

## BOOK REVIEW

*Turunen, Pirjo. (2003). "Production of word structures: A constraint-based study of 2;6 year-old Finnish children at-risk for dyslexia and their controls". Jyväskylä, Finland: Jyväskylä University Printing House.*

## INTRODUCTION

"Production of word structures: A constraint-based study of 2;6 year-old Finnish children at-risk for dyslexia and their controls" is the author's Ph.D. dissertation presented to the University of Jyväskylä in 2003. It is based on cross-sectional word production data from approximately 190 Finnish children at 30 months of age. The author's main hypothesis was that young children acquire prosodic structures before they acquire each individual segment. The data were analyzed at different phonological levels, including word, syllable, phonotactic, and phonemic, to test this hypothesis. This work also compares word production in children who are at-risk for dyslexia and children who have no familial history of dyslexia (control participants). The framework of Optimality Theory was used in the analysis in this study.

## SYNOPSIS

Chapter 1 is an overview of the issues that are relevant to the work. This study is a part of a larger longitudinal project being conducted at the University of Jyväskylä (The Jyväskylä Longitudinal study of Dyslexia JLD). The overall scope and previous results of the JLD project were briefly presented. This chapter also provides an introduction to Finnish phonological acquisition, Optimality Theory, and dyslexia. The purpose of the study and research questions were stated at the end of the chapter.

Chapter 2 is a review of literature on the acquisition of word structures, Finnish pho-

nology and prosody, and constraints in Optimality Theory. After providing a review of prosodic hierarchy and prosodic units in language acquisition, the author presented her primary hypothesis. She hypothesized that "prosodic factors have a strong impact on the word production patterns" and that "the child first has to master the overall structure of the word" in order to produce specific segments and features in the word (p. 31). Relevant constraints were introduced and discussed separately for word, syllable, phonotactic and phoneme levels. Detailed research questions and hypotheses were also spelled out for each phonological level.

Chapter 3 describes the method of data collection and data analysis. The JLD project follows approximately 190 children from birth until school age. Approximately half of the children were considered at risk for becoming dyslexic based on the family history of difficulty in reading and writing. Half of the children were born to the families that had no history of reading and writing difficulties (control participants). Between 1993 and 1996, questionnaires, interviews and assessments were administered to expecting parents regarding their skills in reading and writing in order to locate the participants for the JLD project. After the children were born, assessments were conducted at ages 6, 14, and 18 months and at ages 2;0, 2;6, 3;6, 4;6, 5;0, 5;6 and 6;6. The follow-up assessments will continue to first, second and third grade. This study was based on the data from the assessment when the children were 2 years and 6 months of age. A picture naming task was used for the data collection.

In addition to the comparison between the at-risk and control groups, a follow-up analysis on a subgroup of 'late talkers' was conducted in the study. The late talkers were those who scored one standard deviation below the mean on the measure of their vocabulary production at age 2. A total of 32 chil-

dren were considered as late talkers. Twenty of them were from the at-risk group, and 12 were from the control group. In Chapter 4, the results were reported separately for the at-risk and control groups, and for the group of late talkers. The late talkers were a subgroup of both the at-risk and control groups, not an independent group from the at-risk and control groups.

Chapter 4 presents the analysis of the transcribed data. A total of 33 words were elicited from each child. Of these, 19 words were selected for the transcription and analysis of the study. Analysis of 6 bisyllabic, 6 trisyllabic and 4 four-syllable target words was reported in this chapter. Examples of target words were *avain* 'key', *aurinko* 'the sun' and *appelsiini* 'orange' (a bisyllabic, trisyllabic, and four-syllabic target word, respectively). Child productions of each target word were examined separately. The author examined syllable structure, phonotactics and phoneme production for each target word. The results were compared between the at-risk and control groups. The late talkers' productions were also reported in a separate column in the tables. Overall, it was found that the proportions of truncated productions were higher in children in the at-risk group than in children in the control group. It was also found that late talkers frequently truncated trisyllabic and four-syllable target words.

Chapter 5 provides further analyses comparing the at-risk, control, and late talker groups. Additional subgroups were formed in this chapter by using the later assessments that were conducted when the children were ages 5 and 7. Thirty late talkers were identified using language comprehension and production measures at age 5. A separate analysis was conducted for late talkers who were identified at age 2 and late talkers who were identified at age 5, although I would suppose

that many of the children who were identified as late talkers at age 5 were also in the late talker group at age 2. The assessments at age 7 were used to divide the children into groups of poor, middle, and good readers. The phonological scores based on the word production at age 2;6 were compared among these subgroups in this chapter.

The phonological scores used for this analysis were based on the productions of 19 target words that were analyzed in Chapter 4. Scores were computed for several elements at different phonological levels. For the word-level analysis, the number of syllables were compared between the target words and the child productions to examine whether the overall word structures were target-like in the child production. For the phonotactic level, accuracy of productions of consonant sequences and diphthongs was examined. Productions of /s/ and /r/ were examined for the phoneme level.

The results of the analysis in this chapter indicates that the children who are at risk for becoming dyslexic did not differ from the children in the control group in phonological scoring at age 2;6. The differences between the two groups were statistically non-significant on all measures with an exception of the production of /r/. Late talkers' scores at age 2;6 were lower than the control group in almost all phonological scores. Finally, there was a difference in phonological scores at age 2;6 among children who were later identified as poor, middle and good readers using the assessments at age 7. Based on this finding, the author suggests that there is a strong relationship "between early phonology and early reading skills" (p. 169).

Chapter 6 is a discussion and summary of the work. The author states that this work is a starting point in studying early phonology in Finnish both in typically developing children, and children who may become dys-

lexic in the future. It is emphasized that not all children in the at-risk group will become dyslexic. In the near future, it will become possible to examine the differences between children who are dyslexic and those who are not. The author concludes the study by mentioning limitations of using cross-sectional data from experimental production in young children, and by suggesting that the data from this study be compared to spontaneous speech data in future studies.

### DISCUSSION AND EVALUATION

Perhaps the data and data analysis are the most important contribution of this study. The data set is unique in several ways. First, it provides a large amount of well-controlled data. Thirty-three words were elicited twice in a naming task from 190 Finnish children all at age 2;6, and 19 of the words were carefully transcribed and analyzed. Second, the transcriptions of the data provide the level of details that one could find in longitudinal studies of few children. While those longitudinal studies provide detailed transcriptions, it is not easy to generalize the findings to other children. The data from this study offer both detailed transcriptions and a large amount of data from a controlled experiment.

Another unique contribution of this study is the retrospective analysis of the data collected at 2;6 in subgroups formed by the assessments conducted at ages 5 and 7 (Chapter 5). This type of analysis can only be done using the data from large-scale longitudinal studies, such as the JLD project. It is interesting that children who were later identified as poor readers had lower phonological scores than those who became good readers already at age 2;6. As stated by the author, the results seem to indicate that there is a relationship between early phonology and early reading skills (p. 169).

Contrary to the author's prediction, there were no clear differences between the children at-risk for becoming dyslexic and the children in the control group in their word production at age 2;6. The only difference that reached a statistical significance was the production of /r/. Based on this finding on /r/, the author argues that the data supported the prediction that the phonological deficit behind dyslexia manifests in early phonology (p. 172). Although the difference was statistically significant, the average correct production of /r/ was only 28% even in children in the control group compared to 19% in the at-risk group. Considering that Finnish /r/ is a trill, and that the children were 30 months of age, one would wonder whether the production of /r/ is a reasonable indicator of the children's early phonological skills. Instead, the results could be interpreted as there may not be a noticeable difference between the groups in word production at an early age. This does not mean that there is no difference between typically developing children and children who later become dyslexic in their phonological skills, but the difference may not surface in productions of familiar words at age 2;6. Investigations using different techniques, such as perception tasks, acoustic analyses or the use of nonsense words, may reveal differences between the groups. In addition, a reexamination of the data at the completion of the JLD project will reveal the differences, and lack thereof, between children who are dyslexic and those who are not rather than between children who are at risk for becoming dyslexic and those who are not.

The analysis of the data at different phonological levels was a novel and interesting approach. The author's hypothesis was that a child first learns the prosodic whole-word structure before proceeding to more specific phonotactics and phonemes. She concluded

that the phonological scoring analysis supported the hypothesis because the scores were higher for word-level elements (e.g., the numbers of syllables retained in multisyllabic targets) than the phoneme-level elements (e.g., the production of /r/) (p. 168).

Although I believe that it is an interesting and important proposal, whether the data supported the hypothesis remains in question. The elements that were selected for scoring at different phonological levels could affect the results and the interpretations of the data. For example, the word-level scoring was conducted on the number of syllables regardless of the phoneme elements and syllable structure within each syllable. In this analysis, ap.pe.ii.ni was correct production of ap.pel.sii.ni 'orange' although some syllables lacked target-like syllable structures and phonemes (p. 152). On the other hand, the phoneme-level scoring was conducted only for the phonemes /s/ and /r/, which are acquired relatively late by children (Bernhardt & Stemberger, 1998). If the productions of sounds that are typically acquired early (e.g., /m/ and /p/) were analyzed, the phoneme-level scores would be much higher than the scores based on the productions of /s/ and /r/.

Even though the author's claim is not en-

tirely convincing, I believe that it is an interesting and plausible hypothesis that is worthy of further investigation. Perhaps longitudinal data rather than cross-sectional data would be helpful to test this hypothesis. In addition, since this hypothesis is not specific to the acquisition of Finnish, it can be examined in other languages in the future.

In conclusion, this study is a considerable contribution to the study of early phonological acquisition in Finnish. It is a solid work with a large amount of data and influential theoretical reviews and proposals. This work serves as a reliable resource and reference for the study of phonological acquisition in Finnish and for the Optimality Theoretic account of Finnish phonology.

## REFERENCES

- Bernhardt, B. H., & Stemberger, J. P. (1998). *Handbook of phonological development: From the perspective of constraint-based nonlinear phonology*. San Diego, CA: Academic Press.

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