

# The Acquisition of Vocabulary in Distributed Morphology

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## 1. Introduction

Most research in first language acquisition has focused on the nature of Universal Grammar (UG), and its role in constraining children's acquisition of their native language. The strategy of such research is to discover which parts of the child's grammatical knowledge could not have been learned solely on the basis of environmental linguistic input. Anything the child learns without (or in spite of) relevant environmental evidence can be plausibly attributed to UG. (e.g., Crain & Pietroski 2001). Less research has focused on which parts of child's grammatical knowledge cannot be provided by UG, and therefore must be learned from available environmental input.<sup>1</sup> The mapping between phonology and abstract lexical/syntactic representations is an example of such knowledge. Given cross linguistic variation, this mapping is necessarily arbitrary, at least in part.<sup>2</sup> Just how arbitrary the mapping is, and for which elements of grammar, remains a relatively open question in language acquisition research.

The project proposed below aims to address the acquisition of phonology-grammar mapping (hereafter, morphology) within a particular theoretical framework, Distributed Morphology (DM) (Halle & Marantz 1993). It will be claimed that the nature of children's linguistic input constrains the acquisition of morphology in very specific ways, and the goal of this research project is to verify this claim empirically. The proposal proceeds as follows. Section 2 briefly introduces some key concepts of DM, and

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<sup>1</sup> That is, less research that does not challenge the existence of UG.

restates research questions in DM theoretic terms. Section 3 presents the Transparency Hypothesis (Emonds 1986; Parrott 2001a; 2001b), which makes a specific claim about the how input constrains the acquisition of morphology. Section 4 reviews a domain of grammar where the Transparency Hypothesis can be tested, namely the acquisition of pronoun case forms in coordinated DPs. Finally, Section 5 presents a proposal for an experiment designed to elicit coordinated pronouns from children. The results of this experiment are predicted to support the Transparency Hypothesis, and thereby contribute to a better understanding of the acquisition of morphology.

## **2. Distributed Morphology and language acquisition**

The theory of Distributed Morphology (DM) (Halle & Marantz 1993) will not be reviewed in its entirety here. Rather, I will briefly outline some of DM's key concepts as they relate to the acquisition questions posed above, and to the research project proposed below.

The majority of work in syntax (and thus in language acquisition) has assumed that the mapping between lexical/syntactic structures and phonological features takes place in the lexicon, a view I will refer to as Lexicalism.<sup>3</sup> Lexical items are drawn from the pre-syntactic lexicon with a set of semantic, grammatical, and phonological features. After syntax, these lexical items are submitted to the phonology, where phonological features are interpreted for the articulatory interface. Crucially, the role of phonology is quite limited. While some phonological feature modifying operations are possible

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<sup>2</sup> This has been recognized for some time. As summarized in Jespersen's well known quote (repeated in Chomsky 1995): "No one ever dreamed of a universal morphology."

(accounting for alternations, allophony, and perhaps some allomorphy), the phonological component can only recognize and operate on phonological features, with no reference to syntactic structure. On the Lexicalist view, then, the mapping between grammatical and phonological features is quite simple and isomorphic. Acquisition of morphology is for the most part equivalent with acquisition of lexical items.<sup>4</sup>

In contrast, many researchers have noted that the mapping between grammatical and phonological features is rarely isomorphic. These scholars have claimed that morphology is far more complicated than this simple, Lexicalist picture suggests. This has led to the Separation Hypothesis: phonological features are not associated with all (or some) lexical items in the lexicon, but rather introduced later by a post-syntactic morphological component or algorithm (Anderson 1992; Aronoff 1994; Beard 1995).

The theory of DM adopts the Separation Hypothesis as a starting point (along with further details that are not shared with other morphological theories). In DM, there are no phonological features present either in the 'lexicon' or during the syntactic computation. The pre-syntactic lexicon consists solely of semantic/grammatical feature bundles, and these bundles are operated on by the syntax. After syntax, a hierarchical structure constructed from these feature bundles is submitted to an independent level of morphology, called Morphological Structure (MS), which intervenes between syntax and phonology. MS representations contain both hierarchical and linear information. The

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<sup>3</sup> Recognizing, of course, that the term has been applied to many theories of varying details. Here, I intend Lexicalism to refer only to the view that phonological features are associated with lexical items in the lexicon, before syntax.

<sup>4</sup> Moreover, it seems to me that on the Lexicalist view children's acquisition of lexical items and their morphology can be largely guided (if not completely given) by UG. If some lexical items have a 'slot' for phonological features, and others do not (e.g. the different species of *pro/PRO*), then the child can scan the input for phonological features with which to fill in the slots. A separationist morphology will not posit any lexical 'slots' for phonological features, and so the child's acquisition of morphology will have much less (if any) UG guidance.

features of terminal nodes can be manipulated in various ways at MS, by means of morphological operations such as Fusion, Fission, and Merger.

Vocabulary Entries (VE) are the primary locus for the grammar-phonology mapping in DM, inserting phonological features at terminal nodes after MS operations are complete. VEs contain three kinds of information, illustrated schematically below:

(1) **Vocabulary Entry**

[+F1, -F2]	↔	/phono/	/	Adjacent_X
<i>Substantive</i>		<i>Phonological</i>		<i>Contextual</i>
<i>features</i>		<i>features</i>		<i>features</i>

Substantive features, which can be highly underspecified, identify a terminal node as an insertion target. Contextual features further constrain the possibilities for Vocabulary insertion, referring to a terminal node's environment. If the substantive and contextual features of some VE match (or at least do not contradict the features and environment of) some terminal node, the phonological features of that VE will be inserted at that terminal node. Allomorphy arises in part because VEs compete for insertion. VEs with more highly specified substantive or contextual features will be inserted first, blocking the insertion of less specific VEs (by the Elsewhere Principle).

In DM terms, we can pose the following questions about the acquisition of the grammar-phonology mapping. How are VEs acquired? Are there any constraints on the form or acquisition of VEs?

### 3. The Transparency Hypothesis

Emonds (1986) gave the first concrete proposal for a constraint on the acquisition of the mapping between grammatical and phonological features, and Parrott (2001a; 2001b) updated Emonds' proposal in DM theoretic terms. The proposal, which will be referred to

as the Transparency Hypothesis, takes as a starting point the assumption that VEs are not given by UG, and therefore must be learned solely on the basis of available linguistic input.

The Transparency Hypothesis holds that the mapping between grammatical and phonological features must be transparent in the input in order to be learned.

Transparency is defined by Emonds as follows:<sup>5</sup>

(2) **Morphological transparency (Emonds 1986)**

A syntactic category [grammatical feature] *C* is *morphologically transparent* on *B* iff a productive number of pairs of simple *B* which contrast with respect to *C* also differ phonologically.

Morphological Transparency constrains the form of VEs as follows:

(3) **Vocabulary Transparency (Parrott 2001a; 2001b)**

If some grammatical feature *F* of a terminal node *N* is not morphologically transparent on *N*, then *F* is not contained in the substantive feature set of a Vocabulary Entry for *N*.

Morphological and Vocabulary Transparency constitute the Transparency Hypothesis; the proposed research will attempt to test the hypothesis empirically.

#### **4. Testing the Transparency Hypothesis: English pronouns and coordination**

The case forms of English pronouns in coordinated DPs is a domain where the Transparency Hypothesis can be tested. English pronouns have at least two morphological forms, usually taken to correspond directly to their syntactic Case features. Pronouns appear in the Subject Form (SF) when they are the subject of a tensed clause, and otherwise they appear in the Object Form (OF). This is illustrated below:

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<sup>5</sup> Emonds does not define which notion or what level of productivity is relevant for Morphological Transparency. I will not tackle this (real) problem here, leaving it open for future research; but see Parrott (2001b) for a preliminary attempt.

- (4) a. She kissed him.
- b. He kissed her.

Given the Transparency Hypothesis, two questions arise. First, are syntactic Case features Morphologically Transparent on D in English? Second, do the VEs for English pronouns have syntactic Case features in their substantive features? If the answer to both these questions were yes, VEs for English pronouns would look something like the VEs below:

(5) **A possible VE, with Case features**

{	[D-PRONOUN <sub>[3rd, sing., masc., Nominative]</sub> ]	→ /hi/
	[D-PRONOUN <sub>[3rd, sing., masc., Accusative]</sub> ]	→ /hɪm/

It is clear, however, the answer to the first question is no. As can be seen from just a brief look at D in English, syntactic Case features are not Morphologically Transparent on D in English. For all instances of D other than pronouns, there is no phonological distinction between D with a Nominative and D with an Accusative Case feature. This is illustrated below:

- (6) a. The dog chased the cat.
- b. The cat chased the dog.

According to the Transparency Hypothesis, if syntactic Case features are not Morphologically Transparent on D in English, then by Vocabulary Transparency, VEs for English pronouns cannot have syntactic Case features in their substantive features. How then is the SF/OF distinction maintained on English pronouns? Parrott (2001a) suggests that this distinction is regulated by the contextual features of pronoun VEs. A schematic English pronoun VE is given below:

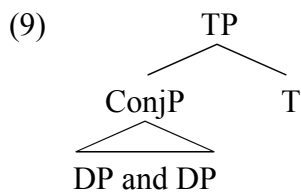
(7) **Schematic VE for English pronouns (Parrott 2001a)**

- $$\left\{ \begin{array}{l} [\text{DP-PRONOUN}] \quad \rightarrow /SF/ / \text{ Adjacent } \_\_\_ T_{[\text{fin}]} \\ [\text{DP-PRONOUN}] \quad \rightarrow /OF/ / \quad \textit{elsewhere} \end{array} \right.$$

This VE states that a SF is inserted when a pronoun D is left adjacent to finite T; elsewhere the OF is inserted.<sup>6</sup> An example VE for *he/him* is given below:

- $$(8) \left\{ \begin{array}{l} [\text{DP-PRONOUN}_{[3\text{rd, sing., masc.}]}] \quad \rightarrow /hi/ / \text{ Adjacent } \_\_\_ T_{[\text{fin}]} \\ [\text{DP-PRONOUN}_{[3\text{rd, sing., masc.}]}] \quad \rightarrow /him/ / \quad \textit{elsewhere} \end{array} \right.$$

This approach to English pronoun case morphology makes an immediate prediction. Consider a coordinate DP in subject position:



In this structure, the maximal projection of the coordinate DP (here depicted as ConjP, although for the present analysis the nature of coordination is irrelevant<sup>7</sup>) is adjacent to finite T. However, nothing inside the coordinate is adjacent to T. Thus, according to the VEs above, there should never be SF pronouns in coordinate DPs. This prediction holds for coordinate DPs in any syntactic position. It accounts immediately for the well known fact (deplored by prescriptivists) that OF pronouns may appear in subject coordinates:

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<sup>6</sup> Adjacency is defined as in Halle & Marantz (1993) and Bobaljik (1995).

- (10)<sup>8</sup> a. Him and DeNiro want to come to Saturday Night Live...  
b. ...what Europe and us were doing to the rest of the world.

The prediction does not account, however, for the fact that SF pronouns can appear in coordinate DPs. Note, however, that coordinated SF pronouns show both linear ordering and lexical specificity effects:

- (11)<sup>9</sup> a. He and DeNiro want to come to Saturday Night Live...  
b. \*? ...what we and Europe were doing to the rest of the world.  
(12) a. \* DeNiro and he want to come to Saturday Night Live...  
b. \*? ...what Europe and we were doing to the rest of the world.

The prediction also does not account for the equally well known (and equally deplored) fact that SF pronouns can appear in object coordinates. SF pronouns can even appear in coordinates with OF pronouns:

- (13)<sup>10</sup> a. That's one of the things that makes it so difficult to guard he and Wallace.  
b. It's her and I against the state of Nevada...

In order to account for these phenomena, Parrott (2001a) proposed that SF pronouns in coordinate DPs are inserted by supplemental VEs that must be learned explicitly, after the period of language acquisition. Because these supplemental Pronoun VEs are learned explicitly, they are extremely specific and thereby block the insertion of regular pronoun VEs according to the Elsewhere Condition. An example of a supplemental pronoun VE, part of a pronoun VE block, is given below:

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<sup>7</sup> Contra, e.g., Johannessen (1998). See Parrott (2000) and work in progress for some arguments against a Johannessen style treatment of pronoun case in coordinated DPs.

<sup>8</sup> These examples are attested, collected from various sources by the author.

<sup>9</sup> These examples are concocted.

<sup>10</sup> These examples are attested, collected from various sources by the author.

(14) **Supplemental pronoun VE: 1st Singular pronoun**

{	[D-PRONOUN <sub>[1st, sing.]</sub> ]	→ /ai/ / [ænd] ___Adjacent
	[D-PRONOUN <sub>[1st, sing.]</sub> ]	→ /ai/ / Adjacent___ T <sub>[fin]</sub>
	[D-PRONOUN <sub>[1st, sing.]</sub> ]	→ /mi/ / <i>elsewhere</i>

The supplemental VE states that for a pronoun D right adjacent to *and*, the SF *I* will be inserted. This VE is the most specific in its block, and so it will be inserted first, blocking the other VEs. This means that the supplemental VE for *I* will be inserted whenever the pronoun terminal follows *and*, regardless of where the coordinate appears. Because the supplemental VE specifies right adjacency to *and*, *I* will never be inserted before *and*. This accounts for linear ordering effects. Moreover, if an individual has learned only the supplemental VE for *I*, she will produce no other SF pronouns in coordinates. This accounts for lexical specificity effects.

Thus, based on the Transparency Hypothesis, Parrott (2001a) suggests the following modified prediction for English pronouns in coordinate DPs. Because supplemental pronoun VEs are learned explicitly and not acquired, the occurrence of SF pronouns in coordinate DPs is both highly variable (both for and between speakers) and highly context sensitive (showing linear ordering and lexical specificity effects).

Summarizing, we have the following claims about English pronoun case morphology. First, syntactic Case features are not Morphologically Transparent on D in English. Second, according to Vocabulary Transparency English pronoun VEs may not contain syntactic Case features in their substantive features. The SF/OF distinction in English pronouns is maintained by contextual features of VEs that refer to adjacent finite T, and not Case features. Third, pronouns in coordinate DPs are not adjacent to T at all.

Finally, supplemental pronoun VEs insert SF pronouns in coordinate DPs. These supplemental VEs must be learned explicitly, and are not acquired.

We are now in a position to make a prediction that can be used to test the Transparency Hypothesis. Children who are acquiring English should not produce SF pronouns in coordinate DPs until they have been taught explicitly to do so (and thereby learned some number of supplemental pronoun VEs). Thus we predict that young, pre-kindergarten children will never produce SF pronouns in coordinate DPs.

## **5. Research design and methodology**

The purpose of this experiment is to elicit from children coordinated subject DPs containing pronouns, in order to see whether these pronouns will be in SF or OF. We predict the latter: children will produce exclusively OF pronouns in subject coordinates.

### **5.1 Participants**

Forty children will participate in the experiment. Previous research has shown that children master the pronoun case morphology of non-coordinated pronouns at approximately 4-5 years (see Parrott (1997) and references therein). Therefore all the participants will be children of this age range, who have not attended kindergarten.

### **5.2 Design**

Children will be given an elicitation task. Elicitation was chosen over observation because previous research has shown that coordinated pronouns occur with extreme rarity in natural language discourse (Parrott 1997). Thus observation provides too few tokens for analysis.

### 5.3 Methodology

The experiment will proceed as follows. A child sits in a room with a puppet stage and two researchers, one male and one female. The child is not told the researchers' names. There is some candy in clear bowl on the stage. A familiar puppet character asks the child to please keep an eye on the candy, and then leaves the stage. A different familiar puppet character appears on stage. This puppet talks to the researchers, encouraging them to eat the candy. After some comical persuasion, the researcher agrees, and together with the puppet they eat up all the candy. The original puppet reenters the stage. Shocked to see the missing candy, the puppet asks the child "What happened? Where is the candy?"

Because the researchers are never named, this should elicit a coordinate DP with a pronoun, for example:

(15) Fozzie and [her/she] ate up the candy!

The number and sex of the researchers eating candy can be manipulated to elicit different pronouns, such as:

- (16) a. Fozzie and [him/he] ate up the candy!  
b. Fozzie and [them/they] ate up the candy!

### 5.4 Prediction and provisional conclusion

We predict that children will produce only OF pronouns in their coordinates. If so, this will constitute support for the Transparency Hypothesis.

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