

SPEECH SOUND DEVELOPMENT OF CROATIAN CHILDREN AT THE AGE OF 3

Diana Tomić¹ & Marija Fabek Subotić²

Faculty of Humanities and Social Sciences, University of Zagreb, Croatia¹; Microton Ltd.
dtomic@ffzg.hr, marijafabek@hotmail.com

ABSTRACT

Recent studies on speech sound development in Croatian show that the existing assessment tasks and normative data should be revised. This paper reports results for the speech sound development in Croatian. 60 (30 M and 30 F) children aged 2;10-4;2 were included in the study. Children were tested by a picture naming task assessing development of 30 Croatian phonemes in various positions within words. The results, based on 75% criterion, show that at the age of three children have mastered vowels, stops (except for /g/), semi-vowels and nasals (except for /ɲ/). The results do not comply with the existing normative data for Croatian. The paper discusses lack of gender differences and the development of assessment task. The administered task and the obtained results can be used as a basis for the future normative study on speech sound development in Croatian.

Keywords: speech sound development, Croatian, Slavic languages, preschool children.

1. INTRODUCTION

Croatian is a Slavic language spoken by 4.2 million people in Croatia. There are five monophthongs /i, e, a, o, u/ and one diphthong /ie/ in Croatian vowel system. Vowel length depends on the accent which can be either long or short and rising or falling. There are 25 consonants in Croatian: stops /p, b, t, d, k, g/, affricates /ts, tʃ, ɟʃ, tɕ, dʒ/ fricatives /f, s, z, ʃ, ʒ, x/ nasals /m, n, ɲ/ approximants /j, v/ lateral approximants /l, ʎ/ and an alveolar trill /r/ which can have syllabic function in consonant clusters i.e. in words like smrt (engl. death) or prst (engl. finger) [8].

The importance of normative data for both clinical practice and speech sound development (SSD) studies is well known. Normative studies should include large samples, be sensitive of sociolinguistic variables and be representative of the whole population [4]. Speech sound development reported for 36 languages in McLeod's guide [10] provides better insight in the availability of normative data in various languages. Although Croatian was not

described in the McLeod's guide, norms for speech sound development are available. The normative study was carried out in the eighties [21] and the results have been used in the clinical practice and speech sound development research ever since. Not only have they been used in Croatia, but also in the neighbourhood countries: Bosnia and Herzegovina, Serbia, Montenegro and even Slovenia due to language similarities. Croatian normative sample included 1136 participants, spontaneous speech production i.e. description of a black and white sketch and target sound analysis in either initial or final position. This type of task is not common for the assessment of SSD and the majority of standardized test use some type of a naming tasks (picture or object). In the Croatian norms the criterion for considering a speech sound developed is the occurrence of 70% developed renditions. The criterion is rather unusual because other studies use 75%, 90% or even 100% [2, 16]. The explanation given by Vuletić [21] is that the higher criterion, i.e. older age at which a particular speech sound should be developed would postpone the beginning of speech and language therapy. Later onset of the therapy could mean less success and longer duration of the therapy. Therefore, for example, according to Vuletić [21] /r/ in Croatian should be developed by the age of 4;6 or the child should start speech and language therapy. When compared to languages with trills, the norms seem rather low and do not agree with recent studies [20]. According to Vuletić [21], at the age of 3, the following speech sounds should be developed: vowels: /a, e, i, o, u/, stops /p, b, t, d, k, g/, fricatives /f, x/, nasals: /m, n/, lateral approximant /l/ and semi-vowels /j, v/. Tolerated developmental renditions are distortions of fricatives /s, z, ʃ, ʒ/, all affricates and trill and substitution of /ʎ/ with /l/ and of /ɲ/ with /n/. Between 3;6 and 4;0 years, children should master nasal /ɲ/ and the substitution of /ɲ/ with /n/ is not tolerated. Later on, by the age of 4;6 lateral approximant /ʎ/ and trill /r/ are mastered. Finally, fricatives: /s, z/ and affricate /ts/ develop between 4;6 and 5;6.

Croatian speech and language pathologists have also reported expected age for SSD based primarily on their professional experience [1, 2, 6]. Their results differ slightly from Vuletić's norms [21]. However,

recent Croatian studies disagree with the existing norms which should be revised, especially for the late developing sounds like laterals, trill and fricatives [18, 19, 20]. Moreover, the existing data do not comply with the universal findings on articulatory motor development which is the basis for SSD [8] and the existing norms lack important methodological information: description of the research method, age groups within sample etc., so the results cannot be compared with contemporary Croatian or cross-linguistic studies.

The aim of this study is to develop SSD assessment task for individual sounds and to administer the task to the youngest age group which is usually included in speech sound development studies.

2. MATERIAL AND METHOD

2.1. Participants

60 children participated in the study (30 M and 30 F). Average age was 3;7 ranging from 2;10 to 4;2 and no delays or disorders were reported by parents. The study was conducted in wider Zagreb area.

2.2. Task development

Speech sound development was assessed by a picture naming task including 30 Croatian phonemes. Several factors were controlled during the task development: position of target sound (initial, medial or final); representation of monosyllabic, disyllabic and trisyllabic words; phonemes represented in a word in order to reduce number of stimuli and familiarity of the word to the children. The task material included 60 words; 21 monosyllabic (35%), 24 disyllabic (40%) and 15 trisyllabic words (25%) representing occurrence frequency in Croatian [12]. The stimuli are included words like: miš (eng. mouse), auto (eng. car) or kolica (eng. stroller). (For more details on the entire stimuli list please consult https://docs.google.com/document/d/1_eotcM6gqO27Bw9VDC5EzzpxGSLFs00KZyiNTsf-vhQ/edit?usp=sharing). Although important, the familiarity criterion could not be met for all target sounds therefore certain less familiar words were used in the task. For example, the words džep (eng. pocket), đak (eng. pupil), val (eng. wave) or ekran (eng. screen), ćelav (eng. bald), njuška (eng. snout) or kivi (eng. kiwi) were used in the task since no other words could be used for the assessment of particular sounds in particular positions. Moreover, voiced palatal affricates in final positions were excluded from the task since the occurrence frequency is very low, the words bedž (eng. badge), smuđ (eng. perch)

or čađ (eng. soot) would be unfamiliar to children and no other studies included them [3, 21].

The material was randomized and PowerPoint presentation with the photos of stimuli was prepared.

2.3. Procedure

2.3.1. Task administration

The children were tested individually in a familiar preschool setting by a trained research assistant. The test was administered as a simple computer game which is becoming more widely accepted testing procedure for children [11, 15, 18, 19, 20]. After establishing rapport, the child was asked to name the photo. The responses were recorded with digital recorder ZOOM H4n Handy Recorder. Duration of the assessment was between 10 and 20 minutes.

2.3.2. Auditory assessment

Auditory assessment was performed by both authors. Interrater agreement was 85%. The applied criteria for auditory assessment were described in [19]. It should be noted that the responses which were result of the repetition and not picture-naming were not used in the study, although the repetition task is frequently used in similar studies. On the other hand, the reports of the stimulability effect, i.e. that the child can repeat target sound after the model six months prior to spontaneous production, should also be considered.

2.3.3. Scoring

Typical categories for developmental renditions (omissions, substitutions, distortions and developed speech sound) were used in the assessment. On average, each target sound, except for voiced palatal affricates, was assessed in three positions which can result with various combinations of developmental renditions. Certain combinations were clear, i.e. if the target sound is developed in all three position it was considered developed, but in other cases in which a target sound was, for example, substituted in initial but developed in medial and distorted in final position. Therefore, in the first example the target speech sound was considered developed and in the second example not developed because of the substitution being the most immature rendition.

2.3.4. Data analysis

SPSS 17 was used for data analysis. Besides descriptive statistics, t-test and ANOVA were used. Bonferroni-test was used as post-hoc test.

3. RESULTS AND DISCUSSION

The results show typical course of speech sound development. Not only is the percentage of developed renditions. Early stages of speech development are characterized by high variability which is evident from s. d. values, especially for late developing sounds (affricates, fricatives and liquids). Compared to the existing norms, SSD follows developmental order, however the age agreement between the results of this study and the normative data was found only for vowels. Unfortunately, the normative data does not report number of children in each age band, therefore we cannot test whether the differences are significant or not. Undoubtedly, the results reveal the importance of the criterion used in order to consider the particular sound to be developed at a certain age. In case of semi-vowels, if 90% criteria is applied they are developed, but not yet completely. The same was found for stops (83%) or nasals (82%). If we use 70% criterion like Vuletić [21] or 75% like Tomić [19] the sounds will be considered developed, but not if 90% criterion is used. The comparison of the results with more recent Croatian studies shows greater agreement. Tomić [19] found 51% of developed approximants among children aged three which is similar to 49% reported in this study, or specifically 3-year olds have 95% of developed renditions in articulation of semi-vowels, 43% in laterals and 14% in trill. The results (mean scores and s. d. for developed renditions) for manner categories are shown in Table 1. When compared, no statistically significant differences were found for comparison of the within-word positions for particular sounds.

Table 1: Speech sound development in Croatian 3-year olds – manner categories.

	Developed renditions	s. d.
Vowels	99%	0.05
Semi-vowels	88%	0.24
Stops	83%	0.19
Nasals	82%	0.20
Fricatives	58%	0.26
Affricates	46%	0.36
Laterals	38%	0.35
Trills	23%	0.36

The results for each target sound provide more detailed insight and are shown in Table 2. The analysis of the results in shows that voiced stops /d/ and /g/ are underdeveloped in comparison to other members of the speech sound group. The individual responses revealed that the stops in final position

were devoiced and the voiced-voiceless opposition was still being developed at the age of three [7].

Table 2: Speech sound development in Croatian 3-year olds – individual sounds.

Vowels	/i/	/e/	/a/	/o/	/u/	
	100%	96%	98%	100%	98%	
Semi-vowels	/j/	/v/				
	90%	87%				
Stops	/p/	/b/	/t/	/d/	/k/	/g/
	98%	83%	88%	78%	93%	58%
Nasals	/m/	/n/	/ɲ/			
	97%	97%	51%			
Fricatives	/s/	/ʃ/	/z/	/ʒ/	/f/	/x/
	63%	42%	42%	30%	93%	80%
Affricates	/ts/	/tʃ/	/dʒ/	/dʒ/		
	50%	38%	52%	38%	55%	
Laterals	/l/	/ʎ/				
	62%	15%				
Trills	/r/	/r̄/				
	30%	12%				

Similar was reported for Serbian [14] with 84.8% of developed renditions among assessed stops. The developmental renditions of the final /g/ were either omissions or velar fronting (substitutions with /d/). Vuletić's study [21] reported that all nasals were being developed by the age of three, however, the results in this study show that only 51% of developed renditions for /ɲ/. The lower score resulted from the substitution of /ɲ/ with /n/ in the final position i.e. the word /koɲ/ was pronounced as /kon/ instead of /koɲ/. The results for fricatives are rather heterogeneous and the average group score does not provide proper understanding. The results agree with the existing Croatian norms if the same criteria (70%) is applied, only for /f/ and /x/ which are undoubtedly developed, but the course of development should be further examined with older age groups in the periods of intensive development of fricatives as suggested in [18]. Similar interpretation can be applied to affricates as well, since the articulation of both groups of speech sounds depends on more developed motor control and perceptual information in phonological representation. According to Croatian norms sound /l/ should be developed by the age of four. The results in this study do not agree with the norms, regardless of the applied criteria and are also supported by recent studies [19] reporting similar pattern – /l/ was developed in 54% of 3-year olds while /ʎ/ in 30%

which is slightly higher than in this study. The lowest percentage of developed renditions was found for trills, confirming it is the last sound to develop in Croatian.

Slovenian, Serbian and Bosnian studies are all based on Croatian norms, but recent studies also suggest that the norms should be revisited. Muznik [13] examined speech sound development in Slovenian and reported similar order of SSD, although considerably lower results for late developing fricatives /s, z, ʃ, ʒ/ and for /r/ and a high result for /l/ (92.26%). Regardless of the language differences, the difference in the results may be explained by the study design, since Slovenian study included only 17 participants aged between 3;6 and 4;6 years. Serbian study [14] also reported higher scores i.e. earlier development of speech sound groups, but the sample size was also small (48 children aged 3 to 7), therefore the results can only emphasize the need for a new large-scale normative study in those languages as well.

The results did not reveal any gender differences. Comparison of PCC for boys and girls did not reach statistical significance ($p=0.2$). Majority of studies reports no gender differences (cf. [8] for a review), although they are mentioned in Croatian normative study, but also in the recent Bosnian study [7] which also did not find any gender differences.

4. CONCLUSION

The results show that 3-year olds' speech sound development in Croatian occurs later than reported in the existing norms for /g/, /p/, four fricatives, /s, z, ʃ, ʒ/, affricates, laterals and the Croatian trill which makes total of 12 out of 30 sounds. The normative study neither complies with universals in motor development, it includes outdated visual stimuli and reports gender differences. The current study reports more than 90% of developed renditions for all vowels, semi-vowel /j/, stops /p, k/, nasals /m, n/ and fricative /f/. If 75% of developed renditions is taken as a criterion for speech sound development, Croatian 3-year olds have mastered all the vowels, semi-vowels and stops (except for /d/), nasals (except for /p/ and two fricatives /f/ and /x/. Similar trend, i.e. lower age of acquisition was discussed in the context of other Slavic languages (Slovenian, Serbian and Bosnian) who still use Croatian norms or adaptation of those norms. The task developed for this study follows contemporary criteria for speech sound assessment and is suitable for assessment of the youngest age groups, therefore it can be used as a basis for the development of Croatian speech development test.

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