7. Then they decide to eat something. There's a big strawberry, an orange, a lemon, a little strawberry, a big tomato, some corn, and a little tomato. Bert says that he doesn't wanna eat the big strawberry. What do you think he wants to eat?
8. Then they decide to go on. Cookie Monster says that he doesn't wanna walk home. What do you think he wants to do?

Part 2

In this game, I am going to do something with some of the toys, here in between us. Then I will tell you what I want you to do with the toys, okay? (F = filler; the target items were prefaced with “Now we're going to use two girls/boys.”)

1. F I'm petting this baby bear. Now can you pet him?
2. F Here's Gumby. Can you squeeze him?
4. Here's Lucy and here's Dorothy. Dorothy is hugging Lucy. Now you hug her.
6. F Here's a table. Can you turn it around?

In this article, we report the results of an experimental study on the interpretation of the local anaphor sjáfan 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 McKeel 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

Requests for reprints should be sent to Nina Hyams, Department of Linguistics, University of California, Los Angeles, 405 Hilgard Avenue, Los Angeles, CA 90024-1543.
of verbs at an early age. All of these results are explainable within the
Reinhart and Reuland framework and illustrate the strongly modular char-
acter 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-
theoristic assumptions of a rich initial state and unrestricted access to
triggering data, an acquisition theory must explain why language acquisi-
tion 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 compo-
nent, 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), Waxler and Manzini (1987));
and pragmatics (e.g., Reinhart (1983) and Grozinsky and Reinhart’s (1993)
Rule I or Chien and Waxler (1988; 1990) and Avrutin and Waxler’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 distinc-
tions (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).1

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 interpre-
tation 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), Waxler
and Chien (1985), and Chien and Waxler (1987) for English-speaking
children; Lee and Waxler (1987) for Korean-speaking children; Jakubowicz
and Olsen (1988) for Danish-speaking children; and Avrutin and Waxler
(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 con-
straints 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

1The binding properties of sig have been described in great detail in Anderson (1986), Maling
others.
long-distance anaphor \textit{sig}. Our concern is to determine if the long-distance binding of \textit{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 \textit{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 \textit{sig} out of subjunctive complements is logophoric, that 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 \textit{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 \textit{sig} to take either a local or a long-distance antecedent (the \textit{raka} 'shave' class) and another one that virtually requires \textit{sig} to take a long-distance antecedent (the \textit{gefa} 'give' class). Our results show that Icelandic adults treat \textit{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 \textit{sig}. One of the most salient results of our previous study (see Hyams and Sigurjónsdóttir (1990)) was that the children's responses to the \textit{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 \textit{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 \textit{sig} and pronouns in a similar manner.

Finally, in Section 5, we address the question of why children have greater difficulty with pronouns and \textit{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 \textit{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 \textit{sjáflan sig} and the simple anaphor \textit{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 (\textit{sjáflan sig} and \textit{sig}) differ in their lexical structure and in the type of content that they are missing. The Icelandic complex anaphor \textit{sjáflan sig} (\textit{sjáflan} = '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 \textit{sig} that occupies the determiner position (see Higginbotham (1983)). The structure of a Self anaphor is given in (1).

\begin{equation}
\text{NP} \text{pronom/sig} \text{[IF Self (y,x)]}
\end{equation}

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 \textit{sjáflan sig}.

The morphologically simple anaphor \textit{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 \textit{sig}. To be interpreted as an argument, \textit{sig} must find an antecedent that supplies the missing phi-features. Following Pica (1987) and Reinhart and Reuland (1991; in press), we assume that \textit{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 \textit{sig} can only take a subject antecedent. The subject orientation of simple anaphors such as \textit{sig} follows from their association with Infl. Thus, \textit{sjáflan sig} and \textit{sig} are anaphoric, that is, referentially defective, although the specific missing content and the procedures needed

\footnote{\textit{Sig} is a 3rd person form that is invariant for gender and number. However, it has three different case forms: accusative \textit{sig}, dative \textit{sey}, and genitive \textit{sin}. There is no nominative form; see Everaert (1990) for a discussion of this fact.}
to obtain this content differ in the two cases.\footnote{The defective nature of these elements entails that they cannot be used deictically (see Reinhart and Reuland (1991; in press)).}

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).\footnote{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).}

\begin{itemize}
\item (2) a. \(\text{[NP sig}_{\text{N}} \ldots e \ldots ]\)
\item b. \(\text{[NP pronoun}_{\text{S}} \ldots e \ldots ]\)
\end{itemize}

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)).\footnote{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.}

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 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.

\(\text{John says that Peter loves self sig.}\)

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).

\[(4) \text{ Principle A: A reflexive-marked predicate is reflexive.}\]

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

\begin{itemize}
\item (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.
\item b. A predicate is reflexive if and only if two of its arguments are coindexed.
\end{itemize}

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)).\footnote{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 Weijer (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.}

\[(6) \text{ Principle B: A reflexive predicate is reflexive-marked.}\]
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. 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. 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). 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, vildi [að Péturj gæfi(subj) sértj/*] bök
   John wanted that Peter gave sig (= John) a book
   í jólágjöf (gefa verb)
   for Christmas
   ‘John wanted Peter to give sig a book for Christmas.’

b. Jón, vildi [að Péturj gæfi(subj) sjálfum sértj/*]
   John wanted that Peter gave Self sig (= Peter)
   bök í jólágjöf
   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, vildi [að Péturj gæfi(subj) honum sj/*/k bök
   John wanted that Peter gave him a book
   í jólágjöf
   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, vildi [að Péturj rakaði(subj) sig/*]
   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, sagði Pétri, [að Proj raka(subj) sig/*]
    ‘John told Peter to shave sig.’

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7 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.

8 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.

9 Recall from footnote 2 that sig has three different forms. Sig is the accusative form, whereas ser—which appears in example (7)—is the dative form.
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).10

(11) Jón, sagði Pétrí, [að Pro, raka[sp] sig↓/↓]  
[+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’ (big in the accusative, þér in the dative, bin 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 rakra 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).

(13) a. Ég gaf sjálfri mér bók.  
[+transitive]  
I gave Self me a book  
‘I gave myself a book.’

b. þú gafst sjálftum 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, rakar sig.  
[+reflexive]  
John shaves sig  
b. *Jón, rakar hann.*  
[+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
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) InfI 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 skipaði mérj [að Proj ‘emja] (InfI) sigj] ‘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 InfI to InfI, as long as no finite InfI 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.  

This account predicts that sig in

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

(i) General condition on A-chains
A maximal A-chain (δ₁, . . . , δₙ) contains exactly one link – δ₁ – which is fully specified for phi-features.

12 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 Buzzo (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)).
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, hótaði Pétur, [að Pro; lemsa sig,]
'I threatened Peter to hit sig (= Peter).'

Reinhart and Reeland 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)). Because verbs of thinking, saying, and perceiving normally take subjunctive complements in Icelandic, the logophoric use of sig shows up most clearly in subjunctives.

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 object not to a matrix subject. 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).

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

(18) a. [NP Skoðun Önnu] en [CP að sig, vanti(subj.)
'sign's opinion Anna's is that sig (= Anna) lacks
hæfileika
'talents'
'Anna's opinion is that sig lacks talents.'

b. Jón sagði Ari [frá ósk þórs] um [CP að Pétur
John told Ari PP about wish þór's about that Peter
sýndi(subj.) séði
'shadowed' virðingi
'showed sig (= þór) respect
'John told Ari about þórs' 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.16 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, segir að Pétur, raki(subj.) sig
John says that Peter shaves sig (= Peter) on
'hverjum degi'
'every day'
'John says that Peter shaves sig every day.'

15Reinhart and Reeland (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.

16However, some Icelandic speakers allow a relaxation of the subjunctive mood requirement and also allow sig to have a logophoric role in indicative complements to semelfactive verbs, for example, sig 'see', víta '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, visi ... hvað henni þótti(=ná) veint um sig.
He knew ... what her thought fond of sig
'He knew how fond of sig she was.'

As previously mentioned, sig does not have a nominative form. Thus, sig can appear in subject position only with those verbs that select a nonnominal 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.

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 segir [að Pétur rakað sigr á
[+transitive]
hverum degi].

John says that Peter shaved sig (= John) on
every day
‘John says that Peter shaved 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. 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 Reykjavik, 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.

17The 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 “mono-clausal,” forcing the pronoun to find an extraclausal antecedent. This is discussed in more detail in Sigurjónsdóttir (1992).

18The verbs tested were: þuvo ‘wash’, þurka ‘dry’, greiða ‘comb’, and klóra ‘scratch’ of the raka class; and klappa ‘pat’, lemja ‘hit’, gefa ‘give’, and benda ‘point to’ of the gefa class. All of these verbs appear in the first transcripts from three Icelandic children who were followed

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Age</th>
<th>Mean Age</th>
<th>Girls</th>
<th>Boys</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>3:03-01:4:00:00</td>
<td>3:07:16</td>
<td>8</td>
<td>7</td>
<td>15</td>
</tr>
<tr>
<td>G2</td>
<td>4:00-01:4:06:00</td>
<td>4:03:12</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>G3</td>
<td>4:06-01:5:00:00</td>
<td>4:09:21</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>G4</td>
<td>5:00-01:5:06:00</td>
<td>5:03:00</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>G5</td>
<td>5:06-01:6:00:00</td>
<td>5:09:13</td>
<td>5</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Adults</td>
<td>Adults</td>
<td>41:03:13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>33</td>
<td>32</td>
<td>65</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>sjálfan sig</th>
<th>sig</th>
<th>Pronoun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicative</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Subjunctive</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Infinitive</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

The act-out task was the Simon-Says-Game developed by Waxler 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).

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

Test sentence: Andrés Ónd segir [nafn barns] að þuvoð (t. raka verb) 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.)

In our study, we modified Waxler 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.
Thus, in (20), the child had to wash either himself (the local antecedent), Donald Duck (the long-distance antecedent), or Fred Flintstone (the extrapausal 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 extrapausal scenario. 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.20

20The 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).21

(21) Dino, Batman, and the Dog were swimming in the Vesturbæjar swimming 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 yourself," and look what Batman did!

Scene (Local): Batman dries himself. (Match)
Test sentence: Dínó vildi að Batman þurrkaðið (subj. raka verb) (= Puppet's 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)

21Recall 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 nonreflexive-marked forms in describing the scenarios: ég 'I', mig (accusative), mér (dative) 'me', þú 'you'; bí (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 Pálsson (1983)), which is younger than the youngest children in our study, who were 3.5. 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'.
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 extracausal 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 extracausal 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 extracausal 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 extracausal referent. Recall from Table 3 that the children were tested on six conditions involving an extracausal scenario for pronouns (i.e., with *raka* and *gefa* verbs in the indicative, subjunctive, and infinitive moods). In order to be classified as

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
knowing that a pronoun is a pronoun, a child had to accept five out of the six test sentences where a pronoun takes an extrapace antecedent. However, because a number of adults consistently rejected the extrapace 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 extrapace 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 precede 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 (Extrapace): The Smurf Girl washes Snow White.

Test sentence: Mjallvit var með svarta blett í kjólnum. (= Puppet's description) The Octopus Lady told the Smurf Girl að þvoðr. The Octopus Lady told the Smurf Girl 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 extrapace 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 pronoun 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 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 conjoined 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,
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 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 extracausal 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 extracausal 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 extracausal 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 extracausal interpretations (long-distance grammar). Finally, the line with xs 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 extracausal interpretation for sig, and hence, the figures from the judgment task do not indicate this possibility. However, some of the children chose an extracausal 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 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 gefu 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.22 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

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22As mentioned in footnote 18, three Icelandic children were followed longitudinally from the age of 2;9 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 *flytta sé* 'to hurry', as in (25b).²³

(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 *flytta* 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.²⁴

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

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²³In 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 *sjálfr sig*, as is illustrated in (i).

(i) Maria, skammast *sín*/*sjalfrar* *sín*.
   [+reflexive]
   Mary ashamed *sig*/Self *sig*
   ‘Mary is ashamed of *sig*/herself.’

²⁴Due 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.

The 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. 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, 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

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25Figure 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 semifeitic verbs, like sja ‘see’, which was the matrix verb used in the indicative test sentences.

26As 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.

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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.
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 4.3.27

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
to 4;6 exhibited their knowledge of the logophoric (long-distance) use of sig.28

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 Reuldand'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 Reuldand'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,
to the higher clause at LF.29 (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.30

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

29 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).

30 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 \( \text{sig} \) is \([+\text{indicative mood}]\), and thus \( \text{sig} \) should allow a long-distance antecedent equally well out of subjunctives and infinitives. Similarly, Pica (1987) proposed that \( \text{sig} \) undergoes head movement out of infinitives and subjunctives, again predicting parallel performance on the two conditions.

### 4.3 The Pronominality of \( \text{sig} \) and Principle B

Turning back to Figure 8, recall that 80% of our adult subjects accepted only the long-distance interpretation of \( \text{sig} \) with the \( \text{gefa} \) verbs in subjunctives. These results follow from Principle B, that is, \( \text{sig} \) with the \( \text{gefa} \) 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 \( \text{sig} \) to take a local antecedent with the \( \text{gefa} \) 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, \( \text{sig} \) is a pronominal both with regard to its internal structure and with regard to Principle B (when it occurs with a \( \text{gefa} \) verb). We thus predict that the children who allow local coreference of \( \text{sig} \) with the \( \text{gefa} \) verbs will also allow the pronouns to take a local antecedent.

However, in order to test our hypothesis that the results for \( \text{sig} \) 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 \( \text{sig} \) with his or her performance on pronouns. Only children who passed both the anaphor test for \( \text{sig} \) and the pronoun test, described in Section 4.1, were included in this analysis. Out of the 40 children who knew that \( \text{sig} \) 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 \( \text{sig} \). Conversely, children who allow a pronoun to take a local antecedent should also allow a local interpretation of \( \text{sig} \). 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 \( \text{sig} \) to take a local antecedent is significantly related to whether they allowed pronouns to take a local antecedent. This result is significant at the .02 level.31 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 \( \text{sig} \) 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 \( \text{sig} \) (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 \( \text{raka} \) verb or a \( \text{gefa} \) verb. Recall that the \( \text{raka} \) verbs have a dual lexical entry, \([+\text{reflexive}]\) and \([+\text{transitive}]\), and when \( \text{raka} \) verbs are \([+\text{transitive}]\), they function like verbs of the \( \text{gefa} \) class with respect to the Binding Principles. For a reflexive-marked \( \text{raka} \) verb, the presentation in (26a) is ruled out uniquely by the Chain Condition, whereas for the transitive entry of the \( \text{raka} \) verbs and the \( \text{gefa} \) 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, raka hamn. \( \text{(raka verb)} \)
\[ [+\text{reflexive}] \]
John shaves himself

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31 We thank Yu-Chin Chien for help with this statistical analysis.
b. *Jón, rakar hann.
   [+ transitive]
   John shaves him

c. *Jón, gaf honum, 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 Waxler (1988; 1990)), Russian-speaking children (Avrutin and Waxler (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.

Waxler and Chien (1985) and Montalbetti and Waxler (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. Grodzinsky and Reinhart (1993) modified the Waxler-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).33

(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 Waxler-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, kissed him.
   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 Waxler (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, loves him.

3See also Chien and Waxler (1988; 1990) and Avrutin and Waxler (this issue) for a more recent and detailed exposition of this idea.
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.\footnote{Avrutin and Wexler (this issue) obtained similar results with Russian-speaking children.}

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., \textit{himself}) and pronouns (e.g., \textit{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 \textit{sig}, which because of its logophoric properties provides a completely new terrain on which to test the syntax/pragmatics interface.

5.1 Icelandic Reflectives 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 \textit{sjálfan sig}, because Principle A (a reflexive-marked predicate is reflexive) requires that \textit{sjálfan sig} be interpreted as a 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 \textit{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).

\begin{quote}
(30) Andrés Önd vildi [að Jenni, þurkaði honum,]
Donald Duck wanted that Jerry dried him
'Donald Duck wanted Jerry to dry him.'
\end{quote}

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).\footnote{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.} 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 \textit{sjálfan sig}, which ranged from 88% to 95% across children. The mean acceptance rates for local antecedents for both \textit{sjálfan sig} and pronouns for each age group are given in Table 6.\footnote{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).}

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.\footnote{Note that (30) contains a verb of the \textit{raka} class. Recall that these verbs have a dual lexical entry, \{+reflexive\} and \{+transitive\}; in the latter case, they function like verbs of the \textit{gafa} class with respect to the Binding Principles. As we discussed in Section 4.4, for a reflexive-marked \textit{raka} verb, the Chain Condition rules out a local interpretation of the pronoun, whereas for the transitive entry of the \textit{raka} verbs and for \textit{gafa} 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.}
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.

   'Donald Duck wanted Jerry to dry him.'

b. Andrés Öndi, sá [að Jenni þurkaði(ind.)] honum]. 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 indefinite complement in Icelandic, it may not take a matrix subject as an antecedent, as in (32) (see footnote 12).

(32) Jón, segir Pétur [að Proj klappan(ind.)] honum á hverjum degi.
   John tells Peter to pat him on every day.
   'John tells Peter to pat him every day.'

This is because under restructuring the infinitive sentence becomes monoclusal 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

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.38

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 child's performance on the sig sentences.

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38 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, segir Pétur [að Proj klappan(ind.)] þar 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 1 because of processing limitations, and this computational “breakdown” means that the child cannot render a grammatical judgment in the case of coreference. Thus, whenever the child is required to give a “judgment” that depends on the implementation of Rule 1, 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 57% 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 1 results in a kind of guessing or chance performance when children must make judgments concerning coreference.39

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) Jónₐ, telur [að Baldur muniₐsubj.] fella hannₐ á prófinu
John believes that Baldur will fail him on the test
og Ariₐ telur það lika
and Ari believes too
= Ari believes that Baldur will fail Ari on the test
(binding)
= Ari believes that Baldur will fail John on the test
(coreference)

(34) Jónₐ, telur [að Baldur muniₐsubj.] fella sigₐ á prófinu
John believes that Baldur will fail sig on the test
og Ariₐ telur það lika
and Ari believes too
= Ari believes that Baldur will fail Ari on the test
(binding)
= Ari believes that Baldur will fail John on the test
(coreference)

39We are indebted to Yosef Grodzinsky for suggesting this explanation of the cross-task variation.
As Thránisson (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. 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 see in the next section, 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, vildi [að Jenni þurraði(subj.) sétr.]
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

\[\text{Note that even pure anaphors such as English himself/herself show both the bound variable and referential reading when they are used logophorically. Thus, Reinhart and Reuland (in press) discussed the example in (i).}\]

(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 (slippery identity) reading, as in (iia), and a referential (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.

\[\text{The claim that sig must be a bound variable in this context is empirically supported by the fact that in the local domain, sig can have only a sloppy identity reading, as in (i). Thus, the strict identity reading, indicating coreference, is unavailable.}\]

(i) Hana Jón rakar sig.
   Only John shaves sig
   = John shaves himself; no other man shaves himself.
   + John shaves John; no other man shaves John

<table>
<thead>
<tr>
<th>Acceptance Rates for the Long-Distance Antecedent for <em>sig</em> in the Logophoric (Subjunctive) Context (%)</th>
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<tbody>
<tr>
<td><strong>gefa Verbs</strong></td>
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</tr>
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<td>G1</td>
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<td>G5</td>
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<tr>
<td>Adults</td>
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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.\[41\]

(36) Mikki Mús, vildi [að Andrés Öndj þvarði(subj.) sétr_j.\[+reflexive]\]
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
interpretation, and coreference/Rule 1 does not enter into the picture. The acceptance rates across children in each age group are given in Table 9. We see that the rates are well above chance and comparable to the other cases where bound variable representations are available (cf. sjálfan sig in Table 6, pronouns in the long distance indicative and subjunctive columns of Table 7, and logophoric sig with the gefa verbs in Table 8).

Let us now turn to the interpretive possibilities for sig in the local domain with the gefa verbs. Recall that Principle B rules out local binding of sig with verbs of this class, as in (37), because the predicate is not reflexive-marked.

(37) Andrés Óndur vildi [að Jenní lemði subj.] sig /i/.
    [transitive]
Donald Duck wanted that Jerry hit sig
'Donald Duck wanted Jerry to hit SIG.'

However, children should allow a local antecedent under a coreferential reading because Rule 1 is unavailable to them, by hypothesis. (Note that Rule I would rule out a local coreferential reading of sig in examples in (37) because sig can be replaced by the bound element sjálfan sig which yields an indistinguishable interpretation.) As is shown in Table 10, this prediction is confirmed; children did allow a local antecedent for sig with the gefa verbs. In this respect, it patterns like the pronouns. As we showed in Section 4.3, those children who allowed a local antecedent for the pronoun also allowed a local antecedent for sig with the gefa verbs. We can now explain this result as an effect of the inaccessibility of Rule 1, which governs both pronouns and sig in Icelandic.

Table 10 shows the mean acceptance rate in subjunctives. We do not include the results for indicatives and infinitives as these sentences are ungrammatical (see footnotes 28 and 29).

If we compare rates of responses for sig (with the gefa verbs) (Table 10) with the rates of responses for the pronouns (Table 6), we see that children were more likely to accept a local antecedent for sig than for pronouns. (This is true for the adults as well.) This result was not directly predicted by our account and we have no explanation for this difference at present.

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 1). The results of our study fully support this hypothesis and a fortiori, Reinhart’s (1983; 1986) distinction between binding and coreference.44

44One 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 1, 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, geði subj.] honun, bók í jölágjöf.
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, geði subj.] honun, bók í jölágjöf.
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, geði subj.] sér, bók í jölágjöf.
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, geði subj.] sér, bók í jölágjöf.
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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