

Dravidian Contributions to the Theory of Language Acquisition

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1. Introduction

THE study of syntax in the modern era begins with the observation that people can produce and understand sentences they have never heard before (Chomsky 1957). From this observation, we conclude that linguistic knowledge must be in the form of a generative symbol system. The term ‘generative’ in this context, refers to the property that a finite number of symbols describes a potentially infinite set of sentences. When someone knows a language, they possess a system of mental representations and computations that characterizes an unbounded number of novel expressions. Of course, not every novel arrangement of words counts as a sentence and so the system must be constrained to distinguish the possible from the impossible. In short, syntactic knowledge consists of a system of rules and representations that defines all and only the sentences that are possible in a given language. And when this system of knowledge interacts with systems of action and perception, a speaker has the ability to produce and understand an unbounded number of sentences.

The field of generative syntax aims to identify the nature of this symbol system. Lurking behind this agenda, however, lies the more fundamental problem of determining how such a symbol system is acquired. How does a learner exposed to noises and gestures produced by the people around them acquire a symbol system? And, of course, a human child must be prepared to do this for any language. Thus, the learning system must be both strongly constrained and highly flexible. To gain traction in characterizing both the constraints and the flexibility, we require an understanding of the kinds of representations and computations that undergird adult languages, and the kinds of presuppositions about linguistic structure that guide learners to these representations. In this chapter, I will review three case studies where insights from the grammar of Kannada and its acquisition have helped us understand the representational presuppositions that drive children’s language acquisition in any language.

2. Origins of Syntactic Bootstrapping

A common, naive theory of word learning holds that we learn word meanings by creating associations between word forms and aspects of the world that these forms label. But, as noted by Landau and Gleitman (1985), correlations between word use and the world are hopelessly weak. To illustrate this problem, Gillette, Gleitman, and Gleitman (1999) conducted a simulation of word learning with adults to investigate whether the extralinguistic context in which a noun or a verb is uttered provides enough information to infer its meaning

or whether contextual information is more helpful for some words than for others? The experimenters presented adult participants with silent videos of mother-child interactions, in which the most common nouns and verbs uttered by the mother were indicated by a beep. Participants were then asked to guess what word the beep stood for. These adults could identify the correct noun 45% of the time based on the visual information alone but could identify the correct verb only 15% of the time. Later simulation studies, such as by Medina et al. (2011), found a similar result: in general, visual contexts generally provide only very weak evidence about word meaning but seem to be more informative for identifying nouns than verbs. This asymmetry parallels the acquisition trajectories of nouns and verbs in many different languages: when children begin talking, they produce nouns almost exclusively, and verbs come later (Bates, Dale, and Thal 1995; Caselli et al. 1995; Gentner 1982). Perhaps this order of acquisition is related to how strongly extralinguistic information supports learning nouns, as opposed to verbs, by observation.

But if the world does not provide the critical information for identifying verb meanings, then how do children learn them? One prominent hypothesis is that the syntactic context provides the crucial information (Gleitman 1990). For example, one type of syntactic information that is potentially easy to observe is the arguments in a sentence containing a verb. For example, a verb like *hit* can occur with a subject and an object in a sentence like *Sally hit her sister*. These arguments label participants in the event described by the sentence: the subject labels agent of the hitting event, and the object labels the patient of the hitting event. Even if a child doesn't know the meaning of *hit*, if that child is aware that subjects tend to name agents and objects tend to name patients, then she might infer that this sentence describes an event where Sally was the agent and Sally's sister was the patient. Indeed, numerous studies of verb learning in many languages suggest that children systematically use the clausal positions of arguments, as well as their categories, as a powerful source of information about verb meaning (Arunachalam et al. 2013; Gertner, Fisher, and Eisengart 2006; Goksun, Kuntay, and Naigles 2008; Harrigan, Hacquard, and Lidz 2019; Landau and Gleitman 1985; Naigles 1990; Papafragou, Cassidy, and Gleitman 2007; Perkins et al. 2024).

But what are the origins of this ability to use syntax to infer aspects of verb meaning? Do children use this information because they have noticed the correlations in their experience with previous verbs? Or do they do so because of prior, unlearned, expectations about how meaning and syntax are related?

The domain of causation, because it has some universal components and some cross-linguistically variable components, provided a useful opportunity to isolate the relative contributions of linguistic constraints and linguistic experience. Many change-of-state verbs (e.g. *break*) have both a transitive and intransitive use which differ with respect to causation. The transitive version (1a) includes an argument to play the role of causer/agent, whereas the intransitive version (1b) does not.

- (1) a. Kim broke the vase
b. the vase broke

This relation between transitivity and causation is found in all languages (Comrie 1985; Haspelmath 1993; *inter alia*). However, one thing that does vary cross-linguistically is whether the alternation is morphologically marked. For example, in many languages, the intransitive variants are basic, and an additional causative morpheme is added to indicate causation. In other languages, the transitive variants are basic, and an additional anticausative morpheme is added to indicate the lack of causation. In still other languages, both strategies

exist for different verbs. Thus, the addition and subtraction of arguments are used universally to mark the alternation whereas the presence of verbal affixes to mark the alternation varies both cross-linguistically and within a language.

This state of affairs presents an interesting research question, namely, whether children use argument number as a cue to causal interpretation because this cue is reliably present in their language or because they are predisposed to do so. Lidz, Gleitman, and Gleitman (2003) pitted the universal property of argument number against the cross-linguistically variable property of morphological marking in Kannada.

Kannada was an appropriate probe language because of its abundant use of the morphological signal of causal interpretation. In Kannada, any verb can be made causal by adding a causative morpheme. For example, a verb like *eeru*, ‘rise’ can occur in an intransitive clause (2a) but requires a causative morpheme to occur in a transitive clause (2b,c).

- (2) a. kudure eer-utt-ade
 horse rise-npst-3sn
 ‘The horse rises.’
- b. *mosaLe kudure-yannu eer-utt-ade
 alligator horse-acc rise-npst-3sn
- c. mosaLe kudure-yannu eer-is-utt-ade
 alligator horse-acc rise-caus-npst-3sn
 ‘The alligator raises the horse.’

Moreover, whenever this morpheme is present, the causal interpretation is entailed. For example, when present on a transitive verb, the causative morpheme introduces an additional causer argument:

- (3) mosaLe kudure-yannu ett-is-utt-ade
 alligator horse-acc lift-caus-npst-3sn
 ‘The alligator makes something lift the horse.’
 *The alligator lifts the horse

Finally, in Kannada, as in all languages, many verbs with two arguments are not interpreted causally, as in (4).

- (4) mosaLe kudure-yannu nooD-utt-ade
 alligator horse-acc see-npst-3sn
 ‘The alligator sees the horse.’
 *The alligator makes the horse see.’

Given this pattern of facts, the causative morpheme is a more reliable cue for causation than is the number of arguments.

Because the presence of the causative morpheme guarantees a causal interpretation but the presence of two arguments is only probabilistically associated with causal interpretation, Kannada offers some insight into the origins of the connection between argument number and causal interpretation.

Lidz, Gleitman, and Gleitman (2003) tested three-year-old children learning Kannada as their first language. Children were asked to act out sentences using toys provided by the experimenter. The sentences used known verbs with either one or two noun phrase arguments

and either with or without the causative morpheme. The predictions were as follows. If children use the most reliable cues in their language input to determine the syntax to semantics mapping, we would expect children learning Kannada to rely more heavily on the causative morpheme as an expression of causal meaning than on the number of arguments. On the other hand, if children are guided by expectations about the syntax-semantics mapping that are based on the principles of grammatical architecture that are responsible for grammatical universals, they should rely more heavily on argument number than causative morphology. In the latter case, children would be expected to override the most reliable cue in the input in favour of the less reliable cue determined by inherent grammatical constraints.

The data were clear. Three-year-old Kannada-learning children treated argument number as an indication of causal interpretation and failed to treat causative morphology as an indication of causativity, despite the fact that the latter is the more reliable cue in their language. In sum, children acted out two noun phrase sentences as causative and one noun phrase sentences as noncausative, independent of the presence or absence of the causative morpheme.

In effect, these children ignored the more reliable morphological cue to verb meaning and instead relied on the syntactic cue. The observation that learners discarded the best cue in favour of a weaker one reveals the role that grammatical architecture plays in guiding language acquisition. Learners use argument number as a cue to verb meaning *not* because it is there in the input, but because they expect to find it there.

3. Structure-Dependent Interpretation

One of the most fundamental properties of syntactic representations is their hierarchical nature. A sentence like (5) (in Kannada) is not just a string of words but rather can be represented as a hierarchical structure reflecting the part-whole organization of words into phrases and phrases into sentences, as in (5b), with some detail omitted.

- (5) a. rashmi pustaka-vannu meejin-a meelee nooD-id-aLu
 Rashmi book-acc table-gen on see-pst-3sf
 ‘Rashmi saw the book on the table’
 b. [_{TP} Rashmi [_{VP} [_{NP} book_{NP}] [_{PP} [_{NP} table_{NP}] on_{PP}] see_{VP}] pst_{TP}]

This hierarchical structure plays a key role in a host of syntactic dependencies, including binding, movement, and agreement. Moreover, a wide range of studies show that early in development children build hierarchical structure (Lidz, Waxman, and Freedman 2003; Shi, Legrand, and Brandenberger 2020) and that they use hierarchical structure to guide their interpretations in adult-like ways (Lukyanenko, Conroy, and Lidz 2014; Lidz, Lukyanenko, and Sutton 2021). This section considers a case where children’s interpretations are overly dependent on surface hierarchical structure.

Consider the ambiguous sentences below along with their potential paraphrases.

- (6) Every horse didn’t jump over the fence
 a. Every horse failed to jump over the fence.
 b. Not every horse jumped over the fence
- (7) The Smurf didn’t catch two birds
 a. It is not the case that the Smurf caught two birds
 b. There are two birds that the Smurf didn’t catch

In each case, two scope readings are possible, indicated by the paraphrases. In (6), when the quantified subject is interpreted outside the scope of negation, the sentence can be paraphrased as (6a), equivalent to ‘none of the horses jumped over the fence’. This reading is an *isomorphic* interpretation since the scope relation between the quantified subject and negation can be directly read off their surface syntactic positions. Example (6) can also be paraphrased as in (6b), in which the quantified subject is interpreted within the scope of negation. This is called a *nonisomorphic* interpretation since, in this case, surface syntactic c-command domain and semantic scope do not coincide. Similarly, (7) also exhibits an isomorphic interpretation (7a) as well as a nonisomorphic interpretation (7b).

Several studies on the acquisition of quantification have shown that when given a Truth Value Judgment Task (TVJT), preschoolers, unlike adults, display a strong preference for the isomorphic interpretation of sentences like ((6)–(7)) (Lidz and Musolino 2002; Musolino 1998; Musolino, Crain, Thronton 2000; Musolino and Gualmini 2004; Noveck et al. 2007; among others). Even in contexts that make the nonisomorphic reading true, children nonetheless display a bias when interpreting the relevant sentences under the isomorphic interpretation.

An early question concerning isomorphism was whether it should be described in terms of linear order or hierarchical structure (Lidz and Musolino 2002). Because in English, the subject both precedes and c-commands negation, when the subject is interpreted outside the scope of negation, one might describe this in terms of the precedence relation or in terms of the c-command relation. Similarly, in English, a quantificational object both follows and is c-commanded by negation; so, children’s restriction to wide scope negation in that context could be seen equivalently as a preference for scope that matches the linear order or as a preference for scope that matches the hierarchical structure. That is, we might paraphrase ‘children showed a preference for the isomorphic interpretation’ as ‘children showed a preference in which the linear precedence relations among the quantifiers mapped to their scope’ or as ‘children showed a preference in which the surface c-command relations among the quantifiers mapped to their scope’.

To address this question, Lidz and Musolino (2002) examined parallel sentences containing a quantifier and negation in Kannada and English to determine whether isomorphism should be described in structural or linear terms. Kannada provided a good testing ground for this question because in that language, unlike English, linear order and hierarchical structure can be easily deconfounded. For example, in (8), the quantifier in object position precedes negation, but negation c-commands the quantifier.

- (8) vidyaarathi eraDu pustaka ood-al-illa (Kannada)
 student two book read-INF-NEG
 ‘The student didn’t read two books.’

Hence, if isomorphism were structurally driven, we would expect wide scope for negation. If it were based on linear order, we would expect wide scope for the object.

Lidz and Musolino found that both Kannada- and English-speaking children overwhelmingly assigned wide scope to negation. The fact that children in both languages assigned the same scope suggests that the isomorphism effect should be understood in structural terms, since it is only in that dimension that the two languages are alike.

Building on this observation, Lidz and Musolino (2006) also examined numerally quantified NPs in subject position in Kannada and English, as in (9).

- (9) a. eraDu chitte paTNa-kke hoog-al-illa.
 two butterfly city-DAT go-INF-NEG
 ‘Two butterflies didn’t go to the city.’
 b. Two butterflies didn’t go to the city.

This is important because the isomorphism in (8) may have been due to a special property of indefinites requiring them to be interpreted with narrowest scope (Krämer 2000). However, Lidz and Musolino found that children in both languages preferred to interpret the numerally quantified NP in subject position as taking scope over negation. Thus, the preference for assigning narrow scope to the numerally quantified NP in object position is correctly understood in terms of the surface syntactic position of that NP, and not its semantics.

The observation that the isomorphism effect is best understood in structural terms provides a novel kind of evidence for the hierarchical nature of children’s syntactic representations. Even when children make errors, these errors are, nonetheless, best understood as reflecting the same kinds of hierarchical representations that characterize adult languages. Relations defined over hierarchical structures play an explanatory role not only in the characterization of adult knowledge but also in the characterization of children’s knowledge. The fact that children apply the *c*-command relation in structures to which they should not suggests that children prioritize this relation in their syntactic representations, using it to guide their acquisition.

4. A Poverty of the Stimulus Problem in Kannada

In this section, we consider the nature of learning and the role that grammatical structure plays in shaping learners’ expectations about cross-linguistically variable properties of syntax. The relevant case concerns the structure of ditransitive.

Kannada ditransitives exhibit a flexible word order, allowing either order of the dative and accusative arguments. In addition, Kannada also optionally displays a benefactive affix on the verb in ditransitives. Putting these two features together allows for four possible ditransitives, illustrated in (10).

- (10) a. hari rashmi-ge pustaka-vannu kaLis-id-a
 hari rashmi-dat book-acc send-pst-3sm
 ‘Hari sent the book to Rashmi.’
 b. hari rashmi-ge pustaka-vannu kaLis-i-koTT-a
 hari rashmi-dat book-acc send-pp-ben.pst-3sm
 ‘Hari sent the book to Rashmi.’
 c. hari pustaka-vannu rashmi-ge kaLis-id-a
 hari book-acc rashmi-dat send-pst-3sm
 ‘Hari sent the book to Rashmi.’
 d. hari pustaka-vannu rashmi-ge kaLis-i-koTT-a
 hari book-acc rashmi-dat send-pp-ben.pst-3sm
 ‘Hari sent the book to Rashmi.’

In addition, we find asymmetries with respect to binding across these constructions (Lidz and Williams 2006; Viau and Lidz 2011). In the benefactive construction, the dative argument can bind into the accusative argument independent of word order, ((11a,b)). However, in the nonbenefactive construction, the dative can bind into the accusative only when the dative comes first ((11c,d)).

(11) a. Q-DATxACCxV+BEN

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'

b. ACCxQ-DATxV+BEN

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'

c. Q-DATxACCxV

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'

d. *ACCxQ-DATxV

*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'

The pattern is reversed regarding the accusative argument binding into the dative. Here, in the benefactive construction the accusative can bind into the dative only when the accusative comes first ((12a,b)). But in the nonbenefactive construction the accusative can bind into the dative independent of word order ((12c,d)).

(12) a. *DATxQ-ACCx BEN

*sampaadaka adar-a lekhan-ige pratiyondudu 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. Q-ACCx DATx BEN

sampaadaka pratiyondudu 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'

c. DATxQ-ACCx unaffixed

sampaadaka adar-a lekhan-ige pratiyondudu lekhana-vannu kaLis-id-a
 editor it-gen author-dat every article-acc send-pst-3sm
 'The editor sent its author every article'

d. Q-ACCx DATx unaffixed

sampaadaka pratiyondudu 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'

In sum, we see the interaction of three factors: word order, morphology, and the grammatical function of the quantifier. When the benefactive morpheme is present on the

verb, the dative argument behaves as if it is syntactically prominent for binding, hence indifferent to word order. But when the benefactive morpheme is absent, the accusative argument behaves as if it is syntactically prominent for binding, hence indifferent to word order.

Viau and Lidz (2011) tested four-year-old children learning Kannada as their first language to see whether they knew these complex facts about when binding is and is not possible. Remarkably, these preschoolers behaved just like adults, displaying a pattern of performance consistent with the generalizations described above.

With respect to learning, these patterns are not reflected in the input. Viau and Lidz (2011) conducted two large-scale corpus analyses and observed that ditransitive sentences in which one internal argument is a quantifier and the other contains a pronoun that matches that quantifier in phi-features almost never occur. The few cases that do occur would not provide enough variability to license conclusions about which binding configurations are licensed across constructions. Consequently, the data from which children acquire these patterns must involve projections from other more readily available facts.

Holding these facts in mind, let us now turn to the analysis of ditransitive constructions. Harley 2002 (building on Freeze 1992 and Kayne 1993) makes three important observations about ditransitive constructions cross-linguistically. First, ditransitives differ cross-linguistically in whether the theme or the goal behaves as though it is syntactically prominent for the purposes of binding. Many languages, like Kannada and English, exhibit both goal-prominent and theme-prominent ditransitives. But some, like Irish and Diné, exhibit only theme-prominent ditransitives. Second, goal-prominence is typically paired with a more restricted interpretation on the goal, such that it must be a possible possessor of the theme. For example, in both English double object constructions and Kannada benefactive ditransitives, the goal argument must be interpreted as a possible possessor of the theme argument, whereas such restrictions do not apply to the theme prominent ditransitives in these languages (or in languages with only theme prominent ditransitives).

- (13) a. # The editor sent New York the book
 b. The editor sent the book to New York
- (14) a. # hari bengaluur-ige pustaka-vannu kalisi-koTT-a
 hari benagaluru-dat book-acc send-ben.pst-3sm
 'Hari sent Bengaluru the book.'
- b. hari bengaluur-ige pustaka-vannu kalis-id-a
 hari bengaluru-dat book-acc send-pst-3sm
 'Hari sent the book to Bengaluru.'

Finally, goal prominence occurs only in languages with possession constructions in which the possessor is syntactically higher than the possessed. For example, Irish possessives do not allow the possessor to bind a pronoun inside the possessed. And, in Irish ditransitives, the goal cannot bind into the theme, illustrating the presence of only theme-prominent structures. In contrast, Kannada possession constructions allow the possessor to bind into the possessee and that language also displays goal-prominent ditransitives independent of word order, as we have seen.

In light of these cross-linguistic patterns in ditransitives, Viau and Lidz (2011) identified two potential contributions for UG in the acquisition of the binding facts illustrated in ((11)–(12)). One contribution, as discovered by Harley (2002), is defining the space of possible languages, linking the syntax of possession to the syntax of ditransitives. The second

contribution is allowing that syntax to define the acquisitional intake from which statistical inference can proceed.

Regarding the first contribution, UG makes a complex set of facts follow from a single representational parameter concerning the syntax of possession relations. If a language exhibits possession constructions in which the possessed is higher than the possessor, it can recruit that structure in certain ditransitives, treating the goal argument as a possessor and making it syntactically prominent. This syntactic prominence explains the binding asymmetries. Importantly, the level at which the cross-linguistic generalization applies is highly abstract and thus is not detectable directly in the surface form of the language.

Regarding the second contribution, UG helps define the kind of information that children should use in determining whether a given ditransitive utilizes the goal-prominent or theme-prominent syntax. The surface realization of ditransitives varies considerably cross-linguistically. In English, the two kinds of ditransitives are distinguished in word order (Oehrle 1976). In Kannada, they are distinguished by an affix on the verb (Lidz and Williams 2006) but not by word order. In Spanish, they are distinguished by clitic doubling of the dative argument but not by word order (Bleam 2001; Uriagereka 1988). But given this divergent surface realization, the mapping between the structure and surface form is opaque.

Viau and Lidz (2011) argued that matching the strings with their underlying structures can be achieved by tracking the kinds of NPs that occur as the dative argument in each surface form. Because the dative in a goal-prominent argument is restricted to being a possible possessor of the theme, the kinds of NPs that fill that role are expected to be more restricted. In particular, possessors tend to be animate, and so learners should expect a relatively high proportion of animates as the dative argument in a goal-prominent ditransitive. The child's perception of the data must, therefore, consist of a representation of morphological variability, word-order variability, and the grammatical functions of each argument. By tracking the relative proportion of animate to inanimate datives for each morphological and word-order variant, the learner can infer the underlying structure of each. If the learner sees a construction that is statistically biased towards animate goals, that skew in the distribution will support the inference that that construction involves the goal-prominent syntax.

Summarizing this section, we have used data from Kannada-learning children to identify two roles of UG in language acquisition: (1) explaining the specific ways that children project beyond their input and (2) defining the child's perceptual intake (i.e. their representation of the input that makes statistical-distributional evidence informative about grammatical structure). In the case of Kannada ditransitives, the former explains children's knowledge of binding patterns across novel sentence types, while the latter explains how observations of the distribution of animate datives can signal the underlying structure and thus explain the binding patterns.

5. Conclusions

In this chapter, we have reviewed three case studies from the acquisition of Kannada. In each case, data from Kannada were critical in identifying something about the kinds of representations learners in all languages use to guide their language acquisition. In the first case, we saw that children's sensitivity to argument roles in the acquisition of verb meaning is not a result of learning but rather a sensitivity that shapes what can be learned. Children do not simply track what is most frequent but rather use their expectations about how syntax and meaning line up in order to use syntactic properties to derive inferences about meaning. In the second case, we saw that children are more restricted in their scope interpretations than adults are. These restrictions derive from children's overreliance on surface c-command

as a cue to meaning. But that overreliance tells us that fundamental abstract relations like c-command play a guiding role in children's behaviour, even when their behaviour is non-adultlike. Finally, in the third case, we saw that by age four children have rich understanding of possible binding relations in ditransitive constructions despite the fact that their experience provides virtually no evidence about how binding in ditransitives should behave. We argued that this knowledge follows from a prior understanding of how ditransitives can be structured in language and what the surface signals of those structures would be. In sum, the work reviewed here illustrates the important role that Kannada, as an instance of a Dravidian language, has played in shaping our understanding of the relation between grammatical theory and the acquisition of a particular grammar.

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