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## ARTICULATION DISORDERS IN SERBIAN LANGUAGE IN CHILDREN WITH SPEECH PATHOLOGY

*POREMEĆAJI ARTIKULACIJE U SRPSKOM JEZIKU KOD DECE SA PATOLOGIJOM GOVORA*

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### Summary

**Introduction.** Articulation is the result of speech organs and it means clean, clear and distinct pronunciation of voices in words.

**Material and Methods.** A prospective study included 24 children between 5 and 15 years of age, of both sexes. All children were monolingual, Serbian being their native language. The quality of articulation was tested with Triage articulation test.

**Results.** Neither omission nor distortion of plosives was observed in any of them, whereas substitution of plosives occurred in 12% of patients. Omission of affricates was not observed in any of the subjects, but substitution and distortion occurred in 29%, and 76% of subjects, respectively. Omission of fricatives was found in 29% subjects, substitution in 52%, and distortion in 82% of subjects. Omission and distortion of nasals was not recorded in any of the subjects, and substitution occurred in 6% of children. Omission of laterals was observed in 6%, substitution in 46% and distortion in 52% of subjects with articulation disorders. **Discussion and Conclusion.** Articulation disorders were observed not only in children diagnosed with dyslalia but in those with dysphasia and stuttering as well. Children with speech disorders articulate vowels best, then nasals and plosives. Articulation of fricatives and laterals was found to be most severely deviated, including all three disorders, i.e. substitution, omission and distortion. Spasms of speech muscles and vegetative reactions were also observed in this study, but only in children with stuttering.

**Key words:** Speech-Language Pathology; Child, Preschool; Adolescent; Child; Speech Articulation Tests; Speech Disorders; Stuttering; Age Factors; Sex Factors

### Sažetak

**Uvod.** Izgovor glasova je rezultat aktivnosti govornih organa. Artikulacija podrazumeva čist, jasan i razgovetan izgovor svih govornih glasova u rečima. **Materijal i metode.** Rad je retrospektivno-prospektivna studija sprovedena na 24-oro dece uzrasta od pet do petnaest godina, oba pola. Deca su bila monolingvalna, svima je srpski jezik maternji. Kvalitet artikulacije ispitan je Trijažnim artikulacionim testom. **Rezultati.** Omisija i distorzija ploziva nije postojala ni kod jednog do njih, dok se supstitucija ploziva javljala kod 12% ispitanika. Omisija afrikata nije postojala ni kod jednog ispitanika, supstitucija kod 29%, a distorzija kod 76% ispitanika. Omisiju frikativa imalo je 29% ispitanika, kod 52% je postojala supstitucija, a kod 82% postojala je distorzija. Omisija i distorzija nazala nije postojala ni kod jednog ispitanika, a supstitucija se javila kod 6% ispitanika. Omisija laterala je postojala kod 6% ispitanika, supstitucija kod 46%, a 52% ispitanika sa poremećajem artikulacije imalo je distorziju laterala. **Diskusija i zaključak.** U ovom istraživanju poremećaj artikulacije, osim dece sa dijagnozom dislalije imala su i deca sa disfazijom i mucanjem. Deca sa govornim poremećajima najbolje izgovaraju vokale, nazale i plozive. Najteže oštećeni izgovor glasova je u grupi frikativa i laterala gde se javljaju sva tri oblika poremećaja, odnosno supstitucija, omisija i distorzija. Tokom ispitivanja, zapaženi su i spazmi govorne muskulature i vegetativne reakcije samo kod dece sa mucanjem.

**ključne reči:** Patologija govora i jezika; Predškolsko dete; Adolescent; Dete; Artikulacioni testovi; Poremećaji govora; Mucanje; Uzrast; Pol

### Introduction

Speech is a basic skill used almost effortlessly in many daily life activities. Despite this apparent simplicity, speech is made of a complex set of cognitive processes and a wide network of brain structures. Cognitive models of speech production generally include distinct processing levels. These allow use of semantic and linguistic information, as well as pre-motor and motor commands [1]. Speech production is a complex multistage process converting conceptual ideas into acoustic signals that can be under-

stood by others. The stages include conceptualization of the intended message, word retrieval, selection of the appropriate morphological forms, sequencing of speech sounds, syllables, and words, phonetic encoding, initiation, and sequences coordination in the tongue, lips, and laryngeal muscles movements, which lead to vocal tract vibrating, and respiration control for vocal phonation and prosody [2].

Speech is the result of the speech organs activity. Speech organs correlation allows the pronunciation control and regulation. Therefore, speech represents a complete communication circle. Com-

munication circle starts in the brain and uses efferent neural pathways to carry commands to the muscles of executive organs of speech. The senses notice the accomplished command of speech organs and use afferent neural pathways to inform the brain of it.

Articulation means clean, distinct and perspicuous pronunciation of all speech sounds in words. Sound articulation is made of three main factors: 1. the quality of pronounced speech sound; 2. the position occupied by speech organs during certain speech sound pronunciation; 3. the ability to recognize pathological speech sound and its differentiation from other speech sounds [4].

Distinctions in speech sounds articulation can be made by: 1. the place of speech sound articulation (bilabial, labiodental, dental, alveolar, palatal, mediopalatal, and velar), 2. the manner of speech sound articulation (vocals - when airflow passes freely, without obstacles and consonants - when there is an obstacle, an air column narrowing, or redistribution between the nose and mouth cavity), 3. speech sound resonance [5].

Articulation disorders are an irregularity or failure in pronouncing one or more speech sounds. The basic division of articulation disorders includes: absence of individual speech sounds (omission), replacing certain speech sounds with other speech sounds (substitution) and incorrect articulation of certain sounds (distortion). Causes of articulation disorders can be divided into organic and functional [6].

The aim of this study was to determine the status of children with articulation disorders (dyslalia), speech and communication development disorders (dysphasia) and fluency disorders (stuttering). The presence of tics, gestures and vegetative reactions was also included in the observation.

## Material and Methods

This study was a retrospective – prospective study, which was conducted at the Department of

Ear, Nose and Throat, Clinical Center of Vojvodina in Novi Sad in the period from May 1<sup>st</sup>, 2012 to June 1<sup>st</sup>, 2013. The study included 24 children of both sexes from 5 to 15 years of age. The children, whose native language is Serbian, are all monolingual.

A questionnaire was made based on the existing medical records, information given by parents and speech therapist, which provided data on the patients' age, their age when treatment was started, and the type of diagnosed speech disorders. Articulation quality was tested by a "Triage articulation test" [7].

Statistical analysis was performed by the software package Microsoft Excel 2007 and statistical package Statistica 5.5.

## Results

The study sample consisted of 24 children, 7 girls (25%) and 17 boys (75%). The majority of children were 6 years old (17%). The average age was 10.5 years for the boys and 8.66 years for the girls (t-test did not show a statistically significant difference,  $p>0.05$ ). According to the type of speech disorder, the majority of subjects (54%) had dyslalia, 25% had dysphasia, and stuttering was observed in 21%. At the moment when therapy started (that age did not match the age at which testing was done), the majority of children (11) were between 6 and 10 years of age (49%), 10 children were from 2 to 5 years of age (21%), while the lowest number of children (3) were from 11 to 14 years of age (10%). The average age when speech disorders therapy started was 6.41 years.

The results showed that 54% of the examinees had dyslalia, while 70% had disturbed articulation, and only 30% had a preserved and proper articulation. According to these data, it can be concluded that the subjects diagnosed with dysphasia and stuttering also had articulation disorders, which means that all the subjects from the group with dyslalia had disturbed articulation, as well as 7% of children

**Table 1.** Articulation and its characteristics by phoneme group  
*Tabela 1.* Artikulacija i njene karakteristike po grupama fonema

	Omission <i>Omisija</i>	Substitution <i>Supstitucija</i>	Distortion <i>Distorzija</i>
Vowels/ <i>Samoglasnici</i> (a, e, i, o, u)	/	/	/
Plosives/ <i>Plozivi</i> (p, b, t, d, k)	/	12%	/
Affricates/ <i>Afrikati</i> (c, č, ć, dž, đ)	/	29%	76%
Fricatives/ <i>Frikativi</i> (f, v, s, z, š, ž, h, j, r)	29%	52%	82%
Nasals/ <i>Nazali</i>	/	6%	/
Laterals/ <i>Laterali</i>	6%	46%	52%
Articulation/ <i>Artikulacija</i>	Normal/ <i>Normalna</i>		30%
	Distortion/ <i>Distorzija</i>		20%
	Substitution, omission and distortion <i>Supstitucija, omisija i distorzija</i>		16%
	Substitution and distortion/ <i>Supstitucija i distorzija</i>		30%
	Substitution and omission/ <i>Supstitucija i omisija</i>		4%

in the stuttering group and 9% of children in the dysphasia group had articulation disorders.

**Table 1** shows the percentage of subjects with articulation disorders manifested as omission, substitution and distortion divided into phoneme groups (vowels, plosives, affricates, fricatives, nasals and laterals). It also shows the percentage of manifestation of these disorders alone or in combination with other articulation disorders. The table shows that subjects with articulation disorders preserved vowels articulation. None of them had omissions of plosives and distortions, while plosive substitutions occurred in 12% of subjects. None of the subjects had omissions of affricates, substitutions occurred in 29%, and distortions in 76% of the subjects. Omission of fricatives, substitutions and distortion of fricatives were found in 29%, 52% and 82% of subjects, respectively. None of them had omissions of nasals and distortions, and nasal substitutions occurred in 6% of subjects. Omissions of laterals occurred in 6% of subjects, substitutions in 46% of subjects and distortions in 52% of subjects with dyslalia.

The results of nasal resonance examination showed that the majority of subjects (96%) had balanced oral and nasal resonance. An open rhinolalia (*Rhinolalia aperta*) was found in 4% of subjects. One subject diagnosed with dyslalia had disturbed nasal resonance as well.

Speech muscle spasms were reported in 21% of subjects with stuttering diagnosis. They occurred as clonic in 12.5% and as tonic-clonic in 8.5% of subjects who had spasms. This research also monitored other speech phenomena, such as tics, gestures and vegetative reactions. The results showed that tics occurred in 13% of children, of whom 4% were diagnosed with dyslalia, and 9% were diagnosed with stuttering. Vegetative reactions occurred in 4%, only in children diagnosed with stuttering, while 83% of them did not exhibit any of the specified disorders.

## Discussion

Dobrota [8] has stated that speech articulation disorders are the most common speech disorders. According to her research, good articulation was present in only 14% of children 4-5 years old, 24% of children 5-6 years old and 39% of children 6-7 years old. Vuletić [9] found articulation disorders in 30% of her study sample. Januzović-Zunić et al. (quote Dobrota) reported that 29.69% of preschool children had a certain articulation disorder. Veselinović et al. [4] conducted a study in Novi Sad which included 69 children from 6 to 10 years of age and found that 23.19% of them had articulation disorders. According to Kukić's research results on speech disorder frequency [10] in Middle Banat, articulation disorders occur in 41.03% of children from 6 to 7 years of age. Stuttering was reported in 3.7% of subjects. In 1988 the Institute of Experimental Phonetic and Speech Pathology, Belgrade, published the fact that 10% of children had devel-

opmental dysphasia over a period of 10 years, but the latest data from the Institute suggest that this pathology has been increasing [11].

According to Guitar, stuttering occurs in about 5% of children [12]. The results of this study confirmed the findings of other authors. In the structure of children with speech disorders, the majority of children (54%) had an articulation disorder – dyslalia, 24% had dysphasia and 21% had stuttering. This study also showed a significantly higher percentage of articulation disorder frequency, as well as a higher percentage of stuttering and dysphasia compared to the results of the above mentioned authors.

Veselinović et al. [4] reported that articulation disorders were more common in boys (56%) than in girls (44%). Karbasi et al. conducted a study [13] on speech disorder frequency on a sample of 7,881 primary school children in the area of Yazd (Iran), and showed a higher frequency of stuttering in boys (16.7%) than in girls (12.7%). In this study, a higher frequency of examined disorder was also found in male subjects (75%) compared to the female subjects (25%), which was in accordance with the foregoing studies by other authors.

The number of cases diagnosed with stuttering is variable, but stuttering is most common among young children (approximately 5%), from 2 to 4 years of age [14]. In this study, stuttering was observed in children 5-15 years old. The authors of the previously mentioned articles also recorded the age in which speech disorders occurred. However, attention in this study was paid to the age of subjects when they were being tested and most of the children were 6 years old at that time.

Tung et al. [15] performed a study on a sample of 30 children, and reported that the age of their patients at which articulation disorder treatment started was from 3.5 to 6 years, whereas the age when dysarthria therapy started was 4 to 12 years as reported by Murray et al. [16] in their study which also included 30 subjects. Yairi [17] believes that the probability of curing stuttering is substantially reduced after 8 years of age. According to this study, the average age when therapy started was six years.

Golubović and Čolić [18] have found that articulation disorder manifests in 37.2% children 5.5 years old, 25.5% of children 6 years old and 19% of children 7 years old. In addition, all children from the study sample had normal articulation of vowels, plosives, and nasals. Omission was almost absent, substitutions were present, and phoneme distortions were most frequent. Frequently distorted phonemes were /č/, /c/, /š/, /ž/, /dž/, /r/, /đ/, /ć/, /s/, /l/, /lj/ [19].

Qualitative analysis of data obtained in Vuković and Ilić research [20] on articulation disorder developed in younger school age children has shown that disorders occur as distortion, substitution and omission of speech sounds, with distortion being the most common form.

The subjects from this study sample had correct vowel articulation, substitution of plosives and na-

sals, substitution of affricates and distortion, while substitution, omission and distortion occurred in the group of fricatives and laterals. This study also confirmed distortion to be the most common disorder, followed by substitution, and omission of speech sounds. Distortion alone occurred in 20% of patients. As previously said, disordered articulation was found in 70% of this study sample, which means that children diagnosed with dysphasia and stuttering also have incorrect articulation of certain phonemes, with different causes such as impaired attention or reduced phonological awareness. Incorrect speech sound pronunciation can be found in the definition of dysphasia although it is defined as a speech and communication disorder. It can also be seen in stuttering, which is defined as a disorder of speech fluency. As for dyslalia, irregular pronunciation of phonemes is at the level of the orofacial muscles without additional causes.

Aboul-Wafa et al. [21] found that all 36 subjects in their study sample had normal nasal resonance expect for two children aged 3 and 5 years, who had an abnormality of nasal resonance in the form of open rhinolalia. Nasal resonance was normal in 96% of subjects of the study sample. One child, having dyslalia as the leading diagnosis, was found to have a disorder of the nasal resonance in the form of open rhinolalia.

Stuttering is a speech disorder characterized by a disorder of fluency, rhythm and tempo of normal speech [10]. Fritzell [22] states that the main features of stuttering are spasms leading to speech flow interruption. According to Howell's [23] developmental stuttering investigations, involving 76 children aged between 8 and 12 years, clonic spasms

usually occur (54%). In this study, speech muscle spasms occurred in 21% of children who had the diagnosis of stuttering. As for the type of spasm, clonic spasms occurred more often (12.5%) than tonic-clonic spasms (8.5%).

Prasse and Kikano [24] observed blinking, jaw twitching and involuntary head movements in children who stuttered. The same reactions were reported by Ashurst et al. [25]. The results of this study show that of all reactions that occurred in patients, tics occurred in 13% of cases, of which 9% in children diagnosed with stuttering and 4% in children diagnosed with dyslalia. Vegetative reactions occurred in 4% of children, only in those with the stuttering diagnosis. None of the above reactions occurred in children diagnosed with dysphasia (26%). This leads to the conclusion that children with the stuttering diagnosis exhibit different reactions, and that compared to children from the other two groups, these reactions are most commonly manifested in children with stuttering diagnosis.

### Conclusion

In this study, articulation pathology developed in children with dysphasia and stuttering as well as in children diagnosed with dyslalia. Children with speech pathology pronounce vowels, nasals and plosives best. The most severe corrupted articulation is in the group of fricatives and laterals, which show all three forms of the disorder such as substitution, omission and distortion. During examination, spasms of speech muscles and vegetative reactions were observed only in children with stuttering.

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