Selective learning in the acquisition of Kannada ditransitives

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Abstract

In this paper we bring evidence from language acquisition to bear on the debate over the relative abstractness of children’s grammatical knowledge. We first identify one aspect of syntactic representation that exhibits a range of syntactic, morphological and semantic consequences both within and across languages, namely the hierarchical structure of ditransitive verb phrases. While the semantic consequences of this structure are parallel in English, Kannada, and Spanish, the word order and morphological reflexes of this structure diverge. Next we demonstrate that children learning Kannada have command of the relation between morphological form and semantic interpretation in ditransitives with respect to quantifier-variable binding. Finally, we offer a proposal on how a selective learning mechanism might succeed in identifying the appropriate structures in this domain despite the variability in surface expression.

Key words: quantification, binding, acquisition, syntax
1. Introduction

A key feature of syntactic explanation is its abstract character. This abstractness manifests itself in two ways. First, the syntactic representation of a sentence is not directly reflected in its surface form. To the extent that sentences have an internal hierarchical structure, this structure is only partially recoverable from its phonological form (Chomsky and Halle 1968, Selkirk 1984, Nespor and Vogel 1986). Second, the components of a syntactic representation have consequences for a broad range of phenomena. Aspects of the phrase structure determine word order, interpretive relations between words and phrases (e.g. binding, anaphora, scope, thematic roles), and the morphological expression of syntactic dependencies (e.g. case, agreement, binding). Indeed, syntacticians generally view a proposal as most explanatory when a single aspect of syntactic representation can be shown to control a broad spectrum of phenomena at once (Chomsky 1981, Perlmutter and Moore 2002, Baker 2003, Moore and Polinsky 2003, Snyder 2007).

The abstractness of syntactic representation comes at a cost, however. The less informative the signal is about the structural representation giving rise to that signal, the more difficult it is for learners to draw inferences about structural representation on the basis of surface forms. Indeed, it is mainly for this reason that Chomsky and others have proposed that a good deal of what people come to know about syntactic structure derives from the nature of the learner and not from the nature of the environment (Chomsky 1959, 1975, 1980, 1981, Fodor 1966, Baker 1979, Pinker 1984, Crain 1991, inter alia). However, it is equally important to recognize that positing innate abstract structure does not solve the learning problem. Rather, it shapes the learning mechanism to be a selective one, rather than a strictly inductive one (Fodor 1966, Pinker 1979, Lightfoot 1982). Even if learners come fully loaded with innate knowledge
about the range of abstract structures that are possibly utilized in language, they must still use evidence from the surface form of language to identify which particular abstract structures underlie any given sentence in the language to which they are exposed (Fodor 1966, Pinker 1979, Tomasello 2000). This problem is made even more severe when we recognize that the very same aspect of syntactic representation may manifest itself differently in the surface form of different languages (Rizzi 1982, Dresher and Kaye 1991, Clark 1992, Sakas and Fodor 2001, Baker 2003). Thus, a selective learning mechanism cannot be a simple triggering mechanism in which certain cues are built into the learner as the evidence that the learner must seek in order to identify a particular syntactic structure in the exposure language (Lightfoot 1993, 1999, Gibson and Wexler 1994, Fodor 1998, Tomasello 2000).

Of course, the conclusion that the acquisition of syntax is achieved in large measure by a selective learning mechanism is valid only to the extent that the arguments for abstract representation are themselves valid. Alternatives to the “early abstraction” view come in two related varieties. One approach recognizes that syntactic representations in adult grammars are abstract, but posits that this abstractness is the result of a learning mechanism that drives the learner from concrete representations of particular experiences to increasingly abstract generalizations over those experiences (Elman et al. 1996, Bybee 1998, Tomasello 2000, *inter alia*). A second approach denies that syntactic representations are so abstract, moving the explanatory burden of seemingly abstract phenomena to other areas of linguistic knowledge (Culicover and Jackendoff 2005). A growing body of research reflects a convergence of these alternatives, attributing less abstractness to syntactic representations and deriving what abstractness there is from domain-general processes of induction and categorization (e.g. Tomasello 1992, 2003, Goldberg, Casenhiser, and Sethuraman 2004, 2005, Goldberg 2006).
The study of the acquisition of argument structure has been a central battleground for debates about learning and abstractness. To date, experimental evidence in this domain has been mixed. Some researchers have emphasized children’s conservativity in extending novel syntactic frames to familiar verbs and the occasionally item-specific nature of their verb-related knowledge (Tomasello and Brooks 1998, Brooks and Tomasello 1999, Tomasello 2000, Savage et al 2003, Tomasello and Akhtar 2003). In contrast, others have highlighted evidence for abstract, verb-general knowledge in children’s usage and comprehension of these frames (Fisher 2002, Lidz et al 2003, Fernandes et al 2006, Gertner et al 2006, Shimpi et al 2007, Viau 2007, Yuan et al 2007). While we are entirely sympathetic to the latter interpretation of the available data, one shortcoming of work done previously in this domain has been its vagueness with respect to the finer points of the abstract representations attributed to learners. For example, consider the English dative constructions in (1).

(1)  
   a. Sara kicked Kai the ball  \textit{Double-object (DO) dative, V NP}_1 \textit{NP}_2  
   b. Sara kicked the ball to Kai  \textit{Prepositional dative, V NP PP}  

Recent studies using syntactic priming in comprehension (Thothathiri and Snedeker 2008) and elicited production of novel verbs (Conwell and Demuth 2007) have shown that three- and four-year-old English-speaking children possess somewhat abstract, verb-independent knowledge about dative constructions, e.g. along the lines of the general dative schemas in (2b) rather than the list of verb-specific schemas in (2a):

(2)  
   a. \textit{give NP}_1 \textit{NP}_2, \textit{give NP PP, show NP}_1 \textit{NP}_2, \textit{show NP PP, read NP}_1 \textit{NP}_2  
   b. \textit{V NP}_1 \textit{NP}_2, \textit{V NP PP}  

However, these studies were not designed to reveal anything about the internal structure of the schemas in (2b). Thus, while these findings are highly suggestive of verb-independent
representations by age three, such representations are fully compatible with learning mechanisms in which abstractness is a driving feature of acquisition as well as those in which abstractness is a consequence of acquisition.

In what follows, we dig deeper, starting where Conwell and Demuth (2007) and Thothathiri and Snedeker (2008) left off. We offer up one particular linguistic phenomenon, quantifier-variable binding in Kannada ditransitives, as a proving ground upon which competing claims about learnability and abstractness can be evaluated with respect to children’s grammatical knowledge. An example of this phenomenon in English is shown in (3), where the quantifier every binds the pronoun his (indicated by subscripts), yielding a bound-variable interpretation according to which each individual worker receives his own paycheck, as opposed to someone else’s.

(3) I gave every\textsubscript{x} worker his\textsubscript{x} paycheck

Looking ahead, we argue that even the best possible combination of rich, informative input and potent cognitive resources alone would likely underdetermine the grammar for this phenomenon in Kannada. This analysis naturally invites a learning mechanism in which abstract syntactic structure serves as a causal factor in successful acquisition, rather than merely being the outcome of learning. If children did not bring these representational resources to bear in acquisition, how four-year-old Kannada speakers might have acquired the linguistic competence that they are shown to have would remain mysterious. However, we wish to emphasize that claims about the causal role of syntactic structure in learning are valid only to the extent that we can identify how surface forms are mapped onto the relevant representations. We therefore include a proposal for how this might be achieved, illustrating how the environment interacts with the innate structure of the learner to allow for successful acquisition.
We first identify one aspect of syntactic representation that exhibits a range of syntactic, morphological and semantic consequences both within and across languages, namely the hierarchical structure of ditransitive verb phrases (Barss and Lasnik 1986, Larson 1988, Harley 2002). Next we show that while the semantic consequences of this structure are parallel in English, Kannada, and Spanish, the word order and morphological reflexes of this structure diverge. Thus, although it is clear that the same structures are exhibited cross-linguistically, the evidence available to learners that would allow them to identify these structures is variable. We then turn to an examination of children learning Kannada, demonstrating that they have command of the relation between morphological form and semantic interpretation in ditransitives with respect to quantifier-variable binding. Specifically, our data show that four-year-old native speakers of Kannada have both hierarchical surface representations of ditransitive constructions—e.g. \([\text{NP}_1\ldots\text{NP}_2\ldots]\text{V}\), in which \(\text{NP}_1\) asymmetrically c-commands \(\text{NP}_2\)—and knowledge of how the various ditransitive surface forms are derived from two distinct underlying structures. Their knowledge is independent of the specific verbs participating in these structures and only partially dependent on the surface word order. Finally, we offer a concrete, though somewhat speculative, proposal on how a selective learning mechanism might succeed in identifying the appropriate structures in this domain despite the variability in surface expression that exists across languages.

2. Background

2.1. Dative asymmetries

Since the focus of this paper is the hierarchical structure of ditransitive verb phrases, we first review some background on certain asymmetries in grammaticality judgments that have been
used as evidence for hierarchical structure in the past. Barss and Lasnik (1986) were the first to discuss the general phenomenon as it is manifested in English with respect to the dative alternation. They present six types of evidence, which we will briefly review in large part using data from Larson (1988). In each case the argument proceeds as follows: Given a grammaticality contrast, the facts fall out as they should if we assume (a) that the principle underlying the contrast crucially depends on the notion of c-command and (b) that this c-command requirement is met in the grammatical structure but not in its ungrammatical counterpart. For our purposes, the following working definition of c-command will suffice (see Reinhart 1976, 1983, Chomsky 1981, 1986):

\[
\text{(4) } C\text{-command: } a \text{ c-commands } b \text{ if and only if the lowest branching node that dominates } a \\
\text{ dominates } b \text{ and } a \text{ does not dominate } b.
\]

In (5), for example—but not (6)—He c-commands John by this definition, which arguably explains why He and John can grammatically corefer only in (6).

\[
\text{< INSERT EXAMPLES 5-6 HERE >}
\]

Returning to the data, the asymmetries shown below in (7-12) are exhibited by prepositional datives and DO-datives alike.

\[
\text{(7) } \text{Binding Principle A}
\]

\[
\begin{align*}
\text{a. } & \text{ I showed [the students]}_x \text{ to each other}_x\text{’s professors} \\
\text{b. } & \text{*I showed each other}_x\text{’s professors to [the students]}_x \\
\text{c. } & \text{ I showed [the professors]}_x \text{ each other}_x\text{’s students} \\
\text{d. } & \text{*I showed each other}_x\text{’s students [the professors]}_x
\end{align*}
\]
(8) Weak crossover
    a. [Which check]_x did you send __ to its_x owner?
    b. *[Which worker]_x did you send his_x check to __ ?
    c. [Which man]_x did you send __ his_x paycheck?
    d. *[Whose pay]_x did you send his_x mother __ ?

(9) Superiority
    a. Which check did you send __ to who?
    b. *To whom did you send which check __ ?
    c. Who did you give __ which paycheck?
    d. *Which paycheck did you give who __ ?

(10) Reciprocals
    a. I sent each boy to the other’s parents
    b. *I sent the other’s check to each boy
    c. I showed each man the other’s socks
    d. *I showed the other’s friend each man

(11) Negative polarity items (e.g. any)
    a. I sent no presents to any of the children
    b. *I sent any of the packages to none of the children
    c. I showed no one anything
    d. *I showed anyone nothing

(12) Quantifier-variable binding
    a. I gave [every check]_x to its_x owner
    b. *I gave his_x paycheck to [every worker]_x
c. I gave [every worker], his paycheck

d. *I gave its owner [every paycheck],

Let us assume that the c-command relation (without reference to linear order) is relevant in explaining the ungrammaticality of the (b) and (d) examples in all of these phenomena—the binding of anaphors, weak crossover, superiority effects, reciprocals, negative polarity licensing, and the binding of pronominal variables by quantifiers—as is standard in the generative tradition.⁴ Taken together, then, the asymmetries illustrated above provide strong evidence that for both prepositional datives and DO-datives the first internal argument c-commands the second, but not vice versa. C-command is unidirectional, hence asymmetrical, with respect to these constituents. Concerning quantifier-variable binding in particular (12), the relative depth of embedding of the internal objects determines binding possibilities. Thus, any dative configuration must have the following hierarchical property (ignoring aspects of the representation that are irrelevant for our purposes such as the category labels of the nodes):

< INSERT EXAMPLE 13 HERE >

Of course, every linguist (generative or otherwise) needs a theory of the phrase structure of datives. In our view, Barss-and-Lasnik-style data are criterial in determining what that phrase structure is, and only accounts positing hierarchical (as opposed to flat or indeterminate) structures for dative verb phrases will adequately capture them.⁵ In Sections 2.2 and 2.3, we motivate the claim that Kannada and Spanish, respectively, have the same underlying structures for ditransitives as English—in which the Goal asymmetrically c-commands the Theme in the “DO-dative” variant and the Theme asymmetrically c-commands the Goal in the “prepositional
dative” variant—with the caveat that these structures are subject to derivational deformation as a function of freer word order in these languages.

2.2. Quantifier-variable binding in Kannada

It is standardly held that quantifiers must c-command pronouns in order to bind them. This c-command requirement follows from the semantics of quantification and from general syntactic requirements on the bound interpretation of pronouns (Reinhart 1983, Heim and Kratzer 1998). We assume its basic correctness here. If quantifiers must c-command pronouns in order to bind them, then the quantifier-variable asymmetry we saw in (12) must arise due to syntactic configurations in which the first dative internal object c-commands the second, but not vice versa, for both dative constructions. In English, however, c-command and linear order are confounded. Thus, theoretical considerations aside, despite empirical findings suggesting that English-speaking children pattern with adults in their knowledge of asymmetries pertaining to Principle C and quantifier-variable binding in datives (Viau 2007, Viau and Lidz in preparation), it is impossible to demonstrate conclusively that the root cause of these asymmetries is asymmetric c-command of the second dative object by the first, as we have argued elsewhere. A simple preference for forward binding, with the binder preceding the bound in the linear string—however unappealing theoretically—could largely explain the observed findings in English. For this reason, we now turn to a discussion of quantifier-variable binding in Kannada, a language whose structure allows us to disentangle c-command and linear order.

Kannada is a Dravidian language spoken by approximately 40 million speakers primarily in the southern Indian state of Karnataka, where it is the official language. Some of its closest relatives, linguistically speaking, include Tamil, Telugu, and Malayalam. Kannada has unmarked Subject-Object-Verb (SOV) constituent order, and its word order is relatively free, with noun
phrases marked for case and verbs typically agreeing with the subject in person, number, and gender (Sridhar 1990).

In Kannada, the quantifier-variable binding asymmetry is more complex than in English, involving an interaction between word order and the presence or absence of a benefactive verbal affix (BEN). The basic pattern of adult grammaticality judgments with a quantified dative argument is shown in (14), where DAT indicates the indirect object, marked with dative case, ACC indicates the direct object, marked with accusative case, and Q- indicates which of these noun phrases contains a quantifier.\(^7\)

\[(14)\]

a. \(\text{Q-DAT}_x\ \text{ACC}_x\ \text{BEN}\)

\[
\begin{align*}
\text{Rashmi} & \ \text{pratiyobba} & \text{hudugan-ige} & \text{avan-a} & \text{kudure-yannu} & \text{tan-du-koTT-aLu} \\
\text{Rashmi} & \ \text{every} & \text{boy-DAT} & \text{3SM GEN} & \text{horse-ACC} & \text{return-PPL-BEN.PST-3SF} \\
\text{‘Rashmi returned every boy his horse’}
\end{align*}
\]

b. \(\text{Q-DAT}_x\ \text{ACC}_x\ \text{unaffixed}\)

\[
\begin{align*}
\text{Rashmi} & \ \text{pratiyobba} & \text{hudugan-ige} & \text{avan-a} & \text{kudure-yannu} & \text{tan-d-aLu} \\
\text{Rashmi} & \ \text{every} & \text{boy-DAT} & \text{3SM GEN} & \text{horse-ACC} & \text{return-PST-3SF} \\
\text{‘Rashmi returned every boy his horse’}
\end{align*}
\]

c. \(\text{ACC}_x\ \text{Q-DAT}_x\ \text{BEN}\)

\[
\begin{align*}
\text{Rashmi} & \ \text{avan-a} & \text{kudure-yannu} \ \text{pratiyobba} & \text{hudugan-ige} & \text{tan-du-koTT-aLu} \\
\text{Rashmi} & \ \text{3SM GEN} & \text{horse-ACC} & \ \text{every} & \text{boy-DAT} & \text{return-PPL-BEN.PST-3SF} \\
\text{‘Rashmi returned his horse to every boy’}
\end{align*}
\]

d. \(\text{*ACC}_x\ \text{Q-DAT}_x\ \text{unaffixed}\)
Descriptively speaking, when the dative-marked object comes first (14a-b), it can bind into the accusative-marked object, whether or not the benefactive affix is present. In contrast, when the accusative-marked object comes first (14c-d), the dative can bind into it only in the presence of the benefactive affix.

If the quantificational phrase is the accusative argument and the pronominal is contained in the dative argument, however, a different pattern emerges.

(15) a.  *DATₚ Q-ACCₚ BEN

  *sampaadaka adar-a lekhan-ige pratiyondu lekhana-vannu kaLis-i-koTT-a
  editor it-GEN author-DAT every article-ACC send-PP-BEN.PST-3SM

  ‘The editor sent its author every article’

b. DATₚ Q-ACCₚ unaffixed

  sampaadaka adar-a lekhan-ige pratiyondu lekhana-vannu kaLis-id-a
  editor it-GEN author-DAT every article-ACC send-PST-3SM

  ‘The editor sent its author every article’

c. Q-ACCₚ DATₚ BEN

  sampaadaka pratiyondu lekhana-vannu adara lekhan-ige kaLis-i-koTT-a
  editor every article-ACC it-GEN author-DAT send-PP-BEN.PST-3SM

  ‘The editor sent every article to its author’

d. Q-ACCₚ DATₚ unaffixed

  sampaadaka pratiyondu lekhana-vannu adar-a lekhan-ige kaLis-id-a
editor    every     article-ACC    it-GEN    author-DAT    send-PST-3SM

‘The editor sent every article to its author’

Here we see that when the accusative-marked object comes first (15c-d), it can bind into the dative-marked object, regardless of whether the benefactive affix is present on the verb.

However, when the dative-marked object comes first (15a-b), the accusative-marked object can bind into it only when the benefactive affix is absent. The relevant binding possibilities for quantified dative and accusative arguments are summarized below.

(16)  

a.  \( \sqrt{\text{Q-DAT}_x \text{ACC}_x \text{V-BEN}} \)  

b.  \( \sqrt{\text{Q-DAT}_x \text{ACC}_x \text{V}} \)  

c.  \( \sqrt{\text{ACC}_x \text{Q-DAT}_x \text{V-BEN}} \)  

d.  \( * \text{ACC}_x \text{Q-DAT}_x \text{V} \)  

e.  \( \ast \text{DAT}_x \text{Q-ACC}_x \text{V-BEN} \)  

f.  \( \sqrt{\text{DAT}_x \text{Q-ACC}_x \text{V}} \)  

g.  \( \sqrt{\text{Q-ACC}_x \text{DAT}_x \text{V-BEN}} \)  

Lidz and Williams (2005) argue that the above asymmetries arise from there being two distinct underlying structures for ditransitives in Kannada. When the benefactive affix is present, the DAT-ACC order is the underlying order, with the ACC-DAT order derived by A-movement. Thus, according to Lidz and Williams (2005), (16c) is derived from (16a) by movement of the accusative argument past the dative. The appearance of backward binding in (16c) is due to the fact that A-movement of the accusative over the dative does not destroy the binding relation established in the underlying order (16a), in which the quantified dative NP c-commands and thereby grammatically binds into the accusative. Similarly, since the DAT-ACC order is underlying, a quantificational accusative-marked object cannot bind into the dative (16e) unless A-movement has occurred, introducing a new configuration to license binding (16g).

When there is no benefactive affix, the ACC-DAT order reflects the underlying structure, and the DAT-ACC order is derived by A-movement. Thus, (16b) is derived from (16d). The
quantified dative NP in (16d) cannot bind into the accusative because it does not c-command the accusative; only after moving above the accusative, as in (16b), can it grammatically bind into the accusative. By the same logic, since the accusative is underlyingly higher than the dative, the binding of the dative by the accusative can be established over this representation (16h) and subsequent A-movement will not destroy it (16f).

We will assume this analysis as well as the syntactic representations that it entails, shown in (17) with the benefactive affix and in (18) without. Optional A-movement is marked with a dashed arrow.

< INSERT EXAMPLES 17-18 HERE >

The conclusion that there are two distinct underlying structures in Kannada, each of which can be transformed by A-movement of the lower NP past the higher one, straightforwardly captures the binding asymmetries discussed above. At this juncture it is important to note that neither a theory of quantifier-variable binding that makes reference only to the surface configurations nor a theory of quantifier-variable binding that makes reference only to the underlying configuration (or to some semantic representation that is isomorphic to what we are treating as the underlying representation, as in Culicover and Jackendoff 2005) can capture the full pattern of facts here. If binding were established only on the basis of the surface configuration, we would be unable to explain why the dative in (16c)—which occurs lower than the accusative in the surface syntax—can bind into the accusative. Neither would we be able to explain why the accusative in (16f), which occurs lower than the dative in surface syntax, can bind into the dative. By the same token, if binding were established only in some non-surface
representation (either the analog of D-structure or some kind of conceptual-semantic representation), it would be mysterious that the dative can bind into the accusative in (16b) but not (16d), since these would presumably be alike at that level of representation. Similarly, it would be mysterious that the accusative can bind into the dative in (16g) but not (16e), which should be alike at the relevant level of representation. In essence, the pattern reported in Lidz and Williams (2005) argues decisively for (a) a theory of ditransitives with two alternative initial arrangements of the arguments and (b) a derivational theory of syntax, since a monostratal theory seems incapable of capturing the relevant generalizations.

An additional piece of evidence supporting the claim that we are dealing with dual underlying structures here is that benefactive and nonbenefactive ditransitives in Kannada have different meanings (Lidz and Williams 2005). For example, benefactive ditransitives imply possession transfer just as DO-datives do in English (e.g. Green 1974, Oehrle 1976). Thus, in (19), Rashmi is understood as receiving the cake, and (19a) cannot felicitously be followed by (19b).

(19) a. nannu Rashmi-ge keek-annu suTT-u-koTT-e
   I Rashmi-DAT cake-ACC prepare-PP-BEN.PST-1S
   ‘I made Rashmi a cake…’

   b. #adare ad-annu nann-a taayi-ge koTT-e
   #but it-ACC I-GEN mother-DAT give.PST-1S
   ‘…but I gave it to my mother’

In contrast, nonbenefactive ditransitives do not imply possession transfer. Accordingly (20b) is a perfectly acceptable and felicitous follow-up to (20a).
(20) a. nannu Rashmi-ge keek-annu suTT-e
   I Rashmi-DAT cake-ACC prepare.PST-1S
   ‘I made a cake for Rashmi…’

b. adare ad-annu nann-a taayi-ge koTT-e
   but it-ACC I-GEN mother-DAT give.PST-1S
   ‘…but I gave it to my mother’

The data are consistent with the Kannada benefactive ditransitive representing the same
possession relation argued to be encoded by the DO-dative in English, a point to which we return
in Section 4. Before turning to our data on children’s interpretation of Kannada ditransitives, we
pause to consider what can be learned from a comparison with ditransitives in Spanish.

2.3. Quantifier-variable binding in Spanish

Spanish is similar to Kannada—and accordingly different from English—in that what is argued
to be the DO-dative is marked morphologically rather than by a distinctive word order. In
Spanish the DO-dative is signaled by clitic (CL) doubling (Uriagereka 1988, Masullo 1992,
pattern of adult grammaticality judgments for Spanish quantifier-variable binding in shown in
(21-22), where IO indicates the indirect object, DO indicates the direct object, Q- indicates the
quantified noun phrase, and CL indicates the clitic le, which refers to or “doubles” the IO:

(21) a. Q-DOx IOx
   el editor envió cada libro a su autor
   the editor send.PST.3S each book to its author
   ‘the editor sent each book to its author’
Descriptively speaking, without the clitic the DO can bind into the IO but not vice versa in the attested DO-IO word order (21a-b). With the clitic, the IO can bind into the DO regardless of
word order (22a-b), but the DO can bind into the IO only if the DO precedes the IO (22c-d). The relevant binding possibilities for quantified IOs and quantified DOs are summarized below:

(23) a. \( \sqrt{\text{CL}} \ Q-\text{IO} \_x \text{DO} \_x \)  
    b. ---  
    c. \( \sqrt{\text{CL}} \\ \text{DO} \_x \ Q-\text{IO} \_x \)  
    d. \* \( \text{DO} \_x \ Q-\text{IO} \_x \)  
    e. \* \( \sqrt{\text{CL}} \text{IO} \_x \ Q-\text{DO} \_x \)  
    f. ---  
    g. \( \sqrt{\text{CL}} \text{Q-DO} \_x \text{IO} \_x \)  
    h. \( \sqrt{\text{Q-DO}} \_x \text{IO} \_x \)

The Kannada and Spanish facts are thus exactly parallel (cf. (16)). Indeed, Bleam (1999, 2003) reaches the same conclusion for Spanish as Lidz and Williams (2005) do for Kannada, arguing that the above asymmetries arise from there being two distinct underlying structures for ditransitives in Spanish. When the clitic is present, the IO-DO order is the underlying order, with the DO-IO order derived by A-movement. Thus, according to Bleam (1999), (23c) is derived from (23a). The appearance of backward binding in (23c) is due to the fact that A-movement of the DO over the IO does not destroy the binding relation established in the underlying order (23a), in which the quantified IO c-commands and thereby grammatically binds into the DO. Similarly, since the IO-DO order is underlying, the quantified DO cannot bind into the IO (23e) unless A-movement has occurred, introducing a new configuration to license binding (23g).

When there is no clitic, the DO-IO order is unmarked (23d). The IO-DO order would have to be derived by A-movement in the absence of a clitic, but as it turns out this option is ruled out for independent reasons. The quantified IO in (23d) cannot bind into the DO because it does not c-command the DO. However, since the DO is underlingly higher than the IO, the binding of the IO by the DO can be established over this representation (23h).
We will assume this analysis as well as the syntactic representations that it entails, shown schematically in (24) with the clitic and in (25) without (see Harley 2002 and Bleam 2003 for extensive discussion). Optional A-movement is marked with a dashed arrow.

< INSERT EXAMPLES 24-25 HERE >

As in English and Kannada, the two underlying structures have different meanings. Clitic-doubled ditransitives imply possession transfer. Thus, in (26), the sister is understood as receiving the cake, and (26a) cannot felicitously be followed by (26b).

(26) a. Originalmente le compré el helado a mi hermana
   originally CL bought.pst.1s the ice cream for my sister
   ‘Originally, I bought the ice cream for my sister...’
   b. #pero decidí comerlo
   #but decide.pst.1s eat.it
   ‘...but I decided to eat it’

In contrast, ditransitives lacking clitic doubling do not imply possession transfer. Accordingly (27b) is a perfectly acceptable and felicitous follow-up to (27a).

(27) a. Originalmente compré el helado a mi hermana
   originally bought.pst.1s the ice cream for my sister
   ‘Originally, I bought the ice cream for my sister...’
   b. pero decidí comerlo
   but decide.pst.1s eat.it
   ‘...but I decided to eat it’
For other similar meaning differences in the spirit of Green (1974) and Oehrle (1976) that hinge on the presence of the clitic in Spanish, see Bleam (2003). It seems that the Spanish clitic-doubled ditransitive represents the same possession relation argued to be encoded by the DO-dative in English and the benefactive ditransitive in Kannada.\footnote{11}

2.4. Framing the learning problem

In the preceding sections we have seen good evidence that English, Kannada, and Spanish all utilize essentially the same two structures in ditransitives.\footnote{12} In the “prepositional dative,” the accusative argument c-commands the dative underlyingly. This structure is expressed in English as the prepositional dative, in Spanish as the non-clitic-doubled ditransitive, and in Kannada as the non-benefactive ditransitive. In the “DO-dative,” the dative argument c-commands the accusative underlyingly. This structure is expressed in English as the DO-dative, in Spanish through dative clitic doubling, and in Kannada through the benefactive verbal affix. Importantly, despite this fundamental structural symmetry across the three languages, the surface manifestation of these structures is distinct in each language. DO-datives show a distinct surface word order in English but not in Kannada and Spanish. Both Kannada and Spanish, unlike English, have a morphological distinction which correlates with the choice of DO-dative or prepositional dative. In Kannada, the DO-dative variant is marked by a benefactive verbal affix, while in Spanish this variant is marked via clitic doubling of the dative argument. Thus, learners cannot rely either on the word order or the morphological form as evidence in determining which of the two abstract structures underlies a ditransitive sentence in the language they are learning. Neither cue is cross-linguistically reliable (Haspelmath 2005). Thus, to the extent that learners can be shown to identify the appropriate structure we are faced with an interesting puzzle. The fact that the very same structures are exhibited in languages with such divergent surface syntax
points towards just the sort of cross-linguistic commonality that a selective learning theory is intended to explain. On the other hand, the fact that the surface realizations of these structures diverge across languages would appear to make it difficult to use the surface form as a cue for the underlying structure.

In what follows, we first demonstrate that children learning Kannada have the relevant abstract syntactic knowledge, as shown by their interpretive preferences with respect to quantifier-variable binding in ditransitives. We then turn to a discussion of how a selective learning mechanism might make the acquisition of these constructions possible.

It should be noted before moving on that four-year-old children are demonstrably adult-like with respect to their proficiency with quantifier-variable binding and their knowledge of c-command irrespective of dative syntax. Concerning quantifier-variable binding, Lidz et al. (2004) show that English-speaking children are willing and able to access the bound interpretation of sentences like (28) as measured by their responses and justifications in an experiment using the same experimental method as ours.

(28) a. Every dancer, kissed Kermit before she, went on stage
    b. Kermit kissed every dancer, before she, went on stage

Concerning c-command, a strong case has been made, for instance, that this fundamental relation constrains children’s interpretations of pronouns in English and Russian (Crain and McKee 1985, Chien and Wexler 1990, Kazanina and Phillips 2001, Kazanina 2005)), as well as their interpretations of scopally ambiguous sentences in English and Kannada (Lidz and Musolino 2002). For current purposes, it is sufficient to conclude on the basis of the available evidence that four-year-old children, whether they are native speakers of English or Kannada, can plausibly be assumed to be proficient in their interpretation of bound variables and reliant on c-command (see
Lidz 2007 for an overview of relevant findings). Now that all of the necessary pieces are in place, we turn to the details of our experiment.

3. Experiment: Quantifier-variable binding in Kannada

As discussed above, our goal here is to test whether Kannada-speaking children have knowledge of abstract structure within the ditransitive verb phrase. Specifically, we ask whether they show evidence of having adultlike patterns of grammaticality judgments with respect to quantifier-variable binding in ditransitives. To the extent that they do, it supports the view that children’s representations encode both the underlying hierarchical structure and the syntactic operations that rearrange it.

3.1. Participants

96 four-year-olds (46M 50F, M 4;6, range 4;2-5;2) participated. Child subjects were run at Swami Vivekinanda and Pushkarini Preschools in Mysore, India. Several adult subjects were also run in order to confirm the patterns of grammaticality judgments discussed above. These patterns were confirmed without exception, but the results are not reported.

3.2. Materials

Each subject judged four test sentences and three control sentences in pseudorandom order. The four test verbs were return, read, bring, and kick. For the complete list of stimuli—including story summaries and test and control sentences—see the Appendix. Each test story had two variants: one which made the bound reading of the test sentence true and the free reading false (bound-true), and another which made the bound reading of the test sentence false and the free reading true (bound-false). Here the terms bound and free should be understood as describing the status of the pronoun in the test sentence with respect to the quantified noun phrase (QNP). For
instance, in the sentence *Teacher kicked every girl her ball*, the bound interpretation of the pronoun *her* is one in which each girl receives her own ball, while the free interpretation involves the girls each getting some other female referent’s ball, e.g. the mermaid’s ball.

Subjects received either all bound-true test stories or all bound-false test stories depending on the condition to which they were randomly assigned, as detailed in Section 3.4.

*Bound-true test stories*

These test stories all made the bound reading true and the free reading false. Let us walk through an example for the test verb *return* in the DAT-ACC BEN condition.

(29) Three boys bring their horses to Rashmi. R2-D2 brings his own special horse to Rashmi also. After leaving for a while, they all return to retrieve their horses. Rashmi gives R2’s horse to the first boy by mistake. He objects and points out that it’s not his horse, so Rashmi gets him the correct horse. Rashmi then gives R2’s horse to the second boy. He objects also, correcting Rashmi and asking why she can’t remember which horse belongs to R2. Rashmi then gives the second boy the correct horse. Finally, Rashmi gives the third boy his horse and then gives R2 his special horse.13

*Puppet: That was a story about Rashmi, who was taking care of some horses. She couldn't remember whose horse was whose. So here's what happened...*

*Rashmi pratiyobba hudugan-ige avan-a kudure-yannu tan-du-koTT-aLu*

*Rashni every boy-dat 3sm-gen horse-acc return-ppl-ben.pst-3sf*

*Rashmi returned every boy his horse*

**DAT-ACC BEN**

Given the context in (29), the bound reading of this test sentence is true since every boy eventually received his own horse. However, the free reading is false since it is not the case that
every boy received R2’s horse (only two boys did). We predicted that child subjects would accept the bound reading of test sentences like these following bound-true contexts in all conditions except the one in which the bound reading is ruled out by the grammar due to the failure of the QNP to c-command the pronoun in the test sentence at any point in the derivation, namely ACC-DAT unaffixed.

Concerning stimulus design, subjects rejecting a bound-true test sentence always had an alternate extrasentential referent for the ambiguous pronoun to which they could refer in justifying their answer. For example, if a subject rejected the test sentence *Rashmi returned every boy his horse*, she could do so with confidence, pointing to the fact that Rashmi only mistakenly gave the horse belonging to R2 (the extrasentential antecedent referred to by *his*) to two of the three boys. Furthermore, in an attempt to balance out the salience of potential pronominal antecedents somewhat, we were careful to have characters refer to the extrasentential antecedent often throughout the story. Continuing with our example, though R2 doesn’t interact with Rashmi until the end of the story when he asks for his horse, the boys refer to him several times, making comments like “No, that’s R2’s horse. Look, it’s different than the others,” and Rashmi refers to this particular horse as “R2’s horse” each time she is corrected by one of the boys. Finally, we made sure that the Agent in all test sentences (Rashmi in this case) was of a different gender than the other characters so as to avoid confusion and potential processing difficulties in pronominal reference resolution.

In Figure 1 below, other important aspects of bound-true stories are highlighted schematically.

< INSERT FIGURE 1 HERE>
The colored dots indicate ownership. In all test stories, ownership was discussed explicitly (e.g. whose horse was whose), and color coding reinforced it. The extrasentential antecedent (e.g. the robot here) was always of the same gender as the other three characters denoted by the QNP, enabling all four characters to be potential antecedents for the pronoun in the test sentence.

Concerning the plot of the test stories, in all cases the Agent initiated transfer events with the three characters denoted by the QNP first before moving on the extrasentential antecedent. This order of major plot elements is represented in Figure 1 by the sequential subscript numbers.

Dashed green lines indicate returns of transferred items that were given by mistake. In the *return* test story, Rashmi keeps forgetting which horses go with which owners and gives R2’s horse first to one boy and then to another. Each time she mistakenly gives a boy R2’s horse, the boy corrects her and she takes the horse back. In other test stories involving physical transfer (*bring* and *kick*), the same sequence obtains. In the test story involving metaphorical transfer (*read*), each time the Agent mistakenly reads the wrong book to a character she takes the book back to where she got it, but for obvious reasons she can not literally take the story back from the character who listened to it.

*Bound*-false test stories

As one might expect, these test stories reversed the truth conditions for our test sentences, making the bound reading false and the free reading true. Let us walk through an example parallel to (29) for the test verb *return* in the DAT-ACC BEN condition, with the relevant differences underlined.

(30) Three boys bring their horses to Rashmi. R2-D2 brings his own special horse to Rashmi also. After leaving for a while, they all return to retrieve their horses. Rashmi gives R2’s horse to the first boy by mistake. He objects and points out that it’s not his horse, so
Rashmi gets him the correct horse. Rashmi then gives R2’s horse to the second boy. He objects also, correcting Rashmi and asking why she can’t remember which horse belongs to R2. Rashmi then gives the second boy the correct horse. Afterward, Rashmi gives the third boy R2’s horse and is corrected. At this point, Rashmi gives R2 his special horse and tells the third boy that she is too frustrated to get his horse for him.

_Puppet: That was a story about Rashmi, who was taking care of some horses. She couldn't remember whose horse was whose. So here's what happened..._

_Rashmi pratiyobba hudugan-ige avan-a kudure-yannu tan-du-koTT-aLu_

_Rashmi every boy-dat 3sm-gen horse-acc return-ppl-ben.pst-3sf_

'Rashmi returned every boy his horse'

DAT-ACC BEN

Given the context in (30), the bound reading of this test sentence is false since it is not the case that every boy eventually received his own horse. One boy is horseless at the end of the story. However, the free reading is true since every boy received R2’s horse. The predictions here were not so straightforward. Children could conceivably have accepted the free reading of the pronoun in all four test sentences since the bound-false stories made this reading true and the free reading is always available. Alternatively, there could have been a general bias toward the bound reading in our test stories even though these stories made it false. If this were the case, we predicted that kids would reject all of the test sentences in which the bound reading was grammatically possible (thereby indicating that they had a bound interpretation of the pronoun) and accept the one test sentence in which the bound reading is not grammatically possible, ACC-DAT unaffixed (thereby indicating that they had a free interpretation of the pronoun).
Apart from the different truth conditions that they established with respect to our test sentences, illustrated in Figure 2, the bound-false test stories were identical in all relevant respects to the bound-true test stories.

< INSERT FIGURE 2 HERE >

Control stories
The three control items were designed to test three independent aspects of language that could potentially confound our results if subjects were not proficient with them. Control 1 tested whether children correctly computed Principle C, an alternative principle based on c-command; Control 2 tested children’s ability to interpret the phrase *its owner*\(^{14}\); and Control 3 tested their relative preference for extrasentential antecedents in interpreting pronouns. The second of the three control items, Control 2, could be described by two possible sentences, one designed to elicit a *yes* response (and thus likely to be interpreted as true) and one designed to elicit a *no* response (and thus likely to be interpreted as false). This is because, as discussed briefly in Section 3.3, control items were also used to maintain a balance of *yes* and *no* responses throughout each experimental session. In contrast to Control 2, Control 1 was always false in context, and the Control 3 test sentence was always true in context.

3.3. Procedure
We used the Truth Value Judgment task (TVJT) (Crain and McKee 1985, Crain and Thornton 1998). In this task, one experimenter told a series of stories using toys and props, and a second experimenter played the role of an easily confused puppet who watched carefully alongside the children.\(^{15}\) After each story, the puppet said what she thought happened in the story. The puppet
first summarized the story (e.g. *That was a story about...*) and then described what she thought happened using the target sentence. The child’s job was to help the puppet learn by telling the puppet whether she was right or wrong. Before any of the stories were told, the rules of the task were explained: if the puppet is right, she gets a cookie; if she is wrong, she gets a sip of milk. Children were told that the puppet likes both types of snacks (though is only allowed one at a time), and they were encouraged to justify their answers. One experimenter recorded children’s responses and justifications. Children were always tested individually.

In order to guard against response bias, control items were used to maintain a balance of *yes* and *no* responses throughout each experimental session. For example, if a participant answered *yes* to the test sentence immediately preceding Control 2, the puppeteer would read a false control sentence after the Control 2 story in an attempt to elicit a *no*, and vice versa. We excluded data from children who missed more than one control story and/or who could not give justifications for their answers.

**3.4. Design**

This experiment had a 2x2x2 design with three factors manipulated between subjects. The three factors were word order (Subj DAT ACC V vs. Subj ACC DAT V), benefactive affix (present or absent), and context (bound-true vs. bound-false). Subjects were randomly assigned to one of eight experimental conditions (12 subjects per condition) corresponding to the four possible permutations of word order and benefactive affix in each of the two contexts. Subjects each judged four test sentences and three control sentences in pseudorandom order. The above aspects of the experimental design are summarized in Table 1 below.

< INSERT TABLE 1 HERE >
To be clear, subjects assigned to the bound-true DAT-ACC BEN condition received a total of four test items, all of which had bound-true stories followed by test sentences with the DAT-ACC order and the benefactive verbal affix. Likewise, subjects assigned to the bound-false DAT-ACC BEN condition received four test items with bound-false stories followed by the same test sentences, and so on. Please refer to Figures 1 and 2 as necessary for the distinction between the bound-true and bound-false story types, respectively.

3.5. Results

Participants’ responses were analyzed in terms of the percentage of bound readings. Unless otherwise indicated, all $p$ values reported below are two-tailed.

Let us examine the results for the bound-true test stories first. Recall that we predicted significantly higher acceptance rates for the bound reading for test sentences with grammatical quantifier-variable binding (DAT-ACC BEN, DAT-ACC unaffixed, and ACC-DAT BEN) than for test sentences in which the QNP failed to c-command the pronoun it was supposed to bind (ACC-DAT unaffixed). The results of Experiment 1 strongly confirmed this prediction, indicating that, as expected, children accepted the bound reading much more often when it was grammatical (90-98%) than when it was ungrammatical (15%). The data were so clear that statistical tests were essentially unnecessary. Still, we can confirm that the difference between percentage bound readings for all three sentence types with grammatical binding was significantly higher than that for the sentence type with ungrammatical binding as measured by independent samples $t$ test (DAT-ACC BEN vs. ACC-DAT unaffixed, $t(22) = 12.21, p < .0001$; DAT-ACC unaffixed vs. ACC-DAT unaffixed, $t(22) = 8.66, p < .0001$; ACC-DAT BEN vs. ACC-DAT unaffixed, $t(22) = 11.48, p < .0001$).
Turning to the bound-false test stories, recall that there were two possible predictions. First, children could conceivably have accepted the free reading of the pronoun in all four test sentences since the bound-false stories made this reading true and the free reading is always available. In this case one would expect high acceptance rates across the board for all four test sentences. Alternatively, there could have been a bias toward the bound reading as we observed in Experiment 2 despite the fact that the bound-false stories made it false. If this were the case we predicted that children would reject all of the test sentences in which the bound reading was false but grammatically possible and accept the test sentence in the one condition in which the bound reading was false and also ruled out by the grammar, ACC-DAT unaffixed. The latter prediction was borne out by the data. Children chose the bound reading more often for test sentences with grammatical binding (65-73%) than for the test sentence with ungrammatical binding (4%). Again, the data were extremely easy to interpret. We can confirm that the difference between percentage bound readings for all three grammatical sentence types was significantly higher than those for the ungrammatical sentence type as measured by independent samples t test (DAT-ACC BEN vs. ACC-DAT unaffixed, t(22) = 6.37, p < .0001; DAT-ACC unaffixed vs. ACC-DAT unaffixed, t(22) = 5.39, p < .0001; ACC-DAT BEN vs. ACC-DAT unaffixed, t(22) = 6.63, p < .0001).
Though Figures 3 and 4 look more or less identical, keep in mind that subjects in the bound-true conditions indicated their choice of the bound reading by accepting test sentences while subjects in the bound-false conditions indicated their choice of the bound reading by rejecting them. The fact that we observe identical response patterns regardless of whether children said yes or no to indicate their preference effectively rules out response bias as an explanatory factor for our results.

3.6 Discussion

The results of this experiment—that Kannada-speaking four-year-olds show the adult pattern of grammaticality judgments for a complex quantifier-variable binding asymmetry in ditransitives—drive home the point made in the introduction that children’s representations of these constructions are configurational, and more specifically that the configurations involved are derived from two distinct underlying structures, as argued by Lidz and Williams (2005). Whereas a simple preference for forward binding, with the binder preceding the bound in the linear string, could technically explain children’s acquisition of the adult pattern in English (see Viau 2007, Viau and Lidz in preparation), such a preference cannot explain the Kannada data. In Kannada, a dative-marked QNP does not need to precede the pronoun that it grammatically binds as long as the benefactive affix is present. In combination with derivational history, c-command—for which there are few surface cues in the input (if any)—reliably determines binding possibilities, as opposed to linear order, which is only a weak cue to the grammaticality of quantifier-variable binding. Kannada-speaking children have been shown to be quite aware of this fact, an awareness which seemingly can only flow from highly abstract knowledge of syntax on their part.
The derivational conclusion here is perhaps most striking. As noted above, monostratal analyses or analyses in which binding is determined on the basis of a single extrasyntactic representation would be hard-pressed to explain the complex array of data presented here since neither surface word order nor the meaning associated with benefactive morphology predicts the binding possibilities by themselves.

In the remaining discussion we turn our attention to how children might have come to acquire the complex interaction between word order and benefactive morphology in predicting quantifier-variable binding in Kannada ditransitives.

4. General Discussion
In order for a selective learning mechanism to function in the acquisition of Kannada ditransitives, it seems to us that three things must be true. First, the learner must know that ditransitives divide into two types with different structures: one in which the DO asymmetrically c-commands the IO in the underlying representation, and another in which the IO asymmetrically c-commands the DO in the underlying representation. Second, the learner must know that these two types are distinguished by the thematic relation borne by the IO argument (i.e. IO = possessor in the “DO-dative” variant; IO = goal in the “prepositional dative” variant). Third, the learner must know that possessors are more likely than goals to be animate. A learner equipped with this knowledge should be able to use the distribution of animate and inanimate IO arguments to determine which ditransitive structure is intended for a given surface form.

Concerning the first two requirements, the analysis in Lidz and Williams (2005) builds on Harley’s (2002) syntactic account of the dative alternation in unifying these requirements within a single representation. The semantic differences distinguishing dative constructions are made to
follow from distinct heads that introduce the distinct thematic relations associated with direct and indirect objects, as illustrated in (31).

< INSERT EXAMPLE 31 HERE >

Specifically, \( \text{P} \text{HAVE} \) requires a Possessor in specifier position and a Theme in complement position (31a), while \( \text{P} \text{LOC} \) requires the opposite configuration, a Theme in specifier position and a Goal in complement position (31b). This refinement of the configurational knowledge attributed to the learner profoundly simplifies the process of acquiring ditransitive constructions. In particular, it enables a deductive learning account, which can be summarized as follows:

(32) Deductive learning for datives: The configurational properties of dative constructions follow deductively from their semantics. Once learners identify which dative construction counts as possessional, it follows that the IO/dative argument is structurally superior to the DO/accusative argument in that construction (and vice versa for the nonpossessional variant).

In essence, the child who is able to determine which dative variant encodes possession gets both variants’ syntax for free (modulo word order variability within and across languages).

Our proposal for how the child would make this determination is simple. Recall the third requirement mentioned above, namely that the learner must know that possessors are more likely to be animate than goals. It is hard to imagine this not being the case, given that animacy is a defining feature of recipiendhood and that possession-oriented concepts such as ‘possessor’ and ‘recipient’ are expressed extremely early in child language (Brown 1973, Tomasello 1998, 2003, \textit{inter alia}). Thus, given that IOs bearing the Possessor thematic relation are highly likely to be
animate and that IOs bearing the Goal thematic relation are completely free to be either animate or inanimate, the learner can simply track the distribution of IO arguments across constructions in order to determine which construction has an IO with the Possessor relation and which has an IO with the Goal relation. The construction in which inanimates occur more frequently as IOs is the construction with a locative (nonpossessational) structure.

Now, let us assume that a statistical pattern in the input holds whereby one dative construction is more likely to appear with an inanimate goal than the other (e.g. prepositional dative in English, ditransitive without BEN in Kannada, ditransitive without clitic doubling in Spanish). This pattern remains to be documented empirically in Kannada and Spanish to our knowledge, but there is evidence that it is present in English both in adults’ spontaneous speech (Bresnan et al 2007) and in adults’ and children’s elicited production (Viau and Landau in preparation). Having observed this pattern, the learner should be able to easily conclude that the dative construction less frequently associated with inanimate goals involves possession and thus can proceed to map that construction to the underlying structure that assigns the possessor thematic relation to the IO. We note that there is suggestive corpus evidence showing that two-year-old English-speaking children behave as if they do discern meaning differences between the two dative constructions (Viau 2006, 2007), and the available behavioral data from three- and four-year-olds support this conclusion as well (see Tamura et al 2007 for Japanese, Viau and Landau (in preparation) for English).

The selective learning account thus works as follows. The child comes to the learning task with the knowledge that natural languages use at least two ways to configure ditransitives: a possession-based structure in which the IO occurs higher than the DO, and a location-based structure in which the DO occurs higher than the IO. If the child is faced with two distinct types
of ditransitive clauses (e.g. DO- vs. prepositional dative in English, benefactive vs. nonbenefactive in Kannada, clitic-doubled vs. not clitic doubled in Spanish), she must then identify which of these to associate with which underlying configuration. To do so, the child relies on the distribution of animate IOs. The construction in which IOs are more likely to be animate than inanimate has the possession configuration and the construction in which IOs are more likely to be inanimate than animate has the location configuration.

Importantly, once the learner correctly identifies the underlying configuration, the variable-binding asymmetries that we have observed in our experimentation follow directly. Thus, the learner requires no experience with particular binding configurations in order to acquire the variable-binding asymmetries we have observed in our experimentation.

This is not to say, of course, that there is no learning involved in the acquisition of ditransitives. Ours is a learning-theoretic account in which the child, armed with a set of possible configurations for ditransitives and faced with the data, is able to use certain patterns of distribution to identify a mapping between surface forms and innate configurations. The innate guidance comes from the set of configurations and their semantic properties. Knowing these semantic properties enables the learner to track appropriate distributional information in the surface forms in order to learn which surface forms map onto which of the innate configurations. Again, the configurations, in concert with basic structural requirements on variable binding (which may themselves either be learned or innate) and knowledge of how word order can be manipulated in the target language (which surely is at least partially learned), directly determine the binding possibilities for the structures tested in our experimentation.

Crucially, for this selective learning account to succeed, children do not need to be able to discern all of the subtle meaning differences between DO-dative and prepositional dative
variants that are often discussed in the literature. As is often highlighted (see, e.g. Rappaport Hovav and Levin 2008) these meaning differences do not generally rise to the level of entailments. Typically, the DO-dative variant merely implies possession transfer, as shown in (33b), which is infelicitous rather than ungrammatical.

(33)  
   a. I made a cake for Rashmi, but I gave it to my mother  
   b. # I made Rashmi a cake, but I gave it to my mother

In order for the child learner to make use of such subtle distinctions, the child would have to (a) be sufficiently exposed to instructive utterances like those in (33) in which possible possession-related inferences are denied; (b) be sufficiently exposed to discourses in which the relative infelicity of one of the utterances, in this case (33b), is made plain; and (c) be capable of noticing the infelicity of (33b). We have no data that shed light on the frequency with which conditions (a) and (b) are met in English, Kannada, or Spanish. Condition (c) could well be plausibly met, though children are hardly known for their pragmatic sophistication (Noveck 2001, Papafragou and Musolino 2003, Musolino and Lidz 2006). Given these considerations, it strikes us that many (likely the vast majority of) utterances with typical dative verbs would be uninstructive with respect to dative meaning differences. Thus, we think it is unlikely that attending solely to contrasts like that in (33) would draw children’s attention to the relevant distinctions to the point that they could decide which dative construction is possessional. Indeed, we think it is a strength of the selective learning account that we have outlined that these kinds of subtle semantic facts do not have to be learned, and do not contribute to learning, but rather follow from an interaction between the structure of the learner and the regularities present in the environment.

It is worth considering, in contrast, whether the distributional facts concerning IO and DO arguments by themselves could somehow be enough to lead to the child’s knowledge of the
complex binding asymmetries observed here in the absence of innate configurational knowledge. Suppose that it is true that the distribution of inanimate IOs is heavily skewed towards nonbenefactive ditransitives in Kannada. In our account, this observation enables the learner to determine that the nonbenefactive ditransitive is a locative (i.e. nonpossessional) structure and hence that the DO is underlyingly higher than the IO. From this, it follows that a quantificational IO in the nonbenefactive ditransitive can bind into the DO only if the IO precedes the DO in the string. What conclusions would be licensed about variable binding on the basis of this asymmetry on a usage-based account (e.g. Tomasello 1992, 2000; Goldberg 2006, *inter alia*) in which particular structures become increasingly abstract as a function of experience? It seems to us that nothing would follow from this distributional observation except that it is a fact. Indeed, on a usage-based account of learning, it seems that the only way to learn the facts in (16) would be to hear each of these sentences repeatedly under conditions in which the learner could clearly discern the intended meaning of the utterance. If the learner were exposed only to a subset of these sentences (or erroneously encoded the intended meaning), then she would run the risk of acquiring a generalization about binding based either on word order or on benefactive morphology rather than on the complex interaction of these two factors that we have observed. While we cannot definitively provide an argument against a usage-based proposal, since the details of the relevant mechanisms for generalization have yet to be elaborated in that literature, it strikes us as a serious challenge to such an approach to explain how the kinds of asymmetries observed in our experimentation could follow from something other than the kind of selective learning account outlined here.

Of course, our selective learning account remains somewhat speculative, as we currently have no clear data on the distribution of animate and inanimate IOs in Kannada or Spanish
(though the results for English are encouraging, as discussed earlier). Indeed, we could very well be wrong about the particular cue that drives the appropriate mapping between surface form and a particular ditransitive structure. Nonetheless, a strength of our account is that the child need have no experience with binding in ditransitives to acquire the complex array of binding facts we have now seen that they command. It remains an important goal for both nativists and those less enamored with the structure of the learner to identify precisely how the kinds of asymmetries observed in this paper (which keep syntacticians in business) can be shown to follow from experience. In our account, experience plays a critical role, but only in concert with a set of specific syntactic hypotheses that this experience can be measured against.
References


*Cognition*, 34, 137-195.


Endnotes

1 By the term *dative* no special claims about case assignment to either internal argument are intended; rather, we lean on the conventional use of *dative* as having to do with literal or metaphorical transfer, typically of some thing to some person or location. *Dative* derives from the Latin *dativus*, meaning “appropriate to giving.” The term *ditransitive* will be used as an umbrella term to refer to both dative constructions in English and to their equivalents in Kannada and Spanish.

2 Note that Barss and Lasnik (1986) originally restricted their discussion to DO-datives; Larson (1988) extended their observations to include prepositional datives in motivating his syntactic analysis.

3 We assume the following general formulation of Binding Principle C: R-expressions (referring expressions, e.g. John) must be free, where free is defined as not being bound by a c-commanding antecedent (e.g. Chomsky 1986). For example, in the sentence *He* left *John*, *He* and *John* can not corefer without incurring a Principle C violation since *He* c-commands *John*.

4 This is a common but not universally embraced assumption. See, for example, van Hoek (1997) or Harris and Bates (2002) for non-structural accounts of pronominal reference. Less formalist work along these lines typically fails to account for or even address the wide range of other phenomena, only some of which are described above, that c-command helps to explain.

5 Another important issue about which we will have little to say is whether the two dative constructions in English are transformationally related, as Larson (1988) originally proposed (see also Aoun and Li 1989, den Dikken 1995, *inter alia*) or rather base-generated (e.g. Goldberg 1995, Harley 2002, Bleam 2003, Lidz 2003, Beck and Johnson 2004; see Rappaport Hovav and Levin 2008 for a review). The analysis proposed for Kannada ditransitives in this paper is a
hybrid of these approaches, with transformations operating on two distinct base-generated structures to yield four possible surface forms.

6 Indeed, Barss and Lasnik’s original use of their asymmetries was to argue for the relevance of linear order in explaining them.

7 We follow Sridhar (1990) and Lidz and Williams (2005) in adopting the convention of capitalizing retroflex consonants in Kannada.

8 See Mahajan (1990) for the distinction between A and A-bar movement with respect to binding possibilities.

9 For a similar argument concerning ditransitives in a related language, Tamil, see Sundaresan (2006).

10 The reverse IO-DO word order is reported to be impossible in Spanish in the absence of the clitic without special focus structure (Demonte 1995, Bleam 1999, 2003).

11 It is important to note as well that when we say that one structure is the “underlying” structure, this has no bearing on what is the preferred or unmarked word order in actual usage. In Spanish the ACC-DAT order is the informationally neutral word order, with the DAT-ACC order bearing a marked information structure status (see Demonte 1995, Bleam 1999, 2003, inter alia for discussion). This is true independent of the presence of clitic doubling. In Kannada the dative-accusative order is the informationally neutral word order, with the accusative-dative order conveying marked information structure. Again, this is true independent of the presence or absence of the benefactive morpheme (see Tirumalesh 2000).

12 Similar claims have also been made for Greek (Anagnostopoulou 2003), Hiaki (Jelinek 1999, Harley 2002), Japanese (Miyagawa and Tsujioka 2004), Korean (Jung and Miyagawa 2004), and Romanian (Diaconescu and Rivero 2007), among other languages.
Of course, all interactions with the children, including the presentation of experimental materials, were conducted in Kannada by a native speaker of Kannada (A.S. Mahadeva).

The motivation for including this specific control sentence comes from the English-language version of this and a related experiment, with which we compare these results explicitly in other work. See Viau (2007) and Viau and Lidz (in preparation) for details.

In this experiment A.S. Mahadeva played the twin roles of storyteller and puppeteer, and Jeffrey Lidz noted children’s responses.

These configurations abstract away from surface word order. In Kannada, the P\textsubscript{HAVE} head would be realized by the benefactive affix.

Interestingly, the correlation of animacy with clitic doubling in Spanish has led many to erroneously conclude that clitic doubling actually requires an animate dative NP. In fact, inanimates that can act as possessors can be clitic doubled as well (cf. Suñer 1988, Bleam 1999).
Appendix: Stimuli

(A1) Test sentences for Experiment 1

ACC DAT unaffixed

1. KICK
adhyaapaka avaL-a ceND-annu pratiyobba huDug-ige od-d-anu
teacher 3sf-gen ball-acc every girl-dat kick-pst-3sm
'Teacher kicked her ball to every girl'

2. BRING
kaavalugaara avaL-a magu-vannu pratiyobba taay-ige kaLis-id-anu
babysitter 3sf-gen baby-acc every mother-dat bring-pst-3sm
'The babysitter brought her baby to every mother'

3. RETURN
Rashmi avan-a kudure-yannu pratiyobba hudugan-ige tan-d-aLu
Rashmi 3sm-gen horse-acc every boy-dat return-pst-3sf
'Rashmi returned his horse to every boy'

4. READ
adhyaapaki avan-a pustaka-vannu pratiyondu aame-ge oodu-heeLidaLu
teacher 3sm-gen book-acc every turtle-dat read-tell-pst-3sf
'Teacher read his book to every turtle'

DAT ACC unaffixed

1. KICK
adhyaapaka pratiyobba huDug-ige avaL-a ceND-annu od-d-anu
teacher every girl-dat 3sf-gen ball-acc kick-pst-3sm
'Teacher kicked every girl her ball'

2. BRING
kaavalugaara pratiyobba taay-ige avaL-a magu-vannu kaLis-id-anu
babysitter every mother-dat 3sf-gen baby-acc bring-pst-3sm
'The babysitter brought every mother her baby'

3. RETURN
Rashmi pratiyobba hudugan-ige avan-a kudure-yannu tan-d-aLu
Rashmi every boy-dat 3sm-gen horse-acc return-pst-3sf
'Rashmi returned every boy his horse'
4. READ
adhyaapaki pratiyondu aame-ge avan-a pustaka-vannu oodu-heelidaLu
teacher every turtle-dat 3sm-gen book-acc read-tell-pst-3sf
'Teacher read every turtle his book'

ACC DAT BEN

1. KICK
adhyaapaka avaL-a ceND-annu pratiyobba huDug-ige od-du-koTT-anu
teacher 3sf-gen ball-acc every girl-dat kick-ppl-ben.pst-3sm
'Teacher kicked her ball to every girl'

2. BRING
kaavalugaara avaL-a magu-vannu pratiyobba taay-ige kaLis-i-koTT-anu
babysitter 3sf-gen baby-acc every mother-dat bring-ppl-ben.pst-3sm
'The babysitter brought her baby to every mother'

3. RETURN
Rashmi avan-a kudure-yannu pratiyobba hudugan-ige tan-du-koTT-aLu
Rashmi 3sm-gen horse-acc every boy-dat return-ppl-ben.pst-3sf
'Rashmi returned his horse to every boy'

4. READ
adhyaapaki avan-a pustaka-vannu pratiyondu aame-ge oodu-heel-i-koTT-aLu
teacher 3sm-gen book-acc every turtle-dat read-tell-ppl-ben.pst-3sf
'Teacher read his book to every turtle'

DAT ACC BEN

1. KICK
adhyaapaka pratiyobba huDug-ige avaL-a ceND-annu od-du-koTT-anu
teacher every girl-dat 3sf-gen ball-acc kick-ppl-ben.pst-3sm
'Teacher kicked every girl her ball'

2. BRING
kaavalugaara pratiyobba taay-ige avaL-a magu-vannu kaLis-i-koTT-anu
babysitter every mother-dat 3sf-gen baby-acc bring-ppl-ben.pst-3sm
'The babysitter brought every mother her baby'

3. RETURN
Rashmi pratiyobba hudugan-ige avan-a kudure-yannu tan-du-koTT-aLu
Rashmi every boy-dat 3sm-gen horse-acc return-ppl-ben.pst-3sf
'Rashmi returned every boy his horse'
4. READ

"Teacher every turtle read his book"
(A2) Test stories for Experiment 1 (bound-true)

KICK

It’s time for soccer practice, and the players on the team (three girls and a mermaid) each kick their balls to the teacher. Now the teacher is going to kick the balls back to the players. He kicks the mermaid's ball to the blue girl. She objects, saying "That's not my ball, that's the mermaid's ball." Then he kicks the blue ball to the blue girl. Next he kicks the mermaid's ball to the yellow girl. She objects, saying "Pay attention! The black ball is the mermaid's. That's her ball." Then he kicks the yellow ball to the yellow girl. Now it's the green girl's turn. The teacher says, "Oh, I remember. The black ball is her ball (pointing to the mermaid). So I'll give you the green ball." He does so. Then he gives the mermaid the black ball.

That was a story about soccer practice. The coach couldn't remember whose ball was whose. So here's what happened....

BRING

Three mother animals and the older sister mermaid are going to a party. They leave their charges (daughter animals and sister) with the babysitter. When they return from the party, they ask the babysitter for their kids back. The babysitter first gives the mermaid baby to the elephant mother. The elephant objects, saying “The mermaid baby doesn't have a trunk. That's not my baby.” The babysitter realizes his mistake and gives the elephant baby to the elephant mom. Then he gives the mermaid baby to the dinosaur mother. “What, are you blind?” she asks. “The mermaid baby has a fish tail. I'm a stegosaurus.” The babysitter realizes his mistake and gives the dinosaur baby to the dinosaur mom. Then he turns to the cow. “I know the mermaid baby does not belong to you either,” he says. So he gives her the cow baby. Then he gives the mermaid baby to the mermaid.

That was a story about a babysitter. He couldn't remember whose baby was whose. So here's what happened...

RETURN

Three boys bring their horses to Rashmi. R2-D2 brings his own special horse to Rashmi also. After a while, they all return to retrieve their horses. Rashmi gives R2’s horse to the first boy by mistake. He objects and points out that it’s not his horse, so Rashmi gets him the correct horse. Rashmi then gives R2’s horse to the second boy. He objects also, correcting Rashmi and asking why she can’t remember which horse belongs to R2. Rashmi then gives the second boy the correct horse. Finally, Rashmi gives the third boy his horse and then gives R2 his special horse.

That was a story about Rashmi, who was taking care of some horses. She couldn't remember whose horse was whose. So here's what happened...
READ

Four students (three turtles and one alligator) hand in their homework assignments (in book form) to the teacher. Now she is ready to give them back. She reads the alligator's book to the first turtle and says what a nice job he did. The first turtle says that that's not his book. She finds the correct book and reads it to him. Next the teacher reads the alligator’s book to the second turtle and is corrected. So she reads the correct book to the second turtle. By now, the teacher has figured things out. She reads the third turtle the correct book, and then she reads the alligator the alligator’s book.

That was a story about a school. The teacher couldn't remember whose book was whose. So here's what happened...
(A3) Test stories for Experiment 1 (bound-true)

KICK

It’s time for soccer practice, and the players on the team (three girls and a mermaid) each kick their balls to the teacher. Now the teacher is going to kick the balls back to the players. He kicks the mermaid's ball to the blue girl. She objects, saying "That's not my ball, that's the mermaid's ball." Then he kicks the blue ball to the blue girl. Next he kicks the mermaid's ball to the yellow girl. She objects, saying "Pay attention! The black ball is the mermaid's. That's her ball." Then he kicks the yellow ball to the yellow girl. Now it's the green girl's turn. The teacher kicks the mermaid’s ball to the green girl, who corrects him once again. Frustrated, the teacher gives the mermaid’s ball to the mermaid and tells the green girl that he’s too frustrated to help her out.

That was a story about soccer practice. The coach couldn't remember whose ball was whose. So here's what happened....

BRING

Three mother animals and the older sister mermaid are going to a party. They leave their charges (daughter animals and sister) with the babysitter. When they return from the party, they ask the babysitter for their kids back. The babysitter first gives the mermaid baby to the elephant mother. The elephant objects, saying “The mermaid baby doesn't have a trunk. That's not my baby.” The babysitter realizes his mistake and gives the elephant baby to the elephant mom. Then he gives the mermaid baby to the dinosaur mother. “What, are you blind?” she asks. “The mermaid baby has a fish tail. I'm a stegosaurus.” The babysitter realizes his mistake and gives the dinosaur baby to the dinosaur mom. Then the babysitter gives the mermaid baby to the cow, who points out his mistake. At this point the babysitter gives the mermaid baby to the mermaid and gives up without helping the cow’s mother any further.

That was a story about a babysitter. He couldn't remember whose baby was whose. So here's what happened...

RETURN

Three boys bring their horses to Rashmi. R2-D2 brings his own special horse to Rashmi also. After a while, they all return to retrieve their horses. Rashmi gives R2’s horse to the first boy by mistake. He objects and points out that it’s not his horse, so Rashmi gets him the correct horse. Rashmi then gives R2’s horse to the second boy. He objects also, correcting Rashmi and asking why she can’t remember which horse belongs to R2. Rashmi then gives the second boy the correct horse. Afterward, Rashmi gives the third boy R2’s horse and is corrected. At this point, Rashmi gives R2 his special horse and tells the third boy that she is too frustrated to get his horse for him.

That was a story about Rashmi, who was taking care of some horses. She couldn't remember whose horse was whose. So here's what happened...
Four students (three turtles and one alligator) hand in their homework assignments (in book form) to the teacher. Now she is ready to give them back. She reads the alligator's book to the first turtle and says what a nice job he did. The first turtle says that that's not his book. She finds the correct book and reads it to him. Next the teacher reads the alligator's book to the second turtle and is corrected. So she reads the correct book to the second turtle. Then the teacher reads the alligator's book to the third turtle, who objects. Finally, the teacher reads the alligator's book to the alligator and then stops, too frustrated to help the third turtle with his correct book.

*That was a story about a school. The teacher couldn't remember whose book was whose. So here's what happened...*
(A4) Control sentences for Experiment 1

PRINCIPLE C (Control 1)

expected response

idu niili ciTTey-a pogostiki-nallli kuppaLis-itu
3sn.prox blue butterfly-gen pogostick-loc jump-pst.3sn
'He jumped on the blue butterfly's pogostick' F

ITS OWNER (Control 2)

Mickey adar-a oDeya-nannu kaaND-a
Mickey 3sn.remote-gen owner-acc find.pst-3sm
'Mickey found its owner' T

Mickey adar-a oDeya-nannu kaaN-al-illa
Mickey 3sn.remote-gen owner-acc find-inf-neg
'Mickey didn’t find its owner' F

PRONOUN FIRST (Control 3)

mari girafe avaL-ige huliy-a molada bagge heeL-itu
baby giraffe her-dat tiger-gen rabbit about tell-pst.3sn
'Baby giraffe told her about tiger's rabbit' T
(A5) Control stories for Experiment 1

PRINCIPLE C (Control 1)

It's the day of the great pogo-stick jumping competition. The competitors are the red butterfly and the blue butterfly. Each butterfly has a pogostick that is matching in color. Before the competition begins, the blue butterfly says that he's tired of his blue pogostick and wants to try a red one. He asks the red butterfly to switch. The red butterfly considers the switch, but decides that he needs good luck because he's seen the blue butterfly jump and doesn't want to use a new pogostick for the competition. So the blue butterfly uses the blue pogostick and the red butterfly uses the red pogostick.

That was a story about a jumping game. The butterflies thought about switching pogosticks. So here's what happened...

ITS OWNER (Control 2)

Mickey was walking down the road one day when he came across a big box. He decided to look inside. There was a computer. He really wanted to play with it, but he thought he should ask permission first. So Mickey set off to find out who the computer belonged to. First he asked the smurf, who was painting a picture. The smurf said it wasn't his computer, but maybe he should ask the dwarf. So Mickey found the dwarf and asked if it was his computer. The dwarf said it was. Mickey asked if he could play with it. The dwarf said yes.

That was a story about Mickey, who found a computer. Here's what happened...

PRONOUN FIRST (Control 3)

The tiger has an amazing rabbit that talks, and she’s just dying to show it off. She lets the baby giraffe in on the secret. At first, he thinks it's a trick, but he finally believes it. After witnessing the talking rabbit, the baby giraffe goes off to tell his mother all about it. The mother is also skeptical, but the baby giraffe insists that he’s telling the truth!

That was a funny story about a tiger who had a talking rabbit, and some giraffes. The giraffes didn’t believe that rabbits could talk. So here's what happened...
(5)  

IP  

He  

I'  

left  

John  

\(\bigcirc\) = c-command domain of pronoun

< EXAMPLE 5 >
After John went home he left.

< EXAMPLE 6 >
(13)  

[Diagram: A tree structure with a verb (V) at the root, followed by an ellipsis (⋯) and an NP (NP₁). Below NP₁ is another ellipsis (⋯) leading to an NP (NP₂). A circle marked with a dot represents c-command domain of NP₁.]

<EXAMPLE 13>
(17) Subject DAT ACC V-BEN

< EXAMPLE 17 >
(18) Subject ACC DAT V

< EXAMPLE 18 >
(24) Subject CL V IO DO

\[ \text{\textit{vP}} \]

\[ \text{\textit{Subject}} \quad \text{\textit{v'}} \]

\[ \text{\textit{CL V}} \quad \text{\textit{PP}} \]

\[ \text{\textit{IO}} \quad \text{\textit{P'}} \]

\[ \text{\textit{P}}_{\text{HAVE}} \quad \text{DO} \]

< EXAMPLE 24 >
(25) Subject V DO IO

\[
\begin{array}{c}
vP \\
\text{Subject} & v' \\
\text{V} & \text{PP} \\
\text{DO} & \text{P'} \\
\text{P}_{\text{LOC}} & \text{IO}
\end{array}
\]

< EXAMPLE 25 >
Figure 1: Plot outline for a bound-true test story
Figure 2: Plot outline for a bound-false test story
Table 1: Experimental conditions (bound-true/bound-false)

<table>
<thead>
<tr>
<th>DAT-ACC BEN</th>
<th>DAT-ACC</th>
<th>ACC-DAT BEN</th>
<th>ACC-DAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control 1</td>
<td>Control 1</td>
<td>Control 1</td>
<td>Control 1</td>
</tr>
<tr>
<td>Return test</td>
<td>Return test</td>
<td>Return test</td>
<td>Return test</td>
</tr>
<tr>
<td>Read test</td>
<td>Read test</td>
<td>Read test</td>
<td>Read test</td>
</tr>
<tr>
<td>Control 2</td>
<td>Control 2</td>
<td>Control 2</td>
<td>Control 2</td>
</tr>
<tr>
<td>Bring test</td>
<td>Bring test</td>
<td>Bring test</td>
<td>Bring test</td>
</tr>
<tr>
<td>Control 3</td>
<td>Control 3</td>
<td>Control 3</td>
<td>Control 3</td>
</tr>
<tr>
<td>Kick test</td>
<td>Kick test</td>
<td>Kick test</td>
<td>Kick test</td>
</tr>
</tbody>
</table>

< TABLE 1 >
Figure 3: Mean percentage bound readings for child (n=48) subjects (bound-true)

(*** < .001, independent samples t tests, all vs. ACC-DAT unaffixed)
Figure 4: Mean percentage bound readings for child (n=48) subjects (bound-false)

(*** < .001, independent samples t tests, all vs. ACC-DAT unaffixed)
(31)  

a. *DO-dative*  

\[ \text{PP} \]  
  \[ \text{IO} \quad \text{Possessor} \]  
  \[ \text{P} \quad \text{P}_{\text{HAVE}} \]  
  \[ \text{DO} \quad \text{Theme} \]  

b. *prepositional dative*  

\[ \text{PP} \]  
  \[ \text{DO} \quad \text{Theme} \]  
  \[ \text{P} \quad \text{P}_{\text{LOC}} \]  
  \[ \text{IO} \quad \text{Goal} \]  

< EXAMPLE 31 >