Acquisition of Prosody in Russian

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Abstract

In this study, a 1.5-hour conversation of a three-year-old Russian girl and her mother was audiotaped and analysed. The speech of the girl is not typical of her normally developing peers, as many vowels and consonants are substituted by different ones, and segmental information is no more sufficient for adequate semantic interpretation. The present study shows that although the child's speech is deviant in some way, the girl has acquired most of the intonation models of the native language, which is normal for three-year-old Russian children.

1. Introduction

The study is focused on the acquisition of prosody by a Russian child. A 1.5-hour conversation of a three-year-old girl and her mother was audiotaped and analysed.

The speech of the girl analysed in the study is not typical of normally developing three-year-olds, as most of what the child is saying is not intelligible to anyone except her mother. This happens because many vowels and consonants are substituted by different ones, and segmental information is no more sufficient for adequate semantic interpretation. However, this delay in speech production is not accompanied by difficulties in perception, nor by mental problems.

This way of language acquisition can be to some extent explained by what has been said in the literature. Professor I. A. Sikorskij in 1899 wrote that there exist two strategies in early language acquisition: "sound" strategy and "syllabic" one [1]. Children who use the former strategy in language acquisition produce in the right way one or two sounds of a word; children using the latter strategy represent in their speech general syllable structure of words, and can fill this structure by the sounds different from a target word. Contemporary authors, among them B. de Boisson-Bardies [2], P. Jusczyk [3], describe the same strategies naming them "referential" ("analytic") and "expressive" ("gestalt"). A child using referential strategy focuses on short stretches of speech, while a child who chooses expressive strategy focuses on multisyllable chunks of speech. Vertical" segmental information contained in single (usually, stressed) syllable is relevant for referential strategy, the details of consonants and vowels are also important. Expressive strategy focuses on "horizontal" information: number of syllables, stress position, intonation patterns; only secondary attention is paid to particular consonants and vowels.

The girl whose speech is studied in the project seems to belong to the "expressive" group, widely using suprasegmental information during the acquisition of the native language phonological system.

2. Segmental analysis

It is interesting to present the results of the analysis of phonetic segments in the child's production. The pilot analysis is based on 53 utterances. When transcribed phonologically, these utterances consist of 265 syllables. The number of syllables actually pronounced by the child is 247; 7% of syllables are omitted.

At the same time, single consonants and vowels are much more subject to modifications. The number of omitted consonants is 24%. Only 15% of the targeted consonant clusters are actually pronounced by the girl. Final consonants are also likely candidates to be omitted (50% of final consonants do not exist in the actual production of the child).

Syllable structure of the girl's speech is very interesting: the number of consonants is almost equal to the number of vowels (242 consonants, 247 vowels). This imposes the "CV" structure on most of the syllables. Consonants substituted by others make 47% of all consonants; 22% of vowels are subject to substitution.

3. Prosodic analysis

Although, as mentioned above, the child's speech is deviant in some way, the girl has acquired most of the intonation models of the native language, which is normal for three-year-old Russian children.

The existing descriptions of Russian intonation name from four to eight linguistically relevant intonation types ([4], [5], [6]). The patterns present in most works include the sentence final intonation pattern used with declaratives, the question word questions pattern, the contour used with exclamations, and the sentence non-final intonation pattern. Sentence final intonation contours used with declaratives generally have a rise at the beginning and a fall on the syllable having a phrasal accent, which is usually situated close to the end. Intonation patterns used with exclamations have a rise-fall pitch movement, and an overall high intensity and Fo. Question word questions' pitch contours are double-focused. The first focus is on the stressed syllable of the question word. This syllable gets the highest pitch and increased intensity. The pitch is slightly falling between the two focuses. The second focus is on the last stressed syllable of a question, where the Fo falls down abruptly. Sentence non-final intonation patterns are characterised by a pitch rise on the last stressed syllable.

All of these patterns are present in the girl's speech production, well matched with appropriate syntactic constructions. Acoustic analysis conducted in the study has revealed that pitch contours of the utterances produced by the child look very much like Russian "adult" intonation patterns described above.

3.1. Declaratives

The child widely uses declaratives in the conversation; many of them are short, one-word, often one-syllable answers. However, there are longer declarative sentences, consisting of

several words and sometimes of two intonation-groups (the word "intonation-group" is used here with the meaning defined in [7]). Sentence final intonation is present in all declaratives, irrespective of their length (see Fig. 1 and Fig. 2).

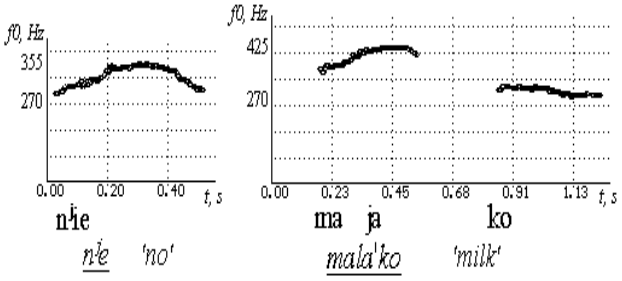

Figure 1: Two declaratives produced by the child. The two numbers on the vertical axis correspond to the highest and the lowest values of the F_0. The actual phonetic transcription is directly under the plot in boldface; the targeted phonological transcription is underlined.

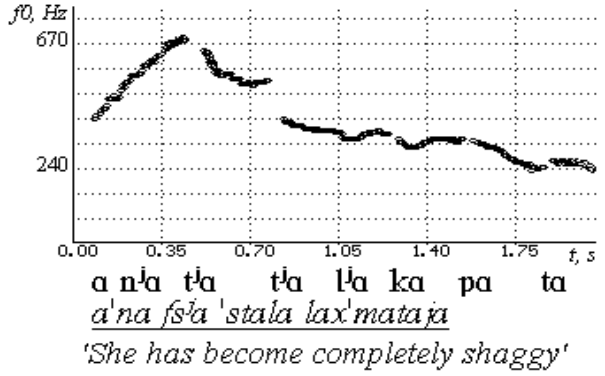

Figure 2: A declarative produced by the child.

3.1.1. Word accent

It is interesting that the child has well acquired the correct way of producing the Russian word accent. It has been long proven that the most important prosodic feature in constituting word accent in Russian in length. The production of the child discussed here is a good example. All the utterances produced by the girl can be easily identified in terms of their accent structure, even though sometimes the meaning of words is not clear. A nice and a little hyperbolised example of the correct production of a word accent is given on Fig. 3.

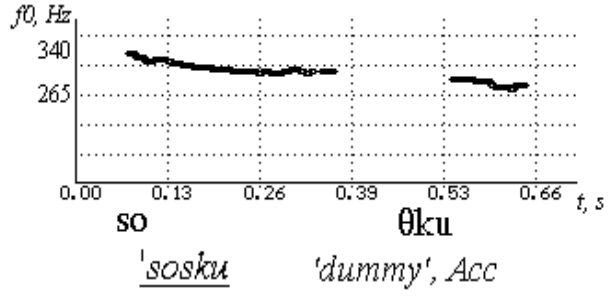

Figure 3: A declarative produced by the child. Note the length of the accented first syllable.

3.2. Exclamations

Exclamations are less numerous than declaratives in the girl's production. The increased overall pitch characterises these contours, and, as well as "adult" patterns, they have a wider Fo range than declaratives (Fig. 4).

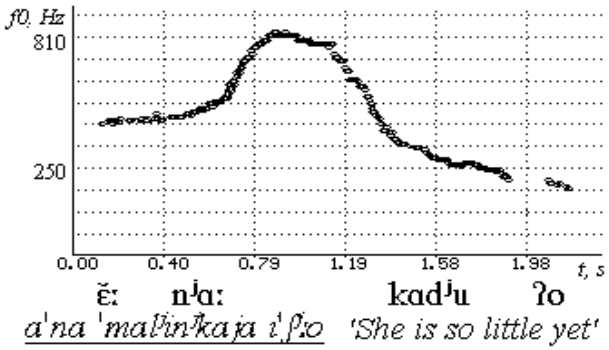

Figure 4: An exclamation produced by the child.

3.3. Questions

During the whole conversation the child did not use any yes/no questions at all. Question word questions, on the contrary, were rather numerous. These questions of the girl resemble "adult" models less than other patterns do. An auditory analysis shows that few of these questions sound like "normal" Russian questions. On Fig. 5 one can see an example of such a "proper" question.

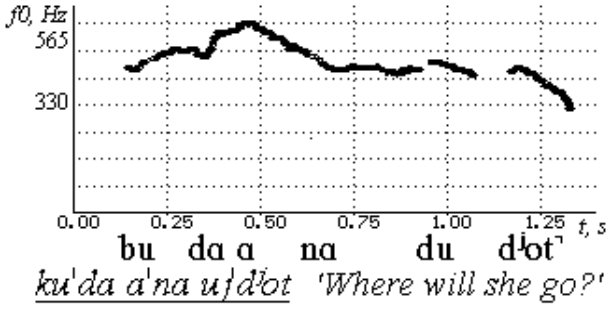

Figure 5: A question-word question produced by the child.

A question which looks and sounds not at all like a question should do, is presented on Fig. 6. A feature mostly responsible for the wrong auditory perception of this question is the final F_0 rise.

The shapes of the fundamental frequency contours of questions and declaratives produced by the girl resemble each other. There are however some differences. One of them is in the interval between the average of high-pitched syllables and a similar average for low-pitched ones. The analysis has shown that this interval is wider for the declaratives. In adult Russian speech, on the opposite, the pitch range is wider for questions. It has also been verified whether question-word questions and declaratives of the child have the same tempo difference as the "adult" ones: in adult speech the tempo of declaratives is generally slower that that of questions. Our results show that there is no significant difference between the tempo of the child's two intonation types, and there is even a slight tendency towards the faster tempo for questions. These

facts prove that the child has not yet mastered the opposition of questions and declaratives on the level of speech production.

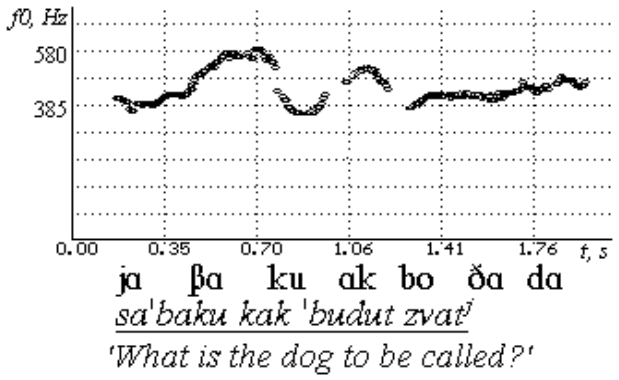

Figure 6: A question-word question produced by the child.

3.3.1. Repeat questions

There is one more type of questions not yet mentioned here: repeat questions. These were not as numerous in the child's production as question-word questions, but were produced in a correct "adult" manner. This intonation type is characterised by an overall pitch rise, and an eventual fall on final post-accented syllables if there are any. One can see good examples of these questions produced by the child on Fig. 7.

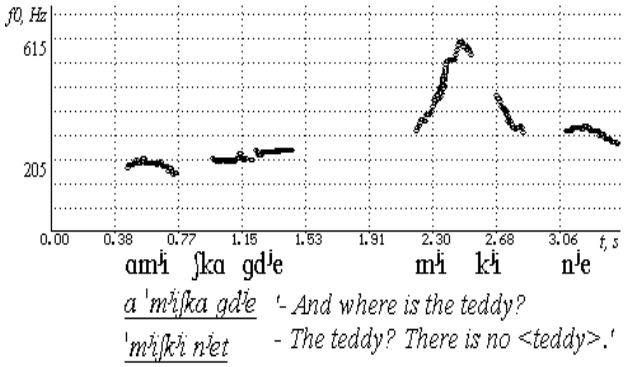

Figure 7: A question asked by the mother, a repeat question produced by the child, and a final answer by the child.

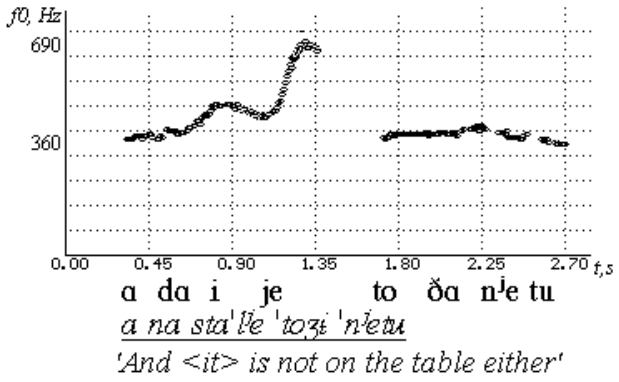

Figure 8: A sentence non-final intonation-group produced by the child (the first intonation-group in a declarative phrase).

3.4. Sentence non-final intonation-groups

Sentence non-final intonation-groups are very well produced by the girl. A preliminary auditory analysis has demonstrated that all of them are easily recognisable by native speakers of Russian. A typical non-final intonation-group is presented on Fig. 8.

3.5. Specific features

Many non-final intonation-groups of the girl are much shorter than they would be when produced by adults. The reason is the slower tempo of the child's speech, which is typical of children's speech in all languages. Due to this slow tempo intonation-group boundaries are much more numerous. A sentence which could be easily and normally produced by an adult as one intonation-group, but which is split by the girl into three intonation-groups, is shown on Fig. 9.

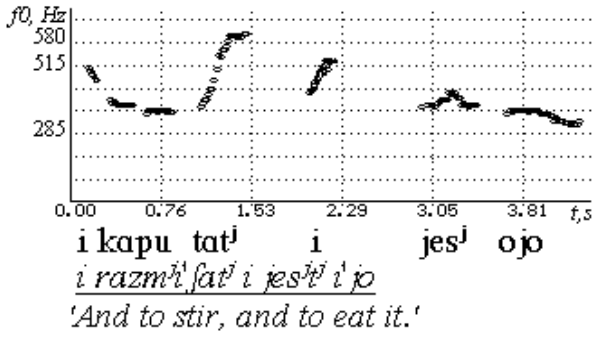

Figure 9: A phrase consisting of three intonation-groups.

One more feature of the early prosodic system of Russian, well demonstrated in the speech production of this girl, consists in that the pitch contours of children's utterances have many "oscillations" without any special function. This "fluctuating" is supported by the slow tempo of speech, which allows children to experimentate with their F_0. An example of such an unnecessary pitch change is given on Fig. 10.

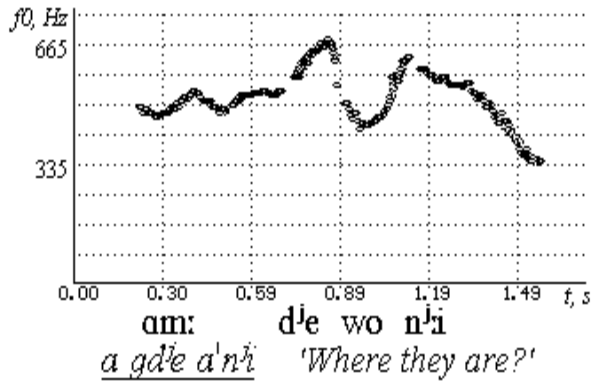

Figure 10: A question-word question produced by the child. Note the sudden pitch change in the middle of the utterance.

On Fig. 11 an utterance produced by the girl and immediately repeated by her mother is presented. One can easily see that the fundamental frequency contour of the mother's utterance is much flatter than that of her child. The

first peak F_0 value corresponds to the stressed syllable of the third word, and the second peak F_0 value stands for the pre-accentuated syllable of the last word.

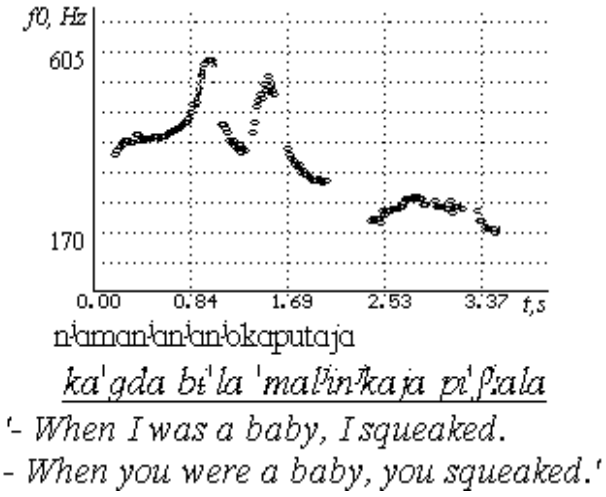

Figure 11: A declarative produced by the child and by her mother. The two numbers on the vertical axis correspond to the highest F_0 value of the child and the lowest the F_0 value of the mother. The actual phonetic transcription of the child's utterance is directly under the plot; the underlined targeted phonological transcription is the same for both utterances, as they consist of the same segments. Note the relative difference between the two contours.

In addition to the types of intonation described above, the child also had a specific intonation type combined with its own specific meaning (e.g. Fig. 12). This intonation type, not included in the basic ones discussed in theoretical works, is rather frequent in the child's production. The fundamental frequency shape is almost the same as the declarative contour, but is characterised by the terminal rise.

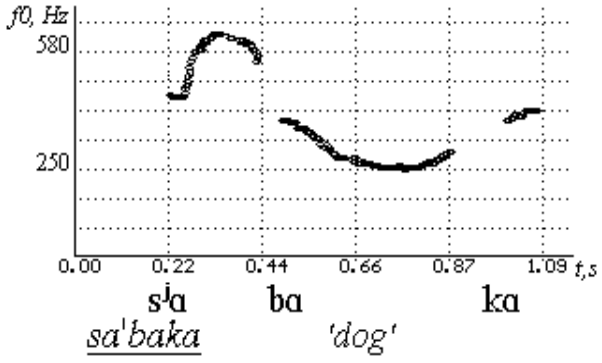

Figure 12: A declarative with a final rise.

This contour is used by the girl with declaratives, usually when she expects some conversation continuation. For example, mother asks whom the girl has seen in the zoo, and the child answers: "A goat". This type of intonation is sometimes used in adult speech for enumeration, though there exists the more common way of enumerating, expressed by the same intonation type as the one used with non-final intonation-group. The most common function of the intonation type in question is important for discourse: this contour shows that the conversation is not over. Looking at our data we can say that the child described in the study has acquired this way of holding the conversation.

4. Discussion

The girl whose speech is analyzed in this paper has well acquired the prosodic system of her native language, and has learned to use her knowledge in the most productive way for speech communication. Even though single consonants and vowels are subject to many substitutions and omissions, the lack of segmental information is compensated by "proper" prosodic structure of the child's speech. For example, the fact that the girl always puts the word accent in its appropriate position, helps her mother to recognize single words. The girl has generally well acquired the main Russian intonation types, and, as she produces them appropriately in different pragmatic and communicative contexts, her mother understands the child.

Apparently, prosody is very important for this girl to master the native language. The girl is able to repeat adult intonation contours very well. Prosodic characteristics of speech are supposedly better traced and retained by the child in the process of communication than single segments. Thus prosody is relevant for her speech perception, and is largely responsible for her mental representations. This produces an inevitable effect on the child's speech production, and on the whole process of language acquisition.

5. Conclusions

The results of the analysis conducted in the study show that though the child has not yet acquired the whole prosodic system of the native language, she has well mastered some important features, mainly in the field of pitch, less in terms of temporal structure. Studying the acquisition of all prosodic parameters as a whole in this particular girl and in other Russian children is still a perspective for future research, which could help to verify whether the girl's speech is really deviant or not. Comparing the speech of this child with other Russian children's speech production and perception could be of use to study the order of the acquisition of different prosodic parameters by children, and this could also help to better understand the origins and development of intonation.

6. References

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