10	100
	<u>57</u>		<u>50</u>		<u>58</u>	

number of children who knew the anaphoric/pronominal properties of the lexical item heading each column. For example, at G1, there are 8 children out of the 15 tested who knew that *sjálfan sig* was an anaphor, 6 who knew the anaphoric properties of *sig*, and 11 who knew that the lexical items *hann* 'he' and *hún* 'she' were pronouns. These are the children included in our analyses of each lexical item.

The results follow. In Section 4.1, we present children's performance on pronouns as compared to the local anaphor *sjálfan sig*. In Section 4.2, we look at their performance on *sig*, first in indicative and subjunctive complements and then in infinitives. Next, in Section 4.3, we compare the children's performance on *sig* to their performance on pronouns. Finally, in Section 4.4, we briefly discuss children's knowledge of the Chain Condition.

#### 4.1 Performance on Pronouns vs. *sjálfan sig*

Let us turn first to the issue of the apparent developmental delay of pronouns as compared to anaphors. As we mentioned in Section 1, a number of cross-linguistic acquisition studies have reported that children's performance on pronouns lags behind their performance on local anaphors (i.e., at an age when children reliably locally bind anaphors, they are still allowing pronouns to take a local antecedent).

The number of Icelandic-speaking children who demonstrated knowledge of the locality requirement on *sjálfan sig* and the antilocality requirement on pronouns are given in Figures 1 and 2. Because *sjálfan sig* is a Self anaphor that reflexive-marks its predicate, it follows by Principle A that *sjálfan sig* has to be coindexed with a coargument of the predicate and cannot take a long-distance antecedent. Recall from Table 3 that there were six conditions in which the children were presented with a long-distance scenario for *sjálfan sig* (i.e., with *raka* and *gefa* verbs in the indicative,

subjunctive, and infinitive moods). In order to pass the Principle A test in the judgment task, a child had to reject five of the six test sentences where the local anaphor *sjálfan sig* had a long-distance interpretation. The same criterion was used in the act-out task. As was illustrated in Table 2, the children had to act-out six test sentences with *sjálfan sig*. If a child gave five or six local responses, he or she was considered to know Principle A; other response patterns were taken to indicate lack of knowledge of Principle A.

The same criterion was used for pronouns. Table 2, which represents the conditions tested in the act-out task, and Table 3, which outlines the types of sentences tested in the judgment task, show that the child had to act out six sentences with pronouns in the act-out task and had to judge six scenarios where a pronoun took a local antecedent in the judgment task. In order to be categorized as knowing that a pronoun cannot take a local antecedent, a child had to act out a long-distance (LD) or extraclausal (EC) interpretation at least five (out of six) times in the act-out task and reject at least five of the six test sentences where a pronoun was used to describe a local antecedent in the judgment task.

Figures 1 and 2 show the children's performance on the local anaphor *sjálfan sig* and pronouns in the act-out and the judgment tasks, respectively. In each figure, the age group is listed along the abscissa and the percentage of children who knew the relevant properties of *sjálfan sig* and pronouns along the ordinate. In Figures 1 and 2, the line with squares indicates the percentage of individual children who knew (given the criterion discussed earlier) that *sjálfan sig* can only take a local antecedent, and the line with

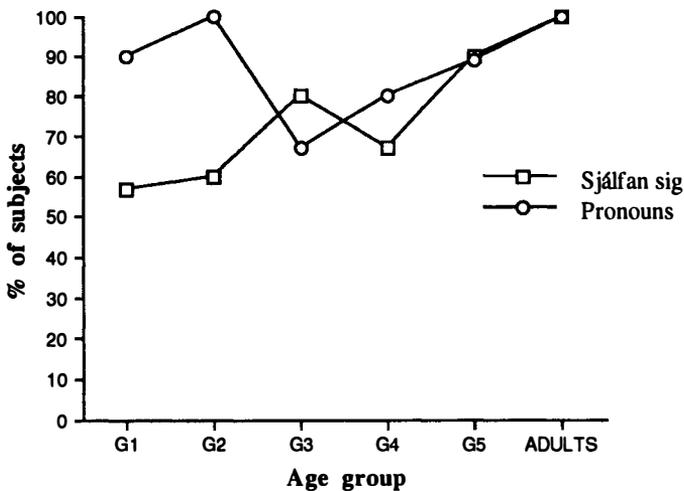


FIGURE 1 Act-out task: % of individual subjects who chose a local antecedent for *sjálfan sig* and LD and EC antecedents for pronouns.

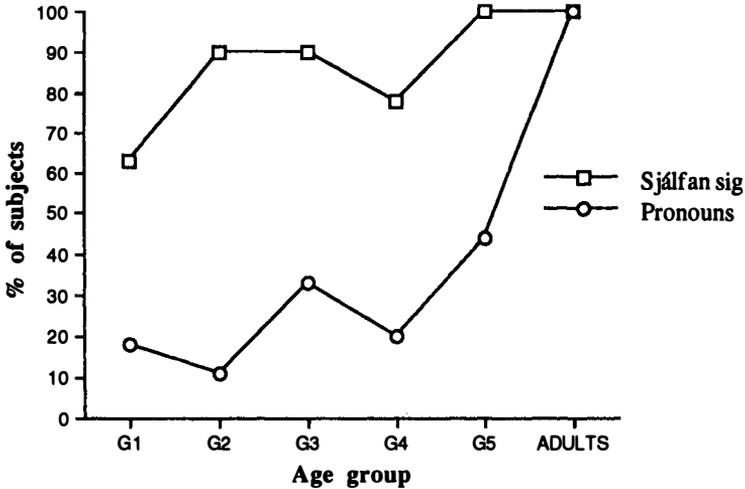


FIGURE 2 Judgment task: % of individual subjects who knew that *sjálfan sig* requires a local antecedent and pronouns require L-D or EC antecedents.

circles indicates children who knew that pronouns cannot refer to a coargument.

Figure 1 shows that according to the act-out task, most of the children in each age group seemed to know that the anaphor *sjálfan sig* has to be bound to a coargument and that a pronoun cannot take a local antecedent, that is, the children do very well on both anaphors and pronouns. Hence, in the act-out task, most of the children seem to know the antilocality requirement on pronouns, and, more important, the children's performance on pronouns does not lag behind their performance on the local anaphor *sjálfan sig*.

However, in the judgment task, represented in Figure 2, the results are quite different. Here, we do find a developmental delay of pronouns as compared to *sjálfan sig* for many children. Figure 2 shows that whereas 90% of the children who were 4 years and older (G2–G5) knew that *sjálfan sig* has to take a local antecedent, only 11% to 44% knew that pronouns cannot refer to a coargument. Thus, the judgment task, which taps a child's multiple interpretations of a sentence, shows that most of the Icelandic children do readily accept a local antecedent for a pronoun. These results replicate the results of many studies on the acquisition of binding (see, e.g., Chien and Wexler (1987), Jakubowicz (1984), Jakubowicz and Olsen (1988), Lee and Wexler (1987)), which have revealed that children have greater difficulty with pronouns than with local anaphors.

Note also that if we compare the children's performance with the local anaphor *sjálfan sig* in Figures 1 and 2, their performance in this domain was

rather stable across the two tasks. However, the children's performance with pronouns varied significantly between the act-out task and in the judgment task. In particular, many children accepted a local antecedent for pronouns in the judgment task, though in the act-out task, they chose the correct nonlocal antecedent. In this respect, our results replicate those of McDaniel, Cairns, and Hsu (1990), who also compared the results of an act-out and a judgment task and concluded that children do better on pronoun sentences in an act-out task than in a judgment task. We return to the pronoun results in Section 5, where we discuss the implication of these findings.

#### 4.2 *Sig*

In the following two subsections, we present the results for *sig* in each of the conditions tested (as outlined in Tables 2 and 3). Figures 3–10 show the results for *sig* in subjunctive, indicative, and infinitive sentences with both the *raka* and the *gefa* verbs in the act-out and the judgment tasks. In each figure, the age group is listed along the abscissa and the percentage of children who showed a particular response pattern is given along the ordinate.

Each figure from the act-out task presents the results of one test sentence (recall that we tested one token of each of the conditions outlined in Table 2). The figures from the act-out task give the percentage of individual children in each age group who responded in a certain way. The line with squares indicates the percentage of children who performed the action in the test sentence on themselves (local antecedent); the line with circles indicates children who acted upon the prop mentioned in the test sentence (LD antecedent); and the line with triangles indicates choice of the prop present in the experimental setting but not mentioned in the test sentence (EC antecedent).

Similarly, each figure from the judgment task reports the children's judgments on one test sentence (e.g., *sig* with a *raka* verb in a subjunctive complement, etc.), which was presented three times following three different scenarios: a local scenario, a long-distance scenario, and an extraclausal one, as specified in Table 3. Thus, each judgment task figure summarizes the children's responses to one triplet of test sentences, such as the one exemplified in (21)–(23). The figures from the judgment task show the percentage of individual children in each age group with a particular grammar type. The line with squares indicates children who only accepted the test sentence in question (e.g., *sig* in a subjunctive complement with a *raka* verb) when it was used to describe a local scenario; these children rejected both the long-distance and the extraclausal scenarios (local grammar). The line with black triangles indicates children who accepted the test

sentence as a grammatical description of both the local and the long-distance scenarios but who rejected the extraclausal one (local + long-distance grammar). The line with circles indicates children who accepted only the long-distance interpretation of the test sentence, and said “no” to both the local and the extraclausal interpretations (long-distance grammar). Finally, the line with *x*s indicates children who rejected all three scenarios (Reject all antecedents). Note that in the judgment task, none of the children who are included in our analyses of *sig* accepted an extraclausal interpretation for *sig*, and hence, the figures from the judgment task do not indicate this possibility. However, some of the children chose an extraclausal antecedent for *sig* in the act-out task, and as previously discussed, this is indicated in the figures from the act-out task. Let us now turn to the results for *sig* in subjunctive and indicative complement clauses. These results bear on the question of whether children develop the logophoric use of *sig*.

**4.2.1 *Sig* in subjunctive and indicative complements: The development of logophoricity.** Recall that Reinhart and Reuland’s Binding Principles A and B apply in the local domain, that is, to the argument (thematic) domain of the verb. Because *sig* in our test sentences is always the direct object of the verb of the complement clause (and is not contained in an adjunct), it follows that when our subjects chose or accepted a local antecedent for *sig*, *sig* was subject to Binding Principles A and B. When *sig* takes a long-distance antecedent, however, it either undergoes restructuring and is subject to the structural Binding Theory (the results of *sig* in infinitive clauses are discussed in the next section), or *sig* can find an antecedent logophorically. As a logophor, *sig* is not subject to syntactic principles but has to fulfill certain semantic (discourse) requirements (i.e., the antecedent must be the individual (other than the speaker–narrator) whose thought, speech, feeling, or point of view is reported on in the sentence; see Maling (1984), Sells (1987), Sigurðsson (1990), Thráinsson (1991), etc.). In our test sentences, the long-distance antecedent in subjunctives fulfilled all the semantic (discourse) requirements of logophoricity. In this section, we present the results of *sig* in subjunctive and indicative complement clauses.

As we noted earlier, adults treat *sig* differently depending on whether a *raka* or a *gefa* verb governs it. Reinhart and Reuland’s theory predicts that with a *raka* verb in a subjunctive complement, *sig* can take either a local or a long-distance antecedent, whereas *sig* in indicative complements of verbs of this class can only have a local interpretation. Recall that verbs of this class have a dual lexical entry: one in which the verb is lexically marked as [+ reflexive] on its theta grid and another one in which it is transitive (i.e., nonreflexive-marked). When *sig* occurs with the reflexive-marked entry, it has to be locally bound by Principle A. With the transitive entry, on the

other hand, Principle B rules out local binding of *sig*, as the predicate is not reflexive-marked. In this case if the predicate is subjunctive, *sig* can find a long-distance antecedent logophorically. This option is normally not available in indicatives, as verbs that take an indicative complement usually do not report their subjects' point of view (i.e., do not have a logophoric meaning).

The results for *sig* with a *raka* verb in subjunctive sentences are given in Figures 3 and 4. The results of the act-out task, given in Figure 3, suggest that when the adults are given a forced choice, there is a preference for the long-distance antecedent. Figure 4 reports the results of the judgment task. As predicted, the majority of adults (80%) allowed both the local and long-distance antecedents for *sig* with *raka* verbs in the subjunctive.

Turning to the children's responses with the *raka* verbs in subjunctives, we see in Figure 3 that in the act-out task, children overwhelmingly preferred the local antecedent for *sig* in marked contrast to the adults. The figure shows that 80% to 89% of the children in age groups G1 to G3 chose the local antecedent. The children's judgments are given in Figure 4. We see that in the two youngest age groups only 14% to 17% of the children allowed both the local and the long-distance interpretation of *sig*, whereas 80% of the adults fell into this group. The majority of children in G1 and G2, or some 50% to 72%, allowed only a local antecedent for *sig*. Thus, the children (younger than 4;6) differed markedly from the adults on both tasks. Most of the children accepted only a local interpretation for *sig* in the

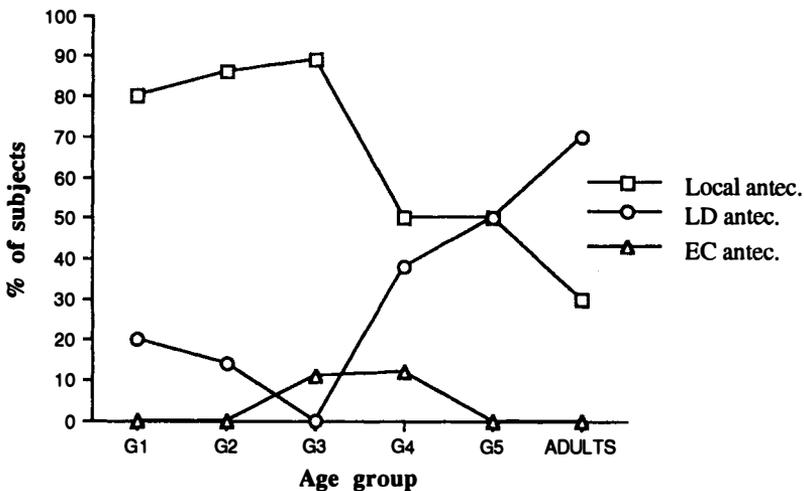


FIGURE 3 Act-out task: Individual subjects' choice of an antecedent for *sig* in a subjunctive sentence with *raka* verb.

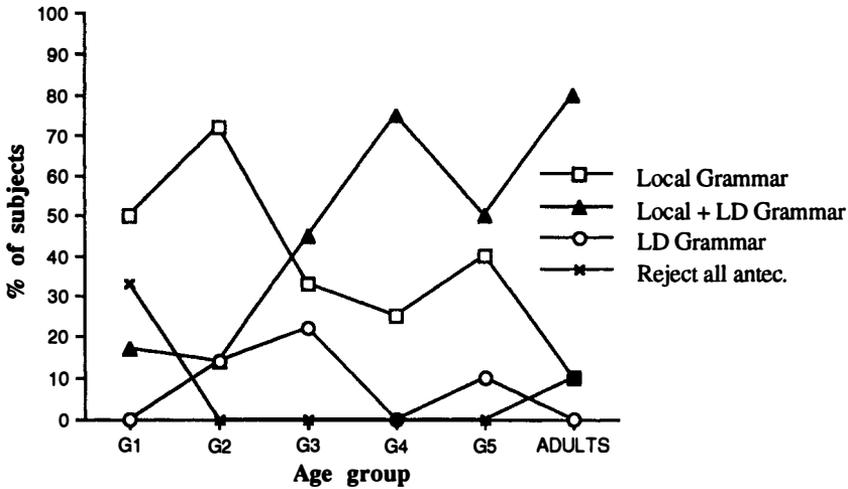


FIGURE 4 Judgment task: Grammar types of individual subjects for *sig* in a subjunctive sentence with a *raka* verb.

judgment task, and in the act-out task the majority of children chose the local antecedent.

One possible interpretation of this result is that young Icelandic-speaking children do not yet have the logophoric use of *sig*. However, as becomes apparent when we discuss *sig* in subjunctive complements to the *gefa* verbs, these children did know that *sig* can function as a logophor, and even the youngest children allowed a long-distance (logophoric) use of *sig* with this verb class. Thus, our interpretation of the *raka* results in Figures 3 and 4 is that many young Icelandic-speaking children have only acquired the [+reflexive] marked entry of verbs of this class. Because the children have not acquired the transitive entry of the *raka* verbs and only have the reflexive-marked entry, Principle A requires *sig* to be locally bound in all cases and the long-distance (logophoric) reading of *sig* is not available.

The hypothesis that the [+reflexive] entry of the *raka* verbs is an earlier acquisition than the [+transitive] entry is supported by longitudinal natural production data from three Icelandic children.<sup>22</sup> In the longitudinal data, we found that between 2;0 and 4;6, when *sig* occurs with a *raka* verb, it is always used to denote a reflexive action. Thus, *sig* either takes a local

<sup>22</sup>As mentioned in footnote 18, three Icelandic children were followed longitudinally from the age of 2;0 to 3;2, 4;0, and 5;10, respectively. (The longitudinal natural production data were obtained from Hrafnhildur Ragnarsdóttir at the Icelandic University College of Education.)

antecedent with a *raka* verb, as in (25a), or occurs with an inherently reflexive-marked verb, such as *flýta sér* 'to hurry', as in (25b).<sup>23</sup>

- (25) a. Hér er 'anna a - a' þvo sér.  
 Here is he to to wash sig  
 'Here he is washing sig.'  
 (Ari, 3;0) (raka-class verb)
- b. Hann var að flýta sér.  
 He was to hurry sig  
 'He was hurrying.'  
 (Ari, 4;6) (inherently reflexive-marked verb)

Returning to Figure 4, we see that the number of children who allowed *sig* to take both a local and a long-distance antecedent increased as a function of age, reaching adult level by G4, where 75% of the children allowed both antecedents. Notice that at G3 (when the children were 4;6 to 5;0), we see a large increase in the acceptance of long-distance responses for many children. This is the age at which we assume that many Icelandic children acquire the transitive entry of the *raka* verbs and, hence, start allowing the logophoric (or long-distance) use of *sig* with this verb class.

The results for indicative sentences are given in Figures 5 and 6. Figure 5 reports the results of the act-out task, and Figure 6, the judgment task.<sup>24</sup> Notice now by comparing the results on the judgment task for the subjunctive sentences in Figure 4 to the judgment task results for the indicative sentences presented in Figure 6, that the children's performance on subjunctives and indicatives diverges sharply around G3.

As just discussed, this is the point at which we assume that the children acquire the transitive entry of the *raka* verbs and thus allow the logophoric (or long-distance) use of *sig* with these verbs in the subjunctive. In the indicative, however, at this same point they develop a strong preference for the local antecedent. It is typically the case that if a language has the subjunctive mood and logophoric pronouns, these are associated. The

<sup>23</sup>In addition to the *raka* and *gefa* verbs, there are the so-called inherently reflexive verbs. These verbs cannot take an object that is distinct in reference from the subject, and in Icelandic, these verbs can only occur with *sig* and not with *sjálfan sig*, as is illustrated in (i).

- (i) María<sub>i</sub> skammast sín<sub>i</sub>/\*sjálfrar sín<sub>i</sub>.  
 [+ reflexive]  
 Mary ashamed sig/Self sig  
 'Mary is ashamed of sig/herself.'

<sup>24</sup>Due to space limitations we do not discuss the results of the act-out task presented in Figure 5. What the act-out task shows, however, is that the children and the adults strongly preferred the local antecedent in indicatives.

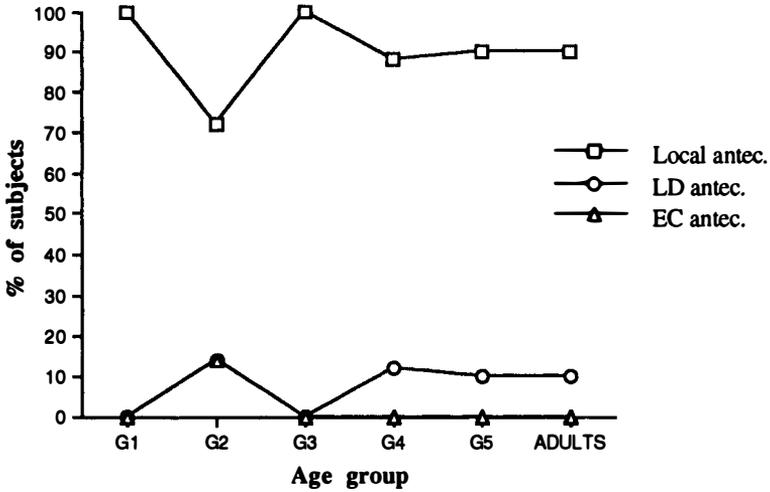


FIGURE 5 Act-out task: Individual subjects' choice of an antecedent for *sig* in an indicative sentence with a *raka* verb.

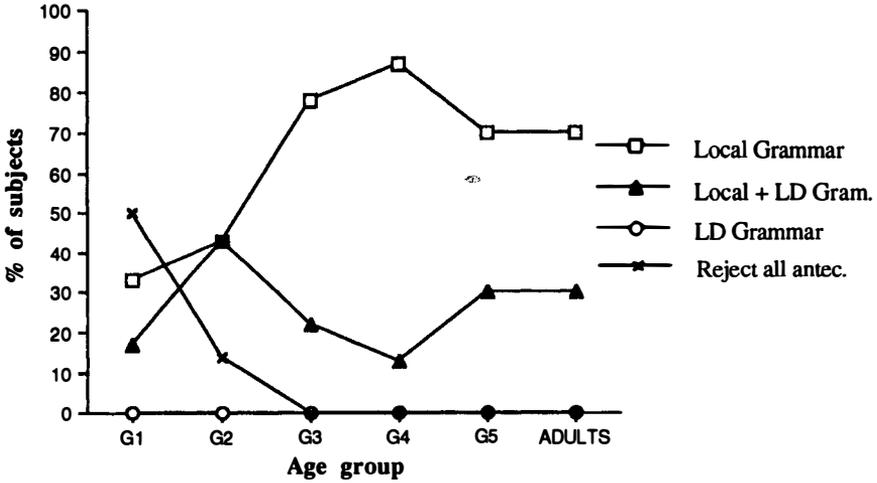


FIGURE 6 Judgment task: Grammar types of individual subjects for *sig* in an indicative sentence with a *raka* verb.

subjunctive mood is used in complements of thinking, saying, and perceiving, and it is precisely in complements of this type that the phenomenon of logophoricity is observed. Assuming that the association of a subjunctive mood and logophoricity follows from universal pragmatic or discourse principles, we expect that in a language such as Icelandic, once the child is

able to distinguish the subjunctive from the indicative mood, he or she should appropriately restrict the logophoric use of *sig* to the subjunctive.<sup>25</sup> The fact that it is at the same age in our study (when the children are 4;6 to 5;0) that we see an increase in the number of children who allow a long-distance response in the subjunctive and a local response in the indicative (see Figures 4 and 6) suggests that this is precisely the point at which the Icelandic children recognize the difference between subjunctive and indicative clauses. This finding is supported by longitudinal natural production data from one Icelandic child,<sup>26</sup> for whom subjunctive verb forms are almost nonexistent until the age of 5 years, when suddenly a number of verbs appear in the subjunctive mood. Thus, in the longitudinal data we see a morphological reflex of this development.

To sum up, our results indicate that many young Icelandic-speaking children (4;6 and under; G1 and G2 in the study) only have the reflexive-marked lexical entry of verbs of the *raka* class. These children only allowed *sig* to take a local antecedent, in marked contrast to the adults who accepted both the local and the long-distance interpretations. At the age of 4;6 to 5;0 (at G3 in our study), two developments occurred. First, the children acquired the transitive entry of the *raka* verbs and, hence, started to allow a logophoric (long-distance) use of *sig* with this verb class. Second, the children distinguished between subjunctive and indicative verb forms and appropriately restricted the logophoric (long-distance) use of *sig* to subjunctive complements. We assume that this association of logophoricity and the subjunctive mood follows from universal linguistic principles that are given to the child in advance. Let us now turn to the results for *sig* with the *gefa* verbs.

As we mentioned earlier, the *gefa* verbs have only a transitive entry. With verbs of this class, then, *sig* cannot take a local antecedent because Principle B rules out local binding when the predicate is not reflexive-marked. If the predicate is subjunctive, *sig* can function as a logophor and refer to the long-distance antecedent. Figures 7 and 8 give the results for *sig* with a *gefa* verb in subjunctive sentences.

Focusing our attention on the adult responses, we see that in the act-out

<sup>25</sup>Figure 6 shows that 70% of the adult controls accepted only a local interpretation for *sig* with a *raka* verb in the indicative. This follows from the fact that a logophoric (long-distance) reading of *sig* is for most speakers not available in indicatives. However, we see that 30% of the adults allowed both a local and a long-distance interpretation of *sig*. These adults presumably speak the dialect discussed in footnote 14 and allowed *sig* to have a logophoric role also in indicative complements to semifactive verbs, like *sjá* 'see', which was the matrix verb used in the indicative test sentences.

<sup>26</sup>As mentioned previously, we have longitudinal natural production data from three Icelandic children. One of these children was followed from the age of 2;0 to 5;0, whereas the other two were younger.

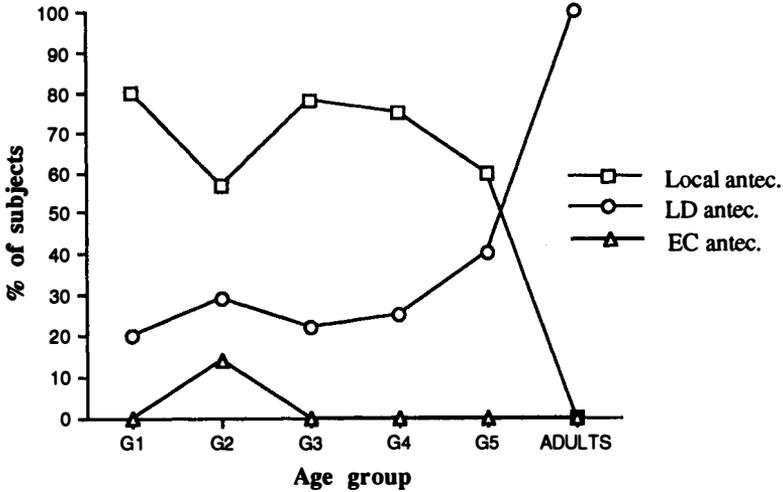


FIGURE 7 Act-out task: Individual subjects' choice of an antecedent for *sig* in a subjunctive sentence with a *gefa* verb.

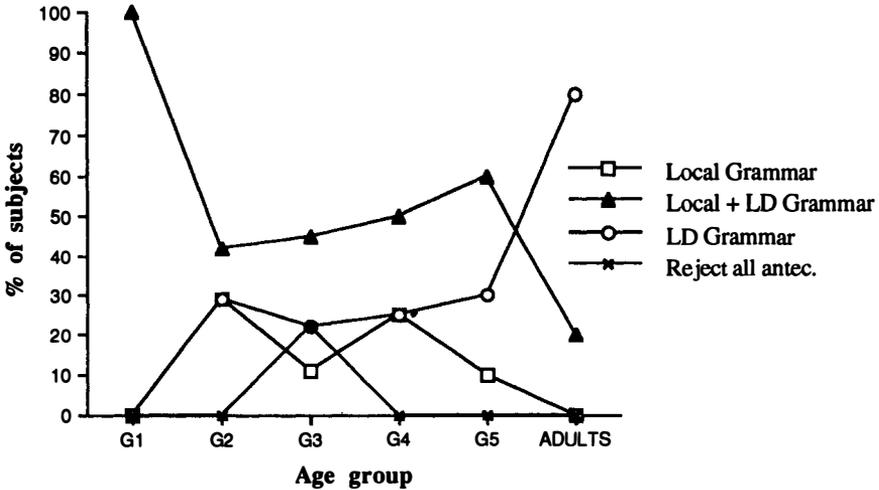


FIGURE 8 Judgment task: Grammar types of individual subjects for *sig* in a subjunctive sentence with a *gefa* verb.

task, all the adults preferred the long-distance antecedent for *sig* (Figure 7), and in the judgment task, 80% of the adults allowed only a long-distance interpretation of *sig* (Figure 8). These results are as expected. Principle B rules out local binding of *sig* with a *gefa* verb, because the predicate is not reflexive-marked and only a long-distance (logophoric) interpretation is available.

Turning to the results for the children, we see that their responses diverged sharply from the adults'. In the act-out task (Figure 7), 57% to 80% of the children in all age groups chose the local antecedent for *sig*. In the judgment task (Figure 8), all the children in the youngest age group and 42% to 60% of the children in age groups G2 to G5 allowed both a local and a long-distance interpretation of *sig*, whereas 10% to 29% accepted only the local interpretation. Hence, many children in our study allowed *sig* to have a local antecedent with the *gefa* verbs in apparent violation of Principle B of the Binding Theory. This is the same effect we saw with the pronouns in Section 4.1. We discuss this important result in more detail in Section 4.3.<sup>27</sup>

The results of the subjunctive sentences also show that many children, even in the youngest groups, allowed *sig* to function as a logophoric and take a long-distance antecedent. Thus, although most of the children in the two youngest age groups did not accept a logophoric (long-distance) reading of *sig* with the *raka* verbs, the results with *gefa* verbs show that the children did know that *sig* can be used logophorically. As we discussed earlier, we take the results of *sig* with the *raka* verbs to mean that children in age groups G1 and G2 had not yet acquired the transitive entry of verbs of this class, and hence, their grammar required *sig* to be locally bound. However, with the *gefa* verbs, which only have a transitive entry, the children aged 3;3

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<sup>27</sup>Our act-out task results differ from the findings of our previous study reported in Hyams and Sigurjónsdóttir (1990), where we tested Icelandic-speaking children's performance on *sig* with the verb *gefa* 'give' using only an act-out task. Whereas in this, our most recent study, the children chose the local antecedent in the act-out task 60% to 70% of the time, in our previous study, the children gave a long-distance response 30% to 83% of the time and picked the local antecedent only 6% to 30% of the time. The adult results, however, are the same across these two studies; all or almost all of the adults preferred the long-distance antecedent for *sig* in subjunctives.

The fact that the results for the children (and not for the adults) differ between the two studies suggests to us that pragmatic factors may have affected the children's responses in the earlier study. There are a number of differences in the design of the two act-out tasks. First, our previous study employed only the verb *gefa* 'give' in all the test sentences, whereas the present study used a number of verbs. Second, in the 1990 study, children were only interviewed twice, whereas this more recent study included many more interviews. Finally, in this study, all the test sentences were preceded by an introductory sentence and the children had more time to get accustomed to the dolls used in the test sentences than in our earlier study. Thus, the preponderance of long-distance responses in the previous study may be due to the fact that the children had not become familiar enough with the dolls and wanted to interact with them by giving them the toy described in the test sentence. That this study better represents the children's actual grammatical knowledge is supported by the fact that in this recent judgment task, children allowed both a local and a long-distance interpretation of *sig* with the *gefa* verbs, which confirms to us that the local reading (exhibited in the present act-out task) is grammatical for the children.

to 4;6 exhibited their knowledge of the logophoric (long-distance) use of *sig*.<sup>28</sup>

A final fact to note is that the adults and the children treated *sig* differently depending on whether a *raka* or a *gefa* verb governed it. By comparing the children's response patterns in subjunctives with the *raka* and the *gefa* verbs, we see that Icelandic children are attuned to these lexical differences at an early age (3;3 to 4;0). As we argued earlier in this section, many children in the youngest age groups only have the reflexive-marked lexical entry of the *raka* verbs and thus distinguished between reflexive-marked *raka* verbs and transitive (nonreflexive-marked) *gefa* verbs. Around the age of 4;6 to 5;0 (G3), many children seemed to acquire the transitive entry of the *raka* verbs and hence realized that the *raka* verbs had a dual lexical entry, whereas the *gefa* verbs only had one. Let us now turn to the results of *sig* in infinitive sentences.

**4.2.2 The development of structural long-distance binding in infinitives.** As previously discussed in regard to Reinhart and Reuland's (1991; in press) theory, the long-distance use of *sig* in infinitive and subjunctive complement clauses in Icelandic is governed by different modules. Thus, the long-distance use of *sig* in subjunctives is logophoric, that is, it obeys semantic (discourse) conditions, whereas the long-distance use of *sig* out of infinitives is structural, that is, it is subject to syntactic principles. Recall that the long-distance structural use of *sig* in infinitives involves restructuring of the infinitive verb at LF, where *sig* adjoins to its governing (infinitive) verb and moves with it from Infl to Infl as long as no finite (indicative or subjunctive) Infl intervenes. Thus, a central prediction of Reinhart and Reuland's theory is that the long-distance use of *sig* in subjunctives will differ from the long-distance use in infinitives.

Our results of *sig* with a *raka* verb in the infinitive are given in Figures 9 and 10. Focusing on the results for the adult controls in the judgment task,

<sup>28</sup>Notice that *sig* with a *gefa* verb in an indicative complement has no possible interpretation. On the one hand, Principle B rules out local binding of *sig* because the predicate is not reflexive-marked. On the other hand, the long-distance reading of *sig* is ruled out because indicatives do not license logophoric *sig*. However, instead of rejecting all antecedents, 70% of the adult controls in our study accepted both the local and the long-distance antecedent in the judgment task. In the act-out task, however, the adults performed at chance, as they chose the local antecedent 60% of the time and the long-distance antecedent 40% of the time. We believe that the subjects' responses in this case do not reflect their grammatical knowledge but rather reflect a strategy for dealing with uninterpretable test sentences in an experimental situation. It may be that the lack of a contrastive (grammatical) reading for the sentence biased the subjects to allow both interpretations in the judgment task. Because the test sentences for *sig* in indicative complements with the *gefa* verbs were not grammatical, we do not discuss these results further.

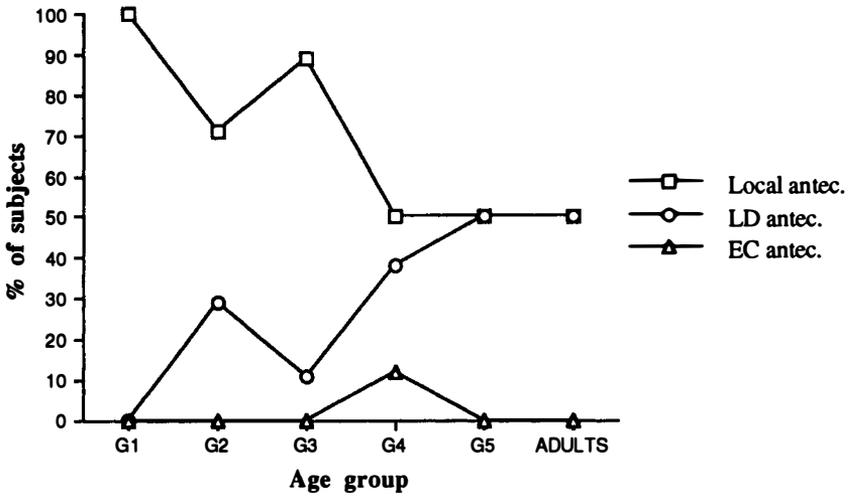


FIGURE 9 Act-out task: Individual subjects' choice of an antecedent for *sig* in an infinitive sentence with a *raka* verb.

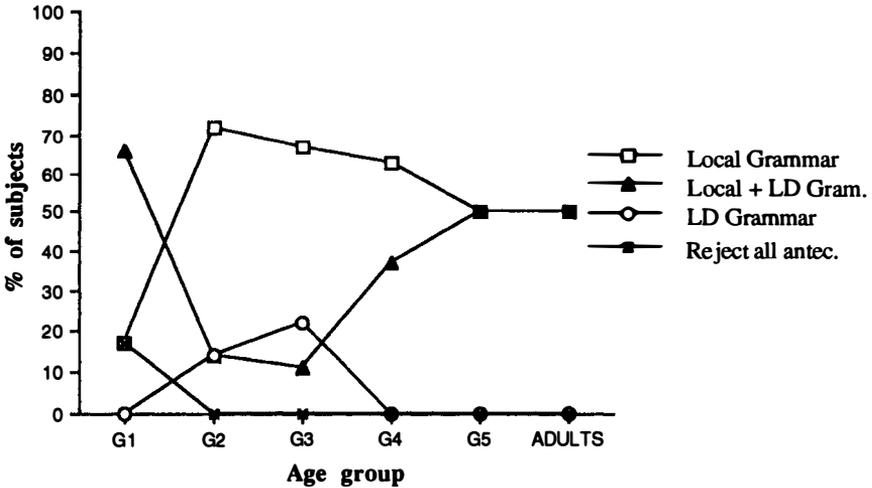


FIGURE 10 Judgment task: Grammar types of individual subjects for *sig* in an infinitive sentence with *raka* verb.

we see in Figure 10 that 50% of the adults accepted both the local and the long-distance interpretation of *sig* in an infinitive sentence with a *raka* verb, whereas the other 50% allowed only the local reading. The result that 50% of our adults rejected the long-distance antecedent in infinitives indicates that not all Icelandic adults allow restructuring of the infinitive verb and *sig*

to the higher clause at LF.<sup>29</sup> (A possible explanation for this difference is that for some speakers control infinitives are IPs and for others, they are CPs. Only IPs undergo restructuring. We leave this issue for future research.) As we see in Figure 10, the children approximated the adults, because in most age groups 50% to 72% of the children allowed only a local interpretation of *sig*, whereas 11% to 50% accepted both the local and the long-distance antecedents.<sup>30</sup>

Notice now that the adults' responses in the infinitive, given in Figure 10, are very different from their responses in the subjunctive, given in Figure 4. In the subjunctive case, 80% of the adults accepted both the local and the long-distance antecedent, whereas 10% allowed only the local interpretation of *sig*. By contrast, in the infinitive, 50% allowed both readings and the other 50% accepted only a local interpretation. The children in age groups G3–G5 patterned similarly; in the subjunctive, most of the children (45% to 75%) allowed both a local and a long-distance reading of *sig*, and in the infinitive, most children (50% to 67%) accepted only the local interpretation.

The fact that the adult response patterns differed in subjunctive and infinitive sentences with the *raka* verbs and that the children's responses approximated the adults' in both cases supports the hypothesis that the long-distance use of *sig* in the two moods is due to different mechanisms. Interpreting these results within the Reinhart and Reuland framework, we would say that most of the adults and the older children allowed both a bound and a logophoric (long-distance) use of *sig* in subjunctives, whereas 50% of the adults and a similar percentage of children in age groups G3–G5 belonged to a dialect that does not allow restructuring (long-distance) use of *sig* out of infinitives.

The different response patterns in infinitives and subjunctives exhibited by adults and children are not immediately explainable within theories like Pica (1987) and Wexler and Manzini's (1987), which proposed a unified treatment of long-distance *sig* in subjunctives and infinitives. Within the

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<sup>29</sup>We limit our discussion of *sig* in infinitive sentences to the *raka* verbs. We do not present the results of *sig* with the *gefa* verbs in infinitive complement clauses as these introduce complications beyond the scope of this article. We note, however, that the infinitive *gefa* results resemble the results we get in indicative sentences with the *gefa* verbs. (Recall that *sig* with the *gefa* verbs in an indicative complement has no possible interpretation.) This is presumably due to the fact that many subjects do not allow restructuring of the *sig* infinitive verb complex, and hence, just as in the indicative sentences, both the local and the long-distance interpretations of *sig* in infinitives are ungrammatical for these subjects (see footnote 28).

<sup>30</sup>We do not discuss the results of the act-out task presented in Figure 9. However, we see that Figures 9 and 10 look very similar (abstracting away from G1), that is, in the act-out task the children in the younger age groups chose the local antecedent, whereas the older children and the adults allowed the local and the long-distance interpretations to the same extent.

Wexler and Manzini (1987) Parameterized Binding Theory, the governing category for *sig* is [+indicative mood], and thus *sig* should allow a long-distance antecedent equally well out of subjunctives and infinitives. Similarly, Pica (1987) proposed that *sig* undergoes head movement out of infinitives and subjunctives, again predicting parallel performance on the two conditions.

#### 4.3 The Pronominality of *sig* and Principle B

Turning back to Figure 8, recall that 80% of our adult subjects accepted only the long-distance interpretation of *sig* with the *gefa* verbs in subjunctives. These results follow from Principle B, that is, *sig* with the *gefa* verbs cannot be bound to a coargument because the predicate is not reflexive-marked. In contrast to what occurred in the adult grammar, many children allowed *sig* to take a local antecedent with the *gefa* verbs, in apparent violation of Principle B. This is similar to their performance with pronouns. Recall from Section 4.1 that most of the children in our study also performed very badly on pronouns, allowing them to take a local antecedent. Within Reinhart and Reuland's model, *sig* is a pronominal both with regard to its internal structure and with regard to Principle B (when it occurs with a *gefa* verb). We thus predict that the children who allow local coreference of *sig* with the *gefa* verbs will also allow the pronouns to take a local antecedent.

However, in order to test our hypothesis that the results for *sig* are related to the results for the pronouns, it is necessary to do an analysis of individual subjects, which compares each individual child's performance on *sig* with his or her performance on pronouns. Only children who passed both the anaphor test for *sig* and the pronoun test, described in Section 4.1, were included in this analysis. Out of the 40 children who knew that *sig* was an anaphor and the 48 children who knew that pronouns were pronouns (see Table 4), 36 knew the relevant properties of both lexical items and thus were included in this analysis.

There are two specific predictions that follow from our hypothesis. First, we predict that children who do not allow a local interpretation of pronouns should also not accept a local antecedent for *sig*. Conversely, children who allow a pronoun to take a local antecedent should also allow a local interpretation of *sig*. Table 5 illustrates how many children adhered to these predictions and how many did not. Cells A and D are those that support our hypothesis, and most of the children behaved as predicted.

A Fisher's exact probability test indicates that our hypothesis is supported; that is, whether children allowed *sig* to take a local antecedent is significantly related to whether they allowed pronouns to take a local

TABLE 5  
Children's Judgments on *sig* are Related to Their Judgments on Pronouns

		<i>Pronoun</i>		
		<i>Do Not Allow Local Antecedent</i>	<i>Do Allow Local Antecedent</i>	<i>Total</i>
<i>sig</i>	Do not allow local antecedent	6 A	3 B	9 A + B
	Do allow local antecedent	6 C	21 D	27 C + D
		12 A + C	24 B + D	36 N

antecedent. This result is significant at the .02 level.<sup>31</sup> In Section 5, we provide an explanation for this finding as well as others discussed earlier. This explanation turns on the distinction between binding and coreference. First, however, we briefly discuss what our results tell us about children's knowledge of the Chain Condition.

#### 4.4 Children's Knowledge of the Chain Condition

If we abstract away from the *sig* results, we might want to suggest that the reason the children allowed a local antecedent for the pronouns is that they had not yet acquired the Chain Condition, which prohibits pronouns from entering into a local A-chain, discussed in Section 2.2. However, this suggestion is problematic on two counts. First, it fails to explain why the same children allowed a local antecedent for both the pronouns and *sig* (see Section 4.3). Second, if the children did not know the Chain Condition, we would predict a difference in their behavior with pronouns depending on whether the pronoun is governed by a *raka* verb or a *gefa* verb. Recall that the *raka* verbs have a dual lexical entry, [+reflexive] and [+transitive], and when *raka* verbs are [+transitive], they function like verbs of the *gefa* class with respect to the Binding Principles. For a reflexive-marked *raka* verb, the presentation in (26a) is ruled out uniquely by the Chain Condition, whereas for the transitive entry of the *raka* verbs and for *gefa* verbs, the representations in (26b) and (26c) are ruled out by both the Chain Condition and Principle B of the Binding Theory (a reflexive predicate is reflexive-marked).

- (26) a. \*Jón<sub>i</sub> rakar hann<sub>i</sub>                    (*raka* verb)  
          [+reflexive]  
          John shaves him

<sup>31</sup>We thank Yu-Chin Chien for help with this statistical analysis.

- b. \*Jón<sub>i</sub> rakar hann<sub>i</sub>.  
 [+transitive]  
 John shaves him
- c. \*Jón<sub>i</sub> gaf honum<sub>i</sub> bók. (*gefa* verb)  
 [+transitive]  
 John gave him a book

If the children's grammar did not include the Chain Condition, Principle B would rule in (26a), which is reflexive-marked, but would exclude (26b,c), which are not. We would thus expect children to do better with pronouns with the *gefa* verbs than with the *raka* verbs. In our study, we did not find a difference in the children's performance on pronouns as a function of verb type. Recalculating the children's performance on pronouns separately for the *raka* and the *gefa* verbs in the judgment task, the mean percentage of children who know that pronouns cannot take a local antecedent across all three clause types—subjunctive, indicative, and infinitive—is 52% with the *raka* verbs and 47% with the *gefa* verbs. Thus, we did not find a difference between the two verb classes with pronouns, indicating that children do know the Chain Condition.

## 5. COREFERENCE AND BINDING

In Section 4.3, we saw that those Icelandic children who allowed pronouns to take a local antecedent also allowed a local antecedent for *sig* with the *gefa* verbs. In the previous section, we saw that this result could not be explained by saying that the children did not know the Chain Condition. Another possible explanation is that the children either did not know or failed to obey Principle B of the Binding Theory, which in Icelandic regulates both pronouns and *sig*. However, there is strong evidence that children do in fact know Principle B (just as they know Principle A) and that their performance with pronouns is a pragmatic rather than a syntactic effect. This evidence comes from English-speaking children (Chien and Wexler (1988; 1990)), Russian-speaking children (Avrutin and Wexler (this issue)), and as we show in Section 5.1, the hypothesis is further supported by the behavior of the Icelandic-speaking children in this study.

Wexler and Chien (1985) and Montalbetti and Wexler (1985) proposed that children have knowledge of Principle B, which regulates syntactic binding, but lack the pragmatic principle that blocks coreference between a pronoun and a local referential antecedent.<sup>32</sup> Grodzinsky and Reinhart

<sup>32</sup>See also Chien and Wexler (1988; 1990) and especially Avrutin and Wexler (this issue) for a more recent and detailed exposition of this idea.

(1993) modified the Wexler–Chien–Montalbetti proposal and suggested that children know the relevant pragmatic rule but do not have the processing capacity to implement it. Grodzinsky and Reinhart formulated the pragmatic rule as in (27).<sup>33</sup>

(27) Rule I. Intrasentential Coreference (see Grodzinsky and Reinhart (1993), Reinhart (1983))

NP A cannot corefer with NP B if replacing A with C, C A-bound by B, yields an indistinguishable interpretation.

Rule I states that a pronoun cannot be coreferential when it can be replaced by a bound element. On both the Wexler–Chien–Montalbetti account and the Grodzinsky and Reinhart account, the children’s grammatical knowledge is intact. The problem lies in the “coreference module”: Children either do not have the requisite pragmatic condition or they are unable to use it.

Thus, children who control Principle B but not Rule I will reliably rule out the bound variable representation in (28a), but they will not rule out the coreference representation in (28b). (For ease of exposition, we represent coreference by underlining the coreferent NPs.)

- (28) a. Little Bear<sub>i</sub> kissed him<sub>i</sub>.  
 b. Little Bear kissed him.

This explains why children allow local antecedents for pronouns and appear to violate Principle B.

The coreference account finds strong empirical support when we compare children’s behavior on sentences such as (28) with their behavior on sentences with quantifiers. Chien and Wexler (1988; 1990) reasoned that if children have knowledge of Principle B but not the pragmatic rule, then they should reject sentences such as (29), because in this case the pronoun can only be a bound variable and the bound variable representation is ruled out by Principle B.

- (29) Every bear<sub>i</sub> loves him<sub>i</sub>.

<sup>33</sup>Chien and Wexler (1988; 1990) and Avrutin and Wexler (this issue) proposed a different formulation of the pragmatic rule, which they referred to as Principle P. Principle P prohibits coreference between two non-coindexed NPs, except when context forces otherwise. Implicit in both Principle P and Rule I is the claim that disjoint reference between two non-coindexed NPs is the default and that coreference requires licensing either by context (in the case of Principle P) or by speakers’ intention to mean something distinct from a bound variable reading (in the case of Rule I).

This is precisely the result that Chien and Wexler obtained; children rejected a local quantified antecedent for the pronouns while allowing a local referential antecedent.<sup>34</sup>

In separating children's knowledge of Principle B from their knowledge of Rule I, these authors followed a line originally proposed by Reinhart (1983; 1986) that distinguishes the syntactic binding of pronouns (i.e., coindexation with a c-commanding antecedent), in which the pronoun functions as a bound variable, from the cases in which the pronoun enters into a coreference relation. In the case of coreference, the speaker intends the pronoun to refer to some referential antecedent, either in the same sentence or in discourse, but the pronoun is not syntactically bound to its antecedent. Binding is regulated by the Binding Principles, whereas coreference is governed by Rule I. As argued by Grodzinsky and Reinhart (1993), the cross-linguistic acquisition results discussed earlier lend strong support to Reinhart's basic distinction and, more generally, to the modular approach to binding. If children show difficulties (or delayed development) with structures involving coreference but not with those containing bound variables, then these must constitute separate modules. In English and Russian, the relevant contrast is between children's good performance with reflexives (e.g., *himsel*) and pronouns (e.g., *him*) bound to quantifiers, which involve knowledge/use of the Binding Principles, as against their poor performance with coreferential pronouns, which involves knowledge/use of Rule I.

In the section that follows, we show that the data from Icelandic children also strongly support the binding/coreference distinction. Many of the developmental results presented in the previous sections are explained by the hypothesis that children have knowledge of binding but do not know or cannot use the pragmatic rule that governs coreference. Particularly compelling are the data on children's interpretation of *sig*, which because of its logophoric properties provides a completely new terrain on which to test the syntax/pragmatics interface.

### 5.1 Icelandic Reflexives and Pronouns

In light of the previous discussion, a reasonable hypothesis for Icelandic is that Icelandic children have knowledge/use of Principles A and B but not of Rule I. In general, what this means is that children will do well on structures involving variable binding, but they will perform poorly where coreference is involved. There are a number of specific predictions that follow for Icelandic. The first and most obvious is that children will perform well with the reflexive *sjálfan sig*, because Principle A (a reflexive-marked predicate is reflexive) requires that *sjálfan sig* be interpreted as a

<sup>34</sup>Avrutin and Wexler (this issue) obtained similar results with Russian-speaking children.

bound variable. This prediction is readily confirmed. As we saw in Section 4.1, 90% of the children in our study who were 4 years and older bound *sjálfan sig* to a local antecedent (i.e., a coargument; see Figure 2).

Turning now to the pronouns, the predictions are basically the same as for English: Children should rule out binding between a pronoun and a local antecedent, but they will not reliably rule out coreference. Hence, we predict that they will incorrectly allow the local antecedent in sentences such as (30).

- (30) Andrés Önd vildi [að Jenni, þurrkaði honum,]
   
Donald Duck wanted that Jerry dried him
   
'Donald Duck wanted Jerry to dry him.'

As discussed in Section 4.1, the results of the judgment task show that 56% to 89% of the children (depending on age group) allowed the pronoun to corefer with the local antecedent (see Figure 2).<sup>35</sup> In a separate analysis, we looked at the percentage of local responses across children in each group. Overall, children accepted the local antecedent for the pronoun 43% to 67% of the time, that is, they performed roughly at chance. This should be compared to the acceptance rate for a local antecedent with *sjálfan sig*, which ranged from 88% to 95% across children. The mean acceptance rates for local antecedents for both *sjálfan sig* and pronouns for each age group are given in Table 6.<sup>36</sup>

Thus, the Icelandic results replicate the results of many other studies of children acquiring other languages: Children do well on bound variable/anaphora constructions, though they perform poorly with pronouns in sentences such as (30) because the rule governing coreference is unavailable to them by hypothesis.<sup>37</sup>

<sup>35</sup>Recall that in the act-out task, the overwhelming majority of children acted out in the nonlocal (i.e., grammatical) interpretation. Thus, there is a marked difference in response patterns across the two tasks. We discuss the implications of this finding at the end of this section.

<sup>36</sup>Note that in this analysis, as well as all the others in this section, we are considering group data, that is, percentages of responses across children in each age group as opposed to analyzing the grammar types of individual children as in the previous sections. We use group data in this section because we are interested in comparing the degree of acceptance/rejection of particular constructions. Note that the responses of all 55 children who participated in the study are included in the group analysis (see Table 1).

<sup>37</sup>Note that (30) contains a verb of the *raka* class. Recall that these verbs have a dual lexical entry, [+ reflexive] and [+ transitive]; in the latter case, they function like verbs of the *gefa* class with respect to the Binding Principles. As we discussed in Section 4.4, for a reflexive-marked *raka* verb, the Chain Condition rules out a local interpretation of the pronoun, whereas for the transitive entry of the *raka* verbs and for *gefa* verbs, both Principle B of the Binding Theory and the Chain Condition rule out a local reading (see 26a, b, c) in Section 4.4). For the purposes of this discussion, these differences are irrelevant. The crucial point is that local binding is ruled out in all cases.

TABLE 6  
Mean Acceptance Rates of a Local Antecedent  
for *sjálfan sig* and Pronouns (%)

	<i>sjálfan sig</i>	Pronoun
G1	92	67
G2	88	45
G3	93	43
G4	95	55
G5	95	45
Adults	98	2

If children's difficulty with pronouns is related to coreference and not to binding, then we further predict that when the pronoun occurs in a context in which binding is allowed, children's performance will be good. Thus, children should readily accept a long-distance antecedent for the pronouns in sentences such as (31a,b). (31a) contains a subjunctive complement and (31b) an indicative complement.

- (31) a. Andrés Öndi<sub>i</sub> vildi [að Jenni þurrkaði<sub>(subj.)</sub> honum<sub>i</sub>].  
Donald Duck wanted that Jerry dried him  
'Donald Duck wanted Jerry to dry him.'  
b. Andrés Öndi<sub>i</sub> sá [að Jenni þurrkaði<sub>(ind.)</sub> honum<sub>i</sub>].  
'Donald Duck saw that Jerry dried him.'

As can be seen from Table 7, children accepted the long-distance antecedent—a bound variable—70% to 95% of the time when the pronoun was contained inside an indicative or subjunctive complement.

Recall now that when a pronoun is contained in an infinitive complement in Icelandic, it may not take a matrix subject as an antecedent, as in (32) (see footnote 12).

- (32) Jón<sub>i</sub> segir Pétir<sub>j</sub> [að Pro<sub>j</sub> klappan<sub>(inf.)</sub> honum<sub>\*j/?\*i/k</sub> á  
John tells Peter to pat him on  
hverjum degi].  
every day  
'John tells Peter to pat him every day.'

This is because under restructuring the infinitive sentence becomes monoclausal and thus takes on the properties of a local binding domain (see Section 2.3 for discussion). We thus predict that children will exhibit the same behavior in the infinitive case as they do in the local binding case; binding is ruled out by the grammar, but coreference is permissible because

TABLE 7  
 Mean Acceptance Rates for the Long-Distance Antecedent for Pronouns in  
 Sentences With Indicative, Subjunctive, and Infinitive Complements (%)

	<i>Indicative</i>	<i>Subjunctive</i>	<i>Infinitive</i>
G1	77	84	56
G2	70	85	35
G3	80	85	55
G4	90	80	55
G5	95	75	45
Adults	100	90	45

of the unavailability of Rule I. We thus expect that children will accept the nonlocal antecedent in the indicative and subjunctive cases, but they will perform roughly at chance in the infinitive, as they do in the local case. Table 7 shows that this prediction is confirmed.<sup>38</sup>

To sum up the discussion thus far, Icelandic children reliably accept grammatical bound variable/anaphora interpretations. This is evidenced by their performance both with *sjálfan sig* and with pronouns with nonlocal antecedents. Thus, on sentences ruled in by Principle A and/or B, children generally performed at 70% to 95% correct. However, their performance dropped dramatically to around chance level precisely in those cases in which the child was asked to judge the grammaticality of a local antecedent for the pronoun. In this case, the child must evaluate the sentence not only vis-à-vis the Binding Principles, but also with respect to Rule I. Following Wexler and Chien (1985), Montalbetti and Wexler (1985), and Grodzinsky and Reinhart (1993), we hypothesize that children's difficulty in the local domain is due to the unavailability of Rule I. In the section that follows, this hypothesis receives further empirical support when we consider the Icelandic's child's performance on the *sig* sentences.

<sup>38</sup>We note that the adult controls also accepted the antecedent roughly half the time, though by hypothesis, they know Rule I: that there is a nondistinguishable bound anaphora representation that blocks the coreference reading of the pronoun, namely (i).

- (i) Jón<sub>i</sub> segir Pétir<sub>j</sub> [að Pro<sub>j</sub> klappa<sub>(inf.)</sub> sér<sub>\*j/i</sub> á hverjum degi].  
 John tells Peter to pat sig on every day  
 'John tells Peter to pat sig every day.'

We attribute the adult performance to the fact that many of the adults did not appear to allow restructuring. This was discussed in Section 4.2.2. Thus, when there is no restructuring, the matrix subject may bind the pronoun as in the indicative and subjunctive cases discussed in the text. It is also likely that at least some of the children had this more restrictive dialect, which does not permit restructuring. Thus, though the children's chance performance in the infinitive case was predicted by the "inaccessibility of Rule I" hypothesis, there may be other factors that contributed to this result.

Before turning to the *sig* results, we briefly discuss the across-task variation that we found with the pronouns. Recall that in the act-out task (Figure 1), children performed well with pronouns, which is to say that they generally respected the antilocality requirement on pronouns. In the judgment task (Figure 2), however, most of the children accepted both the local and the long-distance antecedents. How can we explain this difference? If both the local and long-distance antecedents are acceptable for the child, as evidenced by the judgment task, then why in the act-out task are they not just as likely to act out the local as the long-distance interpretation?

Note, first, that in the act-out task we included an introductory sentence that contains an additional NP not mentioned in the test sentence (see (20)). This NP was included to provide a plausible discourse (extraclausal) antecedent for the pronoun. It has been pointed out to us (Ken Wexler, personal communication) that the children's good performance on pronoun sentences in the act-out task as compared to the judgment task may have been due to the fact that they were choosing the extraclausal NP as antecedent in accordance with a pragmatic principle of "relevance," which states roughly: "Why include this extra NP if it is not relevant to the test sentence?" In fact, the children chose the extraclausal NP 32% of the time in the act-out task. They chose the long-distance antecedent 57% of the time and the local antecedent only 11% of the time. Thus, the availability of an extraclausal antecedent mentioned in the introductory sentence does appear to have contributed to the children's good performance with pronouns. However, the principle of relevance provides only a partial explanation; it does not explain why children strongly preferred the long-distance antecedent over the local one in the act-out task, while accepting both in the judgment task.

Recall from our earlier discussion that the children's poor performance with pronouns on the judgment task involves a difficulty with coreference interpretations. Grodzinsky and Reinhart (1993) argued that children are unable to implement Rule I because of processing limitations, and this computational "breakdown" means that the child cannot render a grammaticality judgment in the case of coreference. Thus, whenever the child is required to give a "judgment" that depends on the implementation of Rule I, as in the judgment task when applied to the local domain, he or she will perform at chance. As noted earlier, this is the result we obtained; children accepted the local antecedent for the pronoun 43% to 67% of the time. Notice, however, that the demands of the act-out task are different. In the act-out task, the child must act out a single interpretation, and it is reasonable to assume that if there is only one fully grammatical reading for the child, then this is the meaning that will be acted out. Turning back to the

pronoun sentences in the act-out task, and assuming Grodzinsky and Reinhart's analysis, we now see that in a sentence such as (30), there is in fact only one grammatical interpretation for the child to act out. By hypothesis, the child is unable to compute a local coreference reading, and the local binding interpretation is ruled out by Principle B. This leaves only the interpretation in which the pronoun takes the long-distance antecedent and functions as a bound variable. As we noted earlier, this is the interpretation that the overwhelming majority of children acted out.

Thus, the differences we observe in children's performance on the act-out and judgment tasks with respect to the pronouns are explained under the assumption that there is only one grammatical reading for sentences such as (30), the long-distance bound variable reading, and that the inaccessibility of Rule I results in a kind of guessing or chance performance when children must make judgments concerning coreference.<sup>39</sup>

## 5.2 *Sig*

As first discussed by Thráinsson (1991), the strict/sloppy identity ambiguity typically associated with pronouns, as in (33), also shows up with *sig* in its long-distance, logophoric use, illustrated in (34).

- (33) Jón<sub>i</sub> telur [að Baldur muni<sub>(subj.)</sub> fella hann<sub>i</sub> á prófinu]  
 John believes that Baldur will fail him on the test  
 og Ari<sub>j</sub> telur það líka  
 and Ari believes so too  
 = Ari believes that Baldur will fail Ari on the test  
 (binding)  
 = Ari believes that Baldur will fail John on the test  
 (coreference)

- (34) Jón<sub>i</sub> telur [að Baldur muni<sub>(subj.)</sub> fella sig<sub>i</sub> á prófinu]  
 John believes that Baldur will fail sig on the test  
 og Ari<sub>j</sub> telur það líka  
 and Ari believes so too  
 = Ari believes that Baldur will fail Ari on the test  
 (binding)  
 = Ari believes that Baldur will fail John on the test  
 (coreference)

---

<sup>39</sup>We are indebted to Yosef Grodzinsky for suggesting this explanation of the cross-task variation.

As Thráinsson (1991) pointed out, not all anaphoric elements must be syntactically bound. In particular, *sig* can enter into both binding and coreference relations, as can the pronouns.<sup>40</sup> And as is the case for pronouns, the contexts in which *sig* may or may not function as a bound variable are determined by the Binding Theory, as we soon see, whereas its coreference possibilities are regulated by Rule I. Icelandic *sig* therefore provides another domain within which to test the hypothesis that children's difficulties are related to coreference and not binding. In general, we derive for *sig* many of the same predictions that were made for the pronoun sentences, though they diverge in at least two important respects, which we discuss later.

As we noted, in its logophoric use, *sig* can be a bound variable and thus we predict that children will readily accept a long-distance antecedent for *sig* in subjunctive complements, such as (35).

- (35) Mikki Mús<sub>i</sub> vildi [að Jenni þurrkaði<sub>(subj.)</sub> sér<sub>i</sub>].  
 Mickey Mouse wanted that Jerry dried sig  
 'Mickey Mouse wanted Jerry to dry sig.'

The situation is analogous to that of pronouns bound by a long-distance antecedent, as illustrated in (31a). For reasons which become clear shortly, we consider children's performance with the *gefa* and the *raka* verbs separately. In the first column of Table 8, we see the rate of acceptance of a long-distance antecedent for *sig* with the *gefa* verbs, and in the second column, the acceptance rates for the *raka* verbs.

The *gefa* verbs patterned as predicted; children readily accepted a long-distance antecedent for logophoric *sig* in this case. Notice, however, that with the *raka* verbs, the acceptance rate was much lower. The reason for this difference becomes clear once we recall that the *raka* verbs have a dual lexical entry, one of which is [+ reflexive]. Principle A requires that the

<sup>40</sup>Note that even pure anaphors such as English *himself/herself* show both the bound variable and referential reading when they are used logophorically. Thus, Reinhart and Reuland (in press) discussed the example in (i).

- (i) Only Lucie buys pictures of herself.

In Reinhart and Reuland's analysis, *herself* is a logophor in this example and does not form a reflexive predicate with the verb *buy*. The sentence is ambiguous between a bound variable (sloppy identity) reading, as in (iia), and a coreferential (strict identity) reading, as in (iib).

- (ii) a. Only Lucie buys pictures of herself, and no one else buys his/her own pictures.  
 b. Only Lucie buys pictures of Lucie, and no one else buys pictures of Lucie.

Though the mechanisms that associate logophors, such as *sig*, with their antecedents are unclear to us, examples like (i) illustrate that logophors often allow both a bound and a referential reading.

TABLE 8  
Acceptance Rates for the Long-Distance Antecedent  
for *sig* in the Logophoric (Subjunctive) Context (%)

	<i>gefa</i> Verbs	<i>Raka</i> Verbs
G1	93	53
G2	70	40
G3	70	60
G4	80	80
G5	90	60
Adults	100	80

coarguments of a reflexive-marked predicate be coindexed. That is, it is precisely in this case that the Binding Principles require *sig* to be bound to a local antecedent, as in (36), and binding to the long-distance antecedent is excluded by Principle A.<sup>41</sup>

(36) Mikki Mús<sub>i</sub> vildi [að Andrés Önd<sub>j</sub> þvæði<sub>(subj.)</sub> sér<sub>j/\*i</sub>].  
[+ reflexive]

Mickey Mouse wanted that Donald Duck washed sig  
'Mickey Mouse wanted Donald Duck to wash sig.'

In Section 4.2.1, we proposed that most of the children in the two youngest age groups had only the [+ reflexive] lexical entry for the *raka* verbs. This claim was based on the fact that these children accepted only a local antecedent for *sig* in sentences such as (36) (see Figures 3 and 4). Moreover, longitudinal data show that the earliest uses of *sig* with the *raka* verbs are always reflexive. Thus, it seems that the reflexive-marked entry is in general an "easier" lexical acquisition. We believe that acceptance rates for the *raka* verbs in Table 8 are depressed by the fact that some of the children had only the [+ reflexive] entry for these verbs and thus rejected the long-distance antecedent as a Principle A violation.

If the reflexive-marked entry is indeed an easier acquisition, it should be available to most of the children. We therefore predict that the children's overall acceptance rate for a local antecedent for *sig* with the *raka* verbs will be quite high; in this instance, Principle A forces a bound variable

<sup>41</sup>The claim that *sig* must be a bound variable in this context is empirically supported by the fact that in the local domain, *sig* can have only a sloppy identity reading, as in (i). Thus, the strict identity reading, indicating coreference, is unavailable.

- (i) Bara Jón rakar sig.  
Only John shaves sig  
= John shaves himself; no other man shaves himself.  
≠ John shaves John; no other man shaves John



TABLE 10  
Mean Acceptance Rates for a Local  
Antecedent for *sig* With the *gefa* Verbs (%)

	<i>sig</i>
G1	93
G2	80
G3	60
G4	70
G5	70
Adults	30

To sum up, in this section, we have considered the hypothesis, first offered by Wexler and Chien (1985) and Montalbetti and Wexler (1985), that children allow a local antecedent for pronouns because they do not have access to the pragmatic rule that blocks coreference in this context. As Grodzinsky and Reinhart (1993) pointed out, what this hypothesis predicts is that children will perform well with sentences where the pronoun is uniquely interpretable as a bound variable (and hence involving only the Binding Theory), but they will perform poorly in sentences where they must judge coreference possibilities (sentences involving Rule I). The results of our study fully support this hypothesis and *a fortiori*, Reinhart's (1983; 1986) distinction between binding and coreference.<sup>44</sup>

<sup>44</sup>One other prediction, which we did not test in this study, concerns the behavior of both the pronouns and *sig* in sentences with quantified antecedents. Our expectation is that Icelandic-speaking children will behave like English- and Russian-speaking children (see Avrutin and Wexler (this issue), Chien and Wexler (1988; 1990)). If Icelandic children know Principle B, but cannot access Rule I, then they should reject local quantified antecedents for the pronouns and for *sig* (though they accept local referential antecedents). The relevant sentences to test are those in (i) and (ii).

- (i) a. Jón vildi [að Pétur<sub>i</sub> gæfi<sub>(subj.)</sub> honum<sub>i</sub> bók í jólagjöf].  
John wanted that Peter gave him (= Peter) a book for Christmas  
'John wanted Peter to give him (= Peter) a book for Christmas.'
- b. Pétur vildi [að enginn<sub>i</sub> gæfi<sub>(subj.)</sub> honum<sub>i</sub> bók í jólagjöf].  
Peter wanted that nobody gave him (= nobody) a book for Christmas  
'Peter wanted nobody to give him (= nobody) a book for Christmas.'
- (ii) a. Jón vildi [að Pétur<sub>i</sub> gæfi<sub>(subj.)</sub> sér<sub>i</sub> bók í jólagjöf].  
John wanted that Peter gave sig (= Peter) a book for Christmas  
'John wanted Peter to give sig (= Peter) a book for Christmas.'
- b. Pétur vildi [að enginn<sub>i</sub> gæfi<sub>(subj.)</sub> sér<sub>i</sub> bók í jólagjöf].  
Peter wanted that nobody gave sig (= nobody) a book for Christmas  
'Peter wanted nobody to give sig (= nobody) a book for Christmas.'

## 6. CONCLUSION

The results of our Icelandic binding experiment illustrate the strongly modular character of binding and its development. Icelandic is particularly revealing in this respect because it shows a complex pattern of interaction among the syntax (Binding Principles A and B), the pragmatic rule governing coreference (Chien and Wexler (1988; 1990), Grodzinsky and Reinhart (1993), Reinhart (1983)), the lexicon (the *raka* verbs and the *gefa* verbs), and the logophoric (or discourse) use of *sig*.

Our results also lend strong support to Reinhart and Reuland's (1989; 1991; in press) general approach to binding that, first, distinguishes the syntactic use of *sig* from its logophoric (discourse) use and, second, treats *sig* as a pronominal both in its internal structure and with regard to Principle B of the Binding Theory. Thus, the developmental data show that children (like adults) treat *sig* differently depending on whether it is contained in a subjunctive or infinitive complement clause and that *sig* (with the *gefa* verbs) patterns like a pronoun in its possibility to take a local antecedent. With respect to this latter issue, our results support the hypothesis that children have early knowledge of Principles A and B of the Binding Theory but have difficulty with the pragmatic rule governing coreference (Avrutin and Wexler (this issue), Chien and Wexler (1988; 1990), Grodzinsky and Reinhart (1993), Montalbetti and Wexler (1985), Wexler and Chien (1985)). Finally, our study charts a course of development in which Icelandic children perform well on structures involving variable binding but perform poorly with both pronouns and *sig* (with the *gefa* verbs) in the local domain, where binding is ruled out and coreference is involved. Our results indicate that *sig* is pronominal in crucial respects and hence constitutes a new domain in which to test for the so-called "developmental delay" of pronouns in acquisition.

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