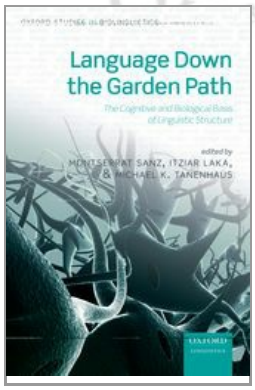

Language Down the Garden Path: The Cognitive and Biological Basis for Linguistic Structures
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Determiners: An empirical argument for innateness 1

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[–] Abstract and Keywords

This chapter proposes that determiners are the thin edge of the wedge in arguments for innateness of syntax. As soon as it is possible to measure children's production of determiners, around age two, their speech meets a range of tests showing abstract knowledge of determiners. Before that time, a range of studies with infants shows that children have an equivalence class of determiners and represent determiners in an underspecified fashion. Only an abstract representation will provide for both those features. The innate abstract knowledge that children possess is that determiners head DPs and take NPs as complements. Learning consists of establishing the specific inventory of determiners in a child's language. Thus, determiners are a candidate for narrow syntax and their acquisition is a top-down process.

Keywords: determiner category, universals, language acquisition, narrow syntax

14.1 Why determiners?

My aim in this paper is to outline an **empirical** argument for innate syntax, using determiners as a case study. There are four reasons for the choice of determiners.

(1) Every model of acquisition includes the eventual presence of syntactic categories, including determiners, in the child's grammar. Agreement on the end point avoids the objection that a given linguistic principle or structure is never part of a speaker's grammar and thus needs no explanation and, *a fortiori*, needs no innate structure to account for its acquisition. Arguments will be focused on how the child gets to the end point, not on what the end point consists of.

(2) Determiners, unlike nouns and verbs, are less directly tied to reference. Determiners have a semantics and a pragmatics, but full knowledge of the pragmatics seems to appear after, rather than before, the syntax of determiners (Modyanova and Wexler 2007). More generally, Naigles (2002) has argued convincingly that experiments that appear to show lack of syntactic knowledge actually instead show difficulty with semantics.

(p.273) (3) Two-year-olds at the onset of combinatorial speech already have determiners in their grammar (Valian, Solt, and Stewart 2009).

(4) It is possible to trace the development of determiners from pre-verbal infancy through age two. That trajectory is not known for any other category.

14.2 What is innate and what is learned?

If determiners are innate, what exactly is innately specified? As a first approximation, I propose an abstract schematic representation, underspecified with respect to details: (1) determiners are heads of determiner phrases; (2) determiners take noun phrases as their complements. In addition, (3) determiners and nouns can be in an agreement relation. If a noun is singular, for example, the determiner used with it can be singular or unspecified with respect to number, but cannot only be plural. In English it is possible to say *a ball* or *the ball*, but not *many ball*. In some languages, determiners and nouns agree in gender; feminine nouns take the feminine form of a determiner.

As is evident from the schema, determiners are the thin edge of the wedge. To hypothesize even the bare minimum about determiners requires reference to other syntactic notions, such as "head," "complement," "agreement," and reference to other syntactic categories. Because languages are described by an interlocking set of concepts, and because language represents an independent domain, no syntactic notion can be defined independently of other notions.

The determiner schema leaves many of the child's learning problems untouched. For example, the child must learn what the specific determiners in her language are. In English, possessive pronouns, like *my*, act like determiners, but in Italian they act like adjectives. The child has to learn the contents of the equivalence class of determiners language by language.

Another learning problem the child faces is figuring out in which contexts a determiner must be used, and, if one must be used, figuring out which one to use. In English, *a* shifts to *the* in certain contexts. In English, bare plural nouns are grammatical but bare singular count nouns are not; in other languages, even plural nouns require determiners; semantics is no help here.

A third learning problem is figuring out the particular features that determiners have in a language. English does not mark gender, but French and Spanish, for example, do.

The crucial feature of this proposal is that the child starts off with an abstract concept and learns details. Contrasting theories propose that the child starts off with details and constructs an abstract concept (e.g., Pine and Lieven 1997; Abbott-Smith and Tomasello 2006).

(p.274) 14.3 When does the child's grammar include determiners?

Using six different tests of knowledge, Valian, Solt, and Stewart (2009) conclude that children represent determiners in their grammar at the onset of combinatorial speech (roughly ages 1 year 10 months–1;10–2;2). The tests were adapted from previous studies arguing against (Eisenbeiss 2000; Pine and Lieven 1997; Pine and Martindale 1996) or in favor of early knowledge of determiners (Valian 1986), using a larger sample, improved methods, and a new way of stratifying the data.

The Valian corpus contains speech from 21 child–mother pairs. The children range in age from 1;10 (1 year 10 months) to 2;8 and their speech ranges in average utterance length from 1.53–4.58 morphemes. There are approximately 1.5 hours of speech per pair and 764 utterances per child. The size of the corpus, both in terms of number of children and in terms of number of utterances per child, makes it possible to separate issues of competence and performance and to show how researchers could draw misleading conclusions.

One important test was the extent to which the child used more than one determiner before a given noun type (Pine and Martindale 1996) and the degree of difference between the child and his or her parent. For example, did the child use the noun *ball* only with *a* (or only with *the*), or with both *a* and *the*? Did the child's productivity in this sense differ from the parent's? The short answer is that all children, even those at low MLUs, used a variety of determiners before their nouns, and did so to the same extent that their parents did, whether the test was confined to *a* and *the* or included all determiners, and whether the child and parent were matched on determiner–noun pairs or not.

The most important finding was a stratification analysis that showed how one could mistakenly think that very young children are not productive in their use of determiners. Consider the case where a child uses a particular noun only once. By definition, it is impossible for the child to use more than one determiner with that noun. Only when a child uses a noun several times with a determiner will it be possible to see whether she uses more than one determiner with such a noun. Previous analyses did not stratify nouns for the number of times they occurred with a determiner. They thus ran the risk,

especially with small numbers of utterances per child, of considering many nouns used only once or twice with a determiner and thus artifactually concluding that the child was not productive with her determiners.

As Figure 14.1 shows, how often a noun appears with a determiner is directly related to overlap—the extent to which a child uses more than one **(p.275)**

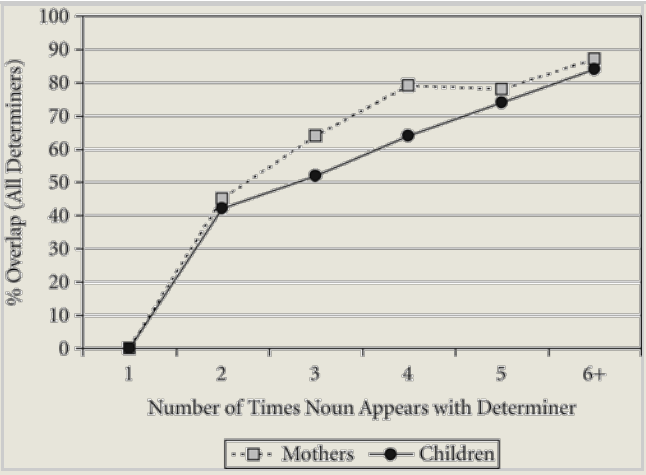

FIGURE 14.1. Productivity (overlap) in determiner use as a function of opportunity to discover overlap

determiner with a given noun. Failure to find overlap is the experimenter's failure, not the child's. One needs a large enough sample to separate how often a noun is used with a determiner. If there are too few cases where a noun is used frequently with a determiner, the opportunity to detect productivity is correspondingly low.

There was no evidence of development in the syntactic structure underlying children's determiner usage. Once there is sufficient opportunity to detect productivity, the child's MLU does not predict overlap.

Children also showed no evidence of early reliance on formulae, such as *what's the* ___*?* On the contrary, children used such phrasal formulae more with increasing MLU.

Finally, children made almost no errors in their use of determiners, verifying previous research (Abu-Akel, Bailey, and Thum 2004; Ihns and Leonard 1988; Valian 1986).

What did change as children's MLU increased was the number of different determiners in their repertoire and how often they used them. There was no development in the *nature* of their determiner usage.

By age two, then, children show abstract knowledge of determiners. The development in productivity can be attributed to development in the number of known determiners and in the number of times a noun is used with a determiner. Children's early uses show, if anything, fewer formulae than their **(p.276)** parents' uses do. The children are faithful to distributional regularities. A linguist, faced with this unknown language, would conclude that it had determiners. Only the sparse data problem—small samples and, within each

sample, few nouns being used multiple times with a determiner—prevents that conclusion. When the sparse data problem is solved, children's productivity is apparent. Development occurs, but after age two it is limited to an increase in the number of determiner types and the frequency of determiner use.

14.4 Is the developmental trajectory continuous or discontinuous?

An account on which a schematic representation of determiners is innate predicts continuity. Development consists of fleshing out the schema, in two ways. First, the child learns what counts as a determiner. In English, for example, the child learns that *a*, *the*, and *some* are in the determiner class. Second, the child learns about the language-specific particulars of each determiner's behavior. In English, she learns that *a* is restricted to single count nouns, *the* can be used with any count or mass noun, and *some* can be used with plural count nouns and mass nouns. The model predicts continuity: the child's grammar is commensurate with the adult's; the child does not shift from one system of representation to another nor does she shift from no representation to representation.

One form of evidence for continuity is **underspecification** of the class of determiners. That is, the child has not fully analyzed the specifics of the input, contrary to what a completely input-driven model would predict. Determiners, because of their high frequency, should be helpful to children in segmenting speech by acting as anchor points, as Valian and Coulson (1988) proposed. But in segmenting the speech stream, the child might treat *the* and the nonsense determiner *kuh* as equivalent because *kuh* retains the highly frequent schwa, even though the child has never heard *kuh*. Or, in French, the child might accept both *le* and *la* as interchangeable, failing to distinguish their gender. As long as highly frequent determiners have few sound-alike competitors, they should help infants to process speech.

An example of phonetic underspecification comes from a comparison of eight- and eleven-month-olds' ability to use real vs nonsense determiners to segment a nonsense noun from its preceding determiner (Shi, Cutler, Werker, and Cruickshank 2006). Infants heard determiner–noun pairs half the time with a high-frequency real determiner (e.g., *the tink*) and half the time with a phonologically similar nonsense determiner (e.g., *kuh breek*). Other infants heard low-frequency determiners, *her* vs *ler*.

(p.277) If infants' first representations are tied to specific words, then they should be equally unable to segment nonsense words like *tink* and *breek* (i.e., equally unable to recognize them when they are presented in isolation), whether they are preceded by *the* or *kuh* during familiarization trials. Since they have never heard *tink* before, they have also never heard the sequence *the tink* before. Although the infants have heard *the* before, if *the* is tied in their representations only to nouns they have previously encountered, the sequence *the tink* should be perceived as a single two-syllable word; *the* should not help the child recognize *tink* as a separate word. Since the children have never heard *kuh* before, they should similarly perceive *kuh tink* as a single two-syllable word.

But if children have coded *the* as a highly frequent word, *the* will be helpful in parsing. If, in addition, the children do not have a full specification for *the*, but have only extracted the schwa, *kuh* should also be helpful. Eight-month-olds treat *tink* and *breek* as separate words when they are preceded by *the* or *kuh*, indicating that *the* is not fully specified phonetically. The low-frequency determiners *her* and *ler* did not help the children segment the speech. Thus, eight-month-olds can use the high-frequency determiner *the* to segment speech, but they represent it in an underspecified fashion that does not distinguish it from its phonologically similar mate *kuh*. *Her* and *ler* are not frequent enough to serve as segmentation cues. At eight months, children primarily use high frequency. Infants thus do not begin with a highly specific representation. Instead, they have an underspecified representation of a very highly frequent form and can initially use that form to segment new words.

By eleven months, the infant has phonetically specified *the*; *kuh* no longer works as an aid to segmentation, and *her* and *ler* are still ineffective. Infants appear to work with the most highly frequent forms first. The eleven-month-olds seem not to know just what items are included in the determiner category beyond its most frequently encountered member, but they do treat it as a separate word.

Another set of data suggesting underspecification comes from children who produce filler syllables, which are usually (though not always) syllables with reduced vowels (see, for example, Bottari, Cipriani, and Chilosi 1993/1994; Peters 2001; Tremblay 2005; Veneziano and Sinclair 2000). Not all children produce them and not all children who produce them use them in exactly the same way, but there is a pattern.

Filler syllables appear to be positioned like syntactic markers, especially before nouns. The first function of these filler syllables may be completely prosodic—to make the child's output sound like the target language. Later, around 19–22 months, such syllables before nouns appear to be serving a **(p.278)** determiner-like syntactic function in European French (Veneziano and Sinclair 2000), Canadian French (Tremblay 2005), and Italian (Bottari, Cipriani, and Chilosi 1993/1994).

The existence of filler syllables is easy to explain on an underspecification model because the child has not mastered the specific knowledge about just which determiners precede just which nouns. An underspecified schema meets the syntactic requirement of supplying a determiner without indicating features like number or gender. In contrast, item-specific learning should not predict filler syllables once infants have passed the age at which they cannot distinguish *the* and *kuh*.

A different form of evidence for continuity is the existence of **equivalence classes**, in which children put different examples of the same category into a single class. Eleven-month-olds have yet to construct an equivalence class for determiners consisting of more than one element. What they are missing, on this analysis, is not the category, but knowledge of all the specific elements that make up the category. But by fourteen months, infants exposed to Canadian French do show evidence of an equivalence class (Shi and Melançon 2010). Having been familiarized with one set of determiners (*des* and *ton*)

before nonsense nouns (*mige(s)* and *crale(s)*), the child generalizes to other examples of the class (*le*) but does not generalize to members of other classes, such as pronouns (*tu*). The children have never heard the made-up nouns before, so they cannot have based their responses on anything that is item-specific. Instead, they have already categorized *des*, *ton*, and *le* into an equivalence class. Around the same age, children exposed to German similarly place German determiners into an equivalence class (Höhle, Weissenborn, Kiefer, Schulz, and Schmitz 2004).

By eighteen months, infants parse a speech stream better if they hear a genuine determiner than a nonsense form or function word from a different class (such as *and*), and, often, better than if they hear no determiner. Even though eighteen-month-olds seldom produce determiners, their comprehension is improved when they hear real determiners, indicating that they expect to hear determiners before nouns (Gerken and McIntosh 1993; Kedar, Casasola, and Lust 2006; Zangl and Fernald 2007).

14.5 What is learned?

But if the child knows so much about determiners, why does she so frequently leave them out? There are three mutually compatible answers to that question. The child's **prosodic template** initially limits the contexts in which the child will include a determiner (Demuth 1994; Demuth and Tremblay 2008; Gerken **(p.279)** 1996). Determiners are more likely to appear when they are the second syllable of a strong-weak foot in "trochaic" languages (like English) and are more likely to appear before monosyllabic words in "iambic" languages (like French).

The child's **knowledge of individual determiners** is limited; without a determiner vocabulary of a large enough size, you cannot use them when they are required. In the Valian corpus children used anywhere between five and 21 determiner types. How often the 21 children and their parents used a determiner was correlated with the number of determiner types (child $r = .80$, $p < .001$; parent $r = .48$, $p < .03$). For children, the range per utterance was .03 to .29; the most frequent types were *a*, *the*, *my*, *some*, *this*, and *that*. The children's parents, in contrast, used 19–28 different types; the determiners/utterance range was .34 to .43. Children have fewer and therefore use fewer.

Controlled processing is the third factor. For two-year-olds, especially children whose MLU is below 3, understanding and producing speech is a controlled rather than automatic process; children must integrate different types of knowledge (syntactic, semantic, phonological, prosodic, pragmatic, and conceptual) and processes (planning at different levels, articulating) in order to be an expert listener and talker. Two-year-olds' looking times show disrupted processing when a nonce determiner is used (Gerken and McIntosh 1993; Zangl and Fernald 2007), in contrast to three-year-olds. The results show both that two-year-olds distinguish between real and fake determiners, as other research also suggests, and that their processing is disrupted with a fake one. Three-year-olds, in contrast, are so skilled at processing familiar nouns that a fake determiner is not disruptive.

The failure of very young children to use determiners very often can thus be understood as the result of interactions among children's different systems: an initial reliance on a prosodic template; an initial small vocabulary; fewer attentional resources. That combination leads to the omission of items (or, more accurately, failure to lexicalize items), like determiners, that have relatively low information value compared to nouns and verbs and are thus more expendable.

To sum up, the developmental trajectory of the acquisition of determiners is better understood than the development of any other syntactic category. Acquisition of determiners is top-down rather than bottom-up. At every point in children's development they look as if they have an abstract category and are learning details about the members of that category. They never look as if they only know details about the category. Children start with an innate schema for determiners. Learning consists of fleshing out that schema with details.

Notes:

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