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ON THE ACQUISITION OF PROSODIC STRUCTURE

by Paula Fikkert

Reviewed by John Archibald.

Summary by the author

0. Introduction

This dissertation provides a detailed account of how acquisition of syllable structure and stress proceeds. It both describes the developmental patterns found in the course of acquisition (i.e., addresses the developmental problem of acquisition) and accounts for the fact that children rapidly and seemingly effortlessly acquire the prosodic structure of words (i.e., the logical problem of acquisition). The study is based on spontaneous longitudinal data from 12 children acquiring Dutch. The children, aged between 1;0 and 4;11 years at the start of a one-year period of data-collection, were recorded at two-week intervals. Although the main focus is on Dutch, the account makes interesting predictions for the acquisition of prosodic structure in general.

One of the most intriguing outcomes of this study is how fast and systematic the acquisition process actually is. Although Dutch prosodic word structure is quite complex, children manage to acquire the most important aspects of it before age 3. In this brief summary I illustrate two patterns of development: that of rhymes (section 1) and that of stress (section 2). I further show that the development can be captured in a "principles and parameters" framework. In this framework the main assumptions are that universal principles and parameters (Universal Grammar, henceforth UG) are innate and need not be learned. Parameters have a default (unmarked) value in UG, but languages may require marked values for some or all parameters. The child's task is to determine the parameter values of his/her language on the basis of the input data, given UG.

1. Acquisition of rhyme structure

Dutch requires the marked value Yes for all of the rhyme parameters VCV, CVC, and CVC(C) in (1); the acquisition data, however, provide evidence for an initial stage in which all parameters have the default value No.

(1) Rhyme parameters

P1: Rhymes can branch into a nucleus and an obstruent coda

P2: Nuclei may branch 1st, contain two sonorants

P3: Extrarhymal consonants are allowed

At this stage, the child's phonological system allows only core syllables, consisting of a consonant followed by any vowel. Vowel length is non-distinctive at this stage, and final consonants are never realized. Examples are given in (2).

(2) Stage 1: All input forms realized as CV(C)

<table>
<thead>
<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>baby</td>
<td>[beibii]</td>
</tr>
<tr>
<td>goat</td>
<td>[get][ai]</td>
</tr>
<tr>
<td>book</td>
<td>[boek]</td>
</tr>
</tbody>
</table>

Positive evidence, i.e., the existence of many dawed syllables in Dutch, may trigger the setting of the branching rhyme parameter P1 from the unmarked to the marked value. This happens at stage 2: the child starts realizing closed syllables, but these syllables are invariably closed by obstruents (3a). Target final sonorants are deleted (3b).

(3) Stage 2

a. VCV_unmarked

\[ \text{CV} \rightarrow \text{CV} \]

b. VCV_marked

\[ \text{CV} \rightarrow \text{CV} \]

Wavelength is still non-distinctive: branching nuclei are not allowed. This changes at stage 3, where final sonorants appear. However, although sonorants are now sometimes realized, they are deleted far more frequently than obstruents. Furthermore, sonorants show an interesting relationship with the preceding vowel: the child produces target syllables containing sonorants either as a short vowel plus a sonorant, or as a long vowel (4a). Vowel length errors are very systematic: short vowels are lengthened if the final sonorant is not produced, while long vowels are shortened precisely when the final sonorant is produced. This suggests that the child always realizes two skeletal positions, either a long vowel, or a short vowel plus a sonorant. However, obstruents show no such relationship with the preceding vowels. Vowel length errors before obstruents mainly occur in closed syllables, and go in both directions, as shown in (4b).

(4) Stage 3

a. VCV_unmarked

\[ \text{CV} \rightarrow \text{CV} \]

b. VCV_marked

\[ \text{CV} \rightarrow \text{CV} \]

Since sonorants and obstruents clearly behave differently at both stages 2 and 3, I propose that sonorants and obstruents occupy different positions in the syllable: obstruents are part of the nucleus. At stage 3 the child changes the value of the branching nucleus parameter P2 from the default to the marked value. However, even though the child now has templates allowing branching nuclei and codas, sonorants remain part of the nucleus. At stage 4 the child changes the value of the branching nucleus parameter P2 from the default to the marked value. I assume that there is a universal constraint prohibiting triphthongal rhymes. This explains why vowel length distinctions cannot be expressed before obstruents: this would result in triphthongal rhymes. Although the target language has many apparent exceptions to the maximal biphonemic rhyme constraint, the child's forms strictly obey it, which supports the universal status of this constraint.

At stage 4, final obstruents are much more often deleted after vowel length errors (5a) than at stage 3. Moreover, vowel length errors now go in one direction only: long vowels are shortened if the final obstruents are produced, as shown in (5b).

(5) Stage 4

a. VCV_unmarked

\[ \text{CV} \rightarrow \text{CV} \]

b. VCV_marked

\[ \text{CV} \rightarrow \text{CV} \]

The pattern is very similar to the one described for sonorants at stage 3, with one difference: VCV_marked does not occur. In other words, compensatory lengthening seems to be restricted to branching nuclei. The data thus provide clear evidence for the constituents rhyme, nucleus and coda.

However, at stage 4 the first VCV_unmarked rhymes also occur (6a). Moreover, VCV_marked is more often produced correctly than at stage 5 (6b), and, VCV_marked targets are still frequently realized as such (6c), indicating that an extra position is becoming available at this stage.

(6) Stage 4: extrarhymal sonorants appear

a. strand 'beach' /strænd/ — [s ','.ænd]

b. twin 'venus' /twi:n/ — [twi:n]

c. kijk 'look' /kik/ — [kik]

Now, parameter P3, which allows extrarhymal consonants (ERC) at word endings, is set from the default to the marked value, although this value can still be overridden by the default value. In principle, stage 4 also allows for a nucleus-coda-ERC template. However, extrarhymal consonants must obey the Sonority Sequencing Principle, and are, therefore, ruled out after obstruents, particularly since child forms do not seem to distinguish plosives and fricatives with respect to sonority.

The development is summarized in (7).

(7) Parameter settings

Stage 1: all parameters have default value No.

Stage 2: P1 not marked value Yes.

Stage 3: P2 not marked value Yes.

Stage 4: P3 not marked value Yes.

2. Acquisition of stress

The acquisition of stress also follows a strikingly regular and systematic developmental pattern. I limit the exposition here to stress in disyllabic words with two full vowels, because Dutch is trochaic and quantity-sensitive. This means that, depending on syllabic structure, stress in disyllabic words can be either initial or final. Children treat the two types of words differently: final-stressed words are more often truncated and are more prone to stress errors than initial-stressed words. While the latter are produced correctly very early (5b), in the acquisition of final-stressed words four stages can be distinguished (8b).

(8) Development of rhyme templates

Stage 1 Stage 2 Stage 3 Stage 4

<table>
<thead>
<tr>
<th>Rhyme</th>
<th>Initial</th>
<th>Initial</th>
<th>Initial</th>
<th>Initial</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>P2</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>P3</td>
<td>Yes</td>
<td>Yes</td>
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<td>Yes</td>
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</tbody>
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- Initial stressed input forms

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- Final stressed input forms

<table>
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<tr>
<th>Input</th>
<th>Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>gitee 'guitar'</td>
<td>[gite][e]</td>
</tr>
<tr>
<td>ballon 'balloon'</td>
<td>[bal][on]</td>
</tr>
</tbody>
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These stages can be well accounted for with the tools of prosodic theory; i.e., the transitions from one stage to the next can be understood as (1) the setting of one or more parameters from the de-
Review by John Archibald

This fine dissertation is a welcome addition to the field of language acquisition. For some time now, the study of the acquisition of syntax has drawn upon current syntactic theories as a model of what is being acquired by the child (e.g., the acquisition of binding principles, government domains, or functional categories). On the whole, the investigation of phonological acquisition has lagged behind in its development, in part due to the absence of a formal model of phonological processes. This dissertation provides a much-needed analysis of the phonological processes and structures that children must learn.

The extrasyllabic and appendicular positions violate the sonority hierarchy by extrasyllable consonants and are constrained by the sonority sequencing principle. This, then, is the syllable structure that children must learn as a first approximation.

Chapter Four ("The Acquisition of Syllable Structure: the Onset") is the first chapter that presents the empirical results of Fikker's study. It will describe the content of the onset parameter too. Regarding the first parameter, I think that it is a question worth pursuing whether the real primitive is whether the onset can branch, or whether the real primitive is whether the onset can branch on the basis of a phonological parameter. Regardless of whether one chooses to strike me as somewhat idiosyncratic primitives of manner that could probably be instituted in a broader model of the phonological processes.
port differing stages of development are really significant. For example, in stage three it is indicated that nonorants are more likely to delete after long vowels (53% — 10/19) that after short vowels (78% — 49/63). Statistically could have been made to show that these results had been enlightening. It is also uncompromisingly declared that the child is acquiring too many VVCCeon forms than VCceon forms. Similarly, at stage four, it is the 1st deletion of non-orants more after long vowels (20% — 6/24) than after short vowels (75% — 12/16). It is important to know whether these differences are statistically extremely significant.

I also feel that there is more to be said about the characteristics of monosyllabic consonant clusters. It is noted that different sequences (with respect to manner of articulation) appear at different times. As I mentioned earlier, I think that some of the explanations of which sequences are heterosyllabically and which sequences are tauto-syllabically, fall out from a model of segmental structure that recognizes more than just manner of articulation. Otherwise, I feel that Fikkert commands and integrates learnability theory with developmental explanation in an interesting and sophisticated way.

Chapter Six ("The Acquisition of Dutch Stress") moves the dissertation into new territory. Fikkert points out that to date there has been no research on how or why children acquire stress. It is suggested that stress and its relation to the adult input and mapping that string onto a template (either syllable or metric) that may or may not be the same as the adult template. Elements that are mapped onto the template are subject to Stray Erasure and are truncated. She demonstrates that children treat disyllabic words with initial stress differently than disyllabic words with final stress with respect to number of errors and truncation patterns. This confirms the traditional description of "syllable deletion" in child language that unstrung stressed syllables and syllables are more likely to delete than unstrung syllables after stressed syllables. For example, in an English word like bonda, a child is much more likely to produce bond than bonda. This pattern is explained as, if Fikkert argues, the child has access to a Universal Grammar template that is trochaic (i.e. a child's output is a syllable that maps onto a model; the string is syllabified, fall out from a model of segment structure that recognizes more than just manner of articulation. Otherwise, I feel that Fikkert commands and integrates learnability theory with developmental explanation in an interesting and sophisticated way.

Chapter Seven ("A Parametric Learning Model for Syllable Structure and Stress") is mainly a discussion of Dresher & Kaye's seminal (1990) paper on the acquisition of stress systems and its implications for child language. Fikkert notes that their learning model sheds light on L1 development by being explicit about the representations assumed by UG and the adult grammar, and the learning mechanisms involved. Following Dresher & Kaye, she argues that UG consists not just of principles and parameters but also of cues that are associated with parameters and must be appropriate to the parameter in question. This is, in fact, crucial for the acquisition of indirect negative evidence to the learning theory. There are two problems that need to be addressed if we attempt to formalize a theory of indirect negative evidence. One is that it is only feasible in a restricted hypothesis space. If the learner is searching through hypotheses like "no one has ever said a five syllable word where the fifth consonant was a g?" then it is unlikely that we could guarantee convergence. However, the child's expectations are constrained by parameter settings (and other linguistic structures) then we can admit this other source of evidence. The other problem is the problem of blame assignment. That the learner identifies a mismatch between the input (or lack of input) and the form that the developing grammar would generate, how does the learner know what to change? Something's wrong with the grammar, but what? The construct of appropriate cues (though not formalized) solves this problem.

The chapter also discusses some of the differences between machine learners (like Dresher & Kaye's) and child learners. Fikkert comments on, amongst other things, the imper­fect memory of children as opposed to machines. Kids, however, may not be at a complete disadvantage compared to machines when it comes to remembering forms. They do seem to both mechanisms of associative memory and rule-based productivity (Finker 1990). There does seem to be both induction and deduction involved.

Conclusion Let me conclude by saying (in case there has been any confusion) that this dissertation is excellent. It is exciting to see phonological theory and developmental language linked so ex­tensively. As Fikkert makes clear, the logical and developmental problems of acquisition need not be viewed as mutually exclusive. The integrative nature of this work makes it a model and measure of thoroughness for future research.

References


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