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Specific Articulation Disorders in Children Native Speakers of Bulgarian – Distribution, Characteristics, Demographic Patterns

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Abstract

The article presents a study of the articulation behaviour in 610 Bulgarian children aged 4 years and 5 months up to 7 years and 6 months. In 503 children (82%), incorrect articulation of consonant sounds from early, middle and late ontogenesis is established. The highest percentage of non-normative production is registered with sounds of early ontogenesis [l] 79% and [r] 43%. The percentage distribution of impaired articulation of ontogenetically middle fricatives is 27% for the group of [ʃ], [ʒ], [tʃ] and 20% for the group of [s], [z], [ts] respectively. Incorrect articulation of the ontogenetically early sounds [k, g] is recorded in 1% of the subjects surveyed for the [k] sound and 4% for the [g] sound. What is observed is the presence of age dynamics of impaired articulation where the number of children without disorders tends to increase with age. Another factor of influence on the distribution of the articulation disorders to be noted is the demographic one, i.e. the place of residence. The results obtained show a significant difference in the number of registered articulation disorders in children living in the capital of Bulgaria (Sofia) and living in other places. The established differences are related to the lack of a comprehensive state policy (health and education) for the organization of prevention, diagnosis and therapy of communicative disorders.

Keywords: speech sound disorders, specific articulation disorders, speech pathology

Introduction

A specific speech articulation disorder is a specific developmental disorder in which the child's use of speech sounds is below the appropriate level for its mental age, but in which there is a normal level of language skills (ICD-10, 2015). Bowen (1998) talks about “functional speech disorder”, which is manifested in the incorrect articulation of one or more than one speech sounds. Articulation disorders are difficulties with the way sounds are formed and strung together, usually characterized by substituting one sound for another, omitting a sound, or distorting a sound (Cuffaro, 2011). Articulation disorders affect a serious percentage of the population of children of preschool and school age. According to DSM-IV (2000) articulation disorders considerably hinder educational and professional achievements as well as social communication.

A fuller outline of the distribution and assessment of childhood articulation disorders is important for parents, specialists and health and education policy. They are related to the optimization of the assessment, interventions and the services offered for these children (P. Enberby, C. Pickstone, 2005). According to McKinnon, McLeod and Reilly (2007), the data in specialized literature on the percentage distribution of speech disorders in different language populations is controversial due to the application of different assessment methods and the different age of the surveyed children. According to Karbasi et al. (2011), what causes additional misunderstandings is the different terminology, definitions and interpretation in the designation of impaired articulation. This makes the comparative analysis of the epidemiological studies in the field extremely difficult. A survey of Keating et al. (2001) based on parent and teacher questionnaires shows that when examining 12,000 Australian children under the age of 14, 1.7% turned out to have speech disorders. According to the same authors, children with speech disorders are more likely to have additional health problems. A study of Zhao et al. (2009) observes a high degree of comorbidity and a number of behavioural problems in children with articulation disorders. The authors studied 112 Chinese children with articulation disorders between the age of 4 and 11. In 61.6%, comorbidity with another disorder was reported, i.e. language disorders, stuttering, tic disorders. At school-age Attention-Deficit Hyperactivity Disorder (ADHD) is with the highest comorbidity (47.5%). Beitchman et al. (1986) report that the prevalence of communicative disorders in Canada at age 5 is 6.4%. Karbasi, Fallah and Golestan (2011) examined 7881 Iranian pre-school children and found that 14% of them had speech disorders (articulation, voice, stuttering). Of the total population of children with disorders (1166 children), the percentage of specific articulation disorders is the highest - 88.6% (1033 children). A general trend in the data from the various studies is the widespread prevalence of speech disorders in childhood, with a tendency to decrease with age. The National Center for Health Statistics (NCHS, as cited in Leske, 1981) reports that the distribution of articulation disorders covers about 1% of the population of all ages. For children aged 6 to 11 the percentage distribution is 8.4% compared to 4.2% among children aged 12 to 17. According to

Shriberg et al. (1994) this is due to the practice-based evidence that impaired articulation could be overcome with age, or "outgrown" over time. Hereby the authors promote the theory of "long-term speech-sound normalization".

There isn't a national epidemiological study of specific articulation disorders for Bulgaria. Terminological diversity, conceptual contradictions and the lack of standardized assessment methods significantly complicate its implementation. These problems hinder the making of important decisions in the planning of policies and practices to address articulation disorders – screening, diagnosis and differential diagnosis, prevention, treatment.

Method

For the purpose of the study an original methodology for the study of articulation in pre-school and primary school age has been developed. The stimuli include linguistic material containing phonemes with high frequency in articulation disorders in children native speakers of Bulgarian. These are sounds of early ontogenesis [k], [g]; sounds of middle ontogenesis [s], [z], [ts], [ʃ], [ʒ], [tʃ] and late ontogenesis sounds [l], [r]. Research samples include stimulus material (109 linguistic items), which explores the articulation of these sounds and is grouped into four categories:

Articulation of isolated phonemes. The stimuli include isolated articulation of the 10 studied speech sounds.

Prompted articulation of words containing the studied speech sounds through visual stimulus in the form of object images. The research samples include 30 graphic images of nouns. The images are taken from *A Picture Test for morphological performance of plural forms of nouns* (E. Todorova, Part II., 2005: 8-67). The stimuli are selected so that each word contains the researched sound and doesn't contain any other sound of the same phonemic class.

Articulation in words with different position of the studied sound - beginning, middle, end. 39 stimuli are included, which examine the degree of influence (presence or absence) of the phoneme position distribution on the type of impaired articulation.

Articulation of words demonstrating combinatory rules of sounds. The stimuli include 30 words in which the studied sounds [are in a syllable, characterized by a consonant cluster of the type - CCV, CCCV, CCVC or demonstrate a consonant cluster at a syllable boundary. The items follow the phonological rules for combining sounds in Bulgarian.

The linguistic items thus constructed allow for an assessment of persistent errors in impaired articulation and allow control of the influence of the formal language structure (influence of the phonological rules).

Participants

In the epidemiological study 610 children aged between 4, 5 to 7, 6 years old took part. Their selection was based on the principle of a controlled sample, where the

cases of established development problems were excluded. This is grounded in the accepted theoretical concept of defining the specific articulation disorders - incorrect production of one or more speech sounds (omissions, substitutions, distortions), which is not due to reduced hearing, mental retardation, linguistic violation, structural damage to the articulation apparatus, neurological disorders or adverse environmental influence.

The respondents are divided into four age groups: from 4, 5 to 5 years old, 20 children, 3.3%; from 5 to 6 years old, 183 children, 30%; from 6 to 7 years old, 246 children, 40.3%; from 7 to 7, 6 years old, 161 children, 26.4%. Of these, 283 are girls (46.39%) and 327 are boys (53.61%). The sample includes 530 children (86.9%) from a large place of residence (city) and 80 children (13.1%) from a small place of residence (village). The surveyed children from the capital are 352 (57.8%), from other places of residence 258 (42.2%).

Results

Percentage distribution

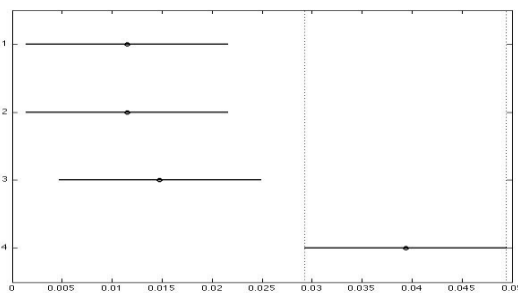
Of the 610 children aged 4, 5 to 7, 6, 503 children (82%) demonstrate some type of articulation disorder. Of these, 303 children (60%) have a monomorphic type of disorder, due to the incorrect articulation of late ontogenesis [l] and [r]. In 200 of the respondents (40%) a polymorphic type of disorder has been identified which affects several phonemic groups, predominantly of middle and late ontogenesis ([s], [z], [ts], [ʃ], [tʃ], [l], [r]) and less frequently of early ontogenesis ([k], [g]). The highest percentage of non-normative production is registered with [l] 79% and [r] 43%. The percentage distribution of impaired articulation of ontogenetically middle fricatives is - 27% for the group of [ʃ], [z], [tʃ] and 20% for the group of [s], [z], [ts]. The results obtained correlate with the sound ontogenesis of the Bulgarian language. Due to the peculiarity of their articulation characteristics, the sounds [ʃ], [z], [tʃ] are defined as sounds with a more complex articulation focus compared to the articulation of the sounds [s], [z], [ts]. Incorrect articulation of the ontogenetically early sounds [k], [g] is registered in only 1% of the tested respondents for the sound [k] and 4% for the sound [g].

The analysis of the percentage distribution of incorrect articulation in the individual subtests shows persistence in the production errors of middle ontogenesis [s], [z], [ts], [ʃ], [z], [tʃ] and late ontogenesis [l], [r]. The articulation of early ontogenesis sounds [k], [g] reveal a difference in the articulation behaviour in the different subtests presented in Table 1.

Table 1.

Phonemas	Subtest 1		Subtest 2		Subtest 3		Subtest 4	
	subject	%	subject	%	subject	%	subject	%
[k]	7	1.1475	7	1.1475	9	1.4754	24	3.9344
[g]	25	4.0984	25	4.0984	24	3.9344	27	4.4262

The results from ANOVA show a significant difference in performance in the different tests regarding the articulation of [k], at a value of $p = 0.00052$, the significance being determined by the results obtained from Subtest 4 presented in Graph 1.



Influence of the age factor

For the verification of the age factor and its influence on the type of articulation behaviour, the respondents are divided into three age groups based on months, respectively - from 53 to 60 months, from 60 to 72 months, from 72 to 84 months. The influence of the age factor in the different age groups is addressed according to three categories: children without disorders; children with a monomorphic type of articulation disorder; children with a polymorphic type of articulation disorder. Using a one-dimensional logistic model, the results categorically distinguish between two types of disorder (monomorphic and polymorphic) according to age at $p = 0.000$ and children with and without age-related disorders at $p = 0.006$. The results obtained define three important trends: (1) with age, the number of children without disorders increases; (2) with age, polymorphic disorders decrease; (3) the number of children with a monomorphic type of disorder remains constant among the studied age population.

Influence of the place of residence factor

What was used for the verification of the sociolinguistic factor - place of residence (according to the size of the place) and its influence on the articulation was ANOVA. The results show a statistically significant difference in the number of registered articulation disorders between large and small places of residence, with a value of $p < 0.1$ for all phonemes examined, except for the [l] sound Table 2.

Table 2.

Articulation disorder (phonemes)	Large place of residence (respondents)	Small place of residence (respondents)	Result (<i>P</i>)
[k]	4	20	0.0757*
[g]	4	23	0.0359*
[s]	27	96	0.0025*
[z]	26	95	0.0018*
[ts]	27	98	0.0016*
[ʃ]	36	126	0.0003*
[ʒ]	36	126	0.0003*
[tʃ]	36	134	0.0000*
[l]	161	325	0.7445
[r]	73	213	0.0000*

* $p \leq 0.1$

The obtained results present a significant difference in the number of registered articulation disorders in children living in the capital of Bulgaria (Sofia) and the ones living in other places of residence. The results obtained with ANOVA show a significant difference at $p \leq 0.1$ for the sounds [k], [g], [l], [r] presented in Table 3.

Table 3.

Articulation disorder (phonemes)	Another place of residence (respondents)	Sofia city (respondents)	Result (<i>P</i>)
[k]	17	7	0.0174*
[g]	18	9	0.0014*
[l]	409	77	0.0000*
[r]	235	51	0.0012*

Regardless of the differences in the number of children with impaired articulation of the sounds [s], [z], [ts], [ʃ], [ʒ], [tʃ] among the surveyed respondents from Sofia and other places of residence, these differences have no significant value.

Discussion

The percentage distribution of articulation disorders demonstrates the influence of two factors, i.e. sound ontogenesis and motoric complexity. The highest percentage of impaired articulation is to be found in late ontogenesis sounds [l], [r]. The lowest rate of distribution is identified in sounds of early ontogenesis [k], [g]. In case of impaired articulation of the early [k] and [g], there is variability in the errors as a result of the phonological context. Therefore, in case of impaired articulation of sounds from early ontogenesis, the manifestation is a symptom of linguistic rather than speech pathology.

The obtained result regarding the age dynamics of impaired articulation is expected and shows the reliability of both the data obtained and the evaluation methodology used. The population sample reflects stages in the development of the motor skills for articulation and their respective ontogenetic sequence, both in norm and in pathology (in the case of a disorder). With age, children with disorders improve their speaking skills and, subsequently, non-normative articulation decreases.

The decrease in number of children with disorders corresponds to the decrease in number of children with polymorphic articular dysfunction. The polymorphic type of disorder is characterized by incorrect sound production from two or more phonemic groups. In the population sample, these are children with predominantly wrong articulation of the group including the sounds [s], [z], [ts], [ʃ], [ʒ], [tʃ] as well as [l], [r]. Significantly less often this type of disorder is also demonstrated with an incorrect sound production of the sounds [k, g]. The decrease in number of children with a polymorphic disorder in the sample is at the expense of the acquisition of normative articulation of early and medium ontogenesis sounds. The number of children with a monomorphic type of disorder remains constant. The monomorphic type of disorder is characterized by incorrect articulation of sounds from the same phonemic class. In the sample, these are children with incorrect articulation of the sounds [l] and [r]. In other words, children with a monomorphic disorder demonstrate incorrect articulation of ontogenetically late sounds.

The results obtained for the age dynamics of articulation behaviour in pre-school age also have a significant diagnostic aspect. Knowing the child's age: from 53 to 60 months / from 60 to 72 months / from 72 to 84 months, we can predict the exact probability in which group he/she would fall: (1) children without disorders; (2) children with a monomorphic type of disorder; (3) children with a polymorphic type of disorder. This would ease the diagnostic procedures applied. At the age between 4, 6 to 6, the probability of impaired articulation being of a polymorphic nature is significantly greater than after 6 years of age. In children aged 6 years and over, it is more likely to expect a monomorphic type of dysfunction, mainly with sounds of late ontogenesis [l] and [r]. The probability of children aged between 6 and 7 demonstrating an articulation disorder is significantly lower than the probability of predicting articulation dysfunction in the remaining age categories.

The significant differences in the articulation behaviour of children based on the place of residence factor raise a number of alarming questions about the influence of various factors on the mechanisms of prevention, diagnosis and therapy of communicative disorders. The offered specialized services for these children are concentrated in the capital, while in the other places of residence they are insufficient or completely absent. At present, providers of childcare services for children with articulation disorders in Bulgaria are limited to the existence of: State Speech Therapy Centres - two for the whole country (Sofia, Varna); NGOs; private specialists; academic groups in universities. Practically, the only support in kindergartens and schools is limited to the appointment of a speech therapist from a state speech therapy centre who is usually responsible for several institutions. Private centres and offices have been opened in the cities of Sofia, Plovdiv, Varna and Burgas. In the remaining places of residence there are no specialists or organized speech therapy services.

Conclusion

The presented study was focused on speech behaviour in pre-school and primary school age and in particular on the distribution of articulation disorders. The results obtained show a widespread distribution of specific articulation disorders in children native speakers of Bulgarian, where the registered data show a prevalence of 82% in the studied population. The established high rate of impaired articulation is due to the use of a method of assessment carried out by experts on the basis of a face-to-face interaction with the surveyed subjects rather than through collecting data from parental and / or teacher questionnaires. The obtained results are relevant to the sound ontogenesis within a statistical norm. The sounds of early ontogenesis [k, g] are with the lowest rate of distribution followed by the sounds of middle ontogenesis, where a higher rate of distribution is observed of [j], [z], [tʃ] compared to the results of [s], [z], [ts]. The highest percentage of distribution is among the ontogenetically late [r] and [l]. With age, the number of children without disorders increases, so the number of articulation disorders also decreases. Children with disorders improve their speaking skills during the process of growing up. The articulation behaviour is influenced by sociolinguistic factors such as the place of residence, where the size and type of the place is important. The established differences are related to the lack of a comprehensive state policy (health and education) for organizing the prevention, diagnosis and therapy of communicative disorders.

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