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Authors Jadranka Otašević*, Zorica Vukašinović Radojičić†, Božidar Otašević†, Vojnosanitetski pregled (2021); Online First March, 2021.

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Jadranka Otašević*, Zorica Vukašinović Radojičić†, Božidar Otašević†

*Fakultet za specijalnu edukaciju i rehabilitaciju, Univerzitet u Beogradu, Beograd, Srbija
† Kriminalističko-polički Univerzitet, Beograd, Srbija

Correspondence to: Jadranka Otašević, Faculty of Special Education and Rehabilitation, University of Belgrade, Belgrade, Serbia, Dobrinovićeva 07, Phone: 011-423-6428; +38169-3550-337, e-mail: jadrankaotasevic@gmail.com
Apstrakt

Uvod/Cilj. Psihofiziološki poremećaji i patologija govora su jedan od prioritetnih problema javnog zdravlja u Republici Srbiji. Rast i razvoj deteta teče određenim redosledom i tokom, zavisno od individualnih fizioloških kapaciteta, kvaliteta nervno-mišićnih struktura i podsticaja, na koje sredina može značajno da utiče. Razvoj govora od rođenja do odraslog doba je rezultat interakcije neurokognitivnih faktora pomoću kojih se postepeno stiču sposobnosti fonološke prezentacije i motorne kontrole. Cilj istraživanja je bio ispitati povezanost manipulativne spretnosti ruku, oralne praksi i lateralizovanosti sa razvojem i govorom kod dece i njihov potencijal za izradu preventivnih programa. Metode. Uzorkom je obuhvaćeno 60 dece iz Beograda, oba pola, uzrasta od 5,5 do 7 godina. Njih 30 je činilo eksperimentalnu grupu- dece sa odstupanjima u razvoju govora (artikulacioni poremećaji) i 30 kontrolnu grupu - dece urednog razvoja iz opšte populacije. Od instrumenata smo koristili: Test manipulativne spretnosti ruku (Lafayette), Test oralne praksi i deo Testa za procenu lateralizovanosti (auditivna, vizuelna i upotrebna). Rezultati. Nivo razvijenosti hvata je statistički značajno različit kod eksperimentalne i kontrolne grupe (χ²=21,40, df=3, p<0,01). Prisustvo nuskretnji je statistički je značajno različita kod ispitanika eksperimentalne i kontrolne grupe (χ²=10,58, df=1, p<0,01). Oralna praksi je statistički značajno različita kod eksperimentalne i kontrolne grupe (t=2,01, p<0,05). Vizuelna lateralizovanost je statistički značajno različita (χ²=7,56, p<0,05) među posmatranim grupama. Kada se uzmu svi prediktori u obzir, u višestrukom regresionom modelu statistički značajan doprinos u objašnjenju postojanja govorne patologije (articulation disorders) daje: Vizuelna lateralizovanost (OR = 0,38; 95% CI = 0,179-0,832; p=0,015) i Nivo razvijenosti hvata (OR = 0,23; 95% CI = 0,082-0,699; p=0,009). Zaključak. Nivo razvijenosti hvata i vizuelna lateralozovanost je lošija kod dece sa oštećenjem govora (artikulacije) i odstupanjima u razvoju. Upravo ove indikatore razvoja deteta bi trebalo iskoristiti u kreiranju Nacionalnih programa procene i prevencije razvoja u sistem zdravstvene zaštite dece.

Ključne reči:
psihofiziološki razvoj, dece, govor, Nacionalni preventivni programi, javni interes.
Abstract

Introduction/Aim Psychophysiological disorders and speech pathology is one of the priority public health problems in the Republic of Serbia. Child’s growth and development proceed in a particular sequence and course, depending on individual physiological capacities, quality of neuromuscular structures and stimuli, which can be significantly affected by the environment. The development of speech from birth to the adult age is a result of the interaction of neurocognitive factors that contribute to a gradual attainment of phonological presentation and motor control abilities. The aim of the study was to examine the connection between manipulative manual dexterity, oral practice and lateralization with the development and speech in children and their potential for the development of prevention programs. Methods: The sample included 60 children from Belgrade of both sexes, aged between 5.5 and 7 years. Of these, 30 made up the experimental group – children with deviations in speech development (articulation disorders), and 30 the control group – typically developing children from the general population. The instruments used were the Manipulative Manual Dexterity Test (Lafayette), Oral Praxis Test, and part of the Test for assessing lateralisation (auditory, visual, and functional). Results The hand grip development level is statistically significantly different between the experimental and the control group ($\chi^2=21.40$, df=3, $p<0.01$). The presence of associated involuntary movements statistically significantly differs between the experimental and the control group examinees ($\chi^2=10.58$, df=1, $p<0.01$). Oral praxis statistically significantly differs between the experimental and the control group ($t=2.01$, $p<0.05$). Visual laterality statistically significantly differs ($\chi^2=7.56$, $p<0.05$) between the observed groups. When all predictors are taken into account, significant contribution to the explanation of the existence of speech pathology (articulation disorders) is given by the variables: Visual lateralization (OR = 0.38; 95% CI = 0.179-0.832; $p = 0.015$) and the level of hand grip development (OR = 0.23; 95% CI = 0.082-0.699; $p = 0.009$). Conclusion: The hand grip development level and visual laterality are worse in children with speech (articulation) impairment and developmental deviations. It is these indicators of child development that should be used as a guide in designing the National programmes for developmental assessment and prevention in the child healthcare system.

Keywords: psychophysiological development, children, speech, National preventive programmes, public interest.
Introduction

Most activities in the first seven years of life are part of one process of organising nerve impulses in the nervous system. Nerve impulses arise as a result of the direct influence of stimuli. As the child experiences stimuli during its life, learning how to organise them in the brain and discovering what each of them means, it learns how to focus its attention on a particular one, disregarding all the others. Additionally, by organising the stimuli, the child gains control over its perceptual experiences. Nerve impulses must pass through two or more neurons to shape a sensory experience, a motor response, or an opinion. The more complex the functioning, the more neurons become involved in the message transmission. The nervous system of each human being operates in a particular, distinct manner (1).

The function of neurons is determined by the localisation and a series of other circumstances throughout development. What is one of the basic postulates of development is that functionally higher parts develop under the influence of lower parts (e.g., development of the thalamus induces further development of the cerebral hemispheres) (2). Neurons, by way of their intercellular connections, are organised into dynamic functional systems. During development, there occur morphological changes that form the basis of cognitive functions and various skills gained during the individual maturation.

The root causes of behavioural variability and flexibility are morphological and structural changes in neurons, as well as a multitude of established synaptic connections. For neurons to develop interconnections, they must be stimulated. The development of new connections generates new possibilities for neural communication. Each new connection adds another element to the sensory perception and motor ability of a child. The more neural connections, the more capable the child is of learning (1). Psychomotor activities with exposure to various stimuli (that stir different senses eliciting thus psychomotor response) are the stimulating factors that promote maturation of the nervous system.

Growth and development are interrelated but not necessarily interdependent. Growth can be defined as a combination of increases in both number and size of cells. Development is the increase in the complexity of an organism due to nervous system maturation. A child can develop normally but have a delay in growth and vice versa. Growth can be measured precisely but presenting the measurement of development in
numbers is much more difficult and almost impossible (3). Development means synchronised motor, intellectual, and emotional maturation. When we assess development, we can reduce this assessment to four major areas: gross motor skills (basic motor movements), fine motor skills (differentiated motor movements), speech and language, and social development.

Speech development cannot be observed solely through biological development as is, for example, the case with walking, because, once neurological basis becomes mature, a child gradually, by itself, starts walking, which is genetically programmed, while it will never occur with speech however predisposed the child is to that function. The reason is that speech originates exclusively from the biolinguistic conjunction, that is, one of neurobiological potential and verbal social environment. Development of speech from birth to the adult age is the result of the interaction of neurocognitive factors that lead to a gradual acquisition of the abilities of phonological presentation and motor control in the presence of a range of physical and physiological changes in the morphology of the articulation system (4). Given the dynamics of growth and development, as well as the plasticity of the nervous system, a preschool-age child is particularly susceptible to the overall influences that are, in that period, the most enduring and efficient.

It stands as an obligation of every severe society to ensure in the best possible way the timely assessment of the psychophysiological development of every child, from its birth. Early detection of any, even the minimal, developmental disability should be a signal for a thorough monitoring and timely undertaking of the preventive and therapeutic stimulation of development.

Psychophysiological disorders and speech pathology pose a global problem, particularly in the transition countries. Every year records a significant rise in the number of children with developmental disabilities. It is estimated that, worldwide, there are about 11% of children with psychophysiological disorders of varying types, including speech pathology (5). Speech disorders occur both in children with developmental disabilities and in the general population (6). Although no accurate epidemiological studies exist, it is estimated that about 20-30% of the children’s population in our environment suffers from some form of psychophysiological and speech disorder. If we add to this figure data on the acquired disorders that can evolve in children after the period of speech acquisition, then the proportion of the population with psychophysiological and speech disorders is considerably higher (7).
The development/review of the National Programme for the prevention and treatment of psychophysiological disorders is in line with recommendations of the World Health Organisation. For this exact reason, the Republic of Serbia has been advocated for decades, developing a detailed and precise a National Prevention Programme is to decrease the number of children with psychophysiological and speech disorders. One of the preventive measures is early detection, timely diagnosis, and treatment of children with developmental disabilities. Institutional capacities in the field of public health protection need to be strengthening in order to effectively implement public policies.

Governments should have a role of maintaining and improving capacities for the benefit of populations. In health, this means being ultimately responsible for the careful management of their citizens’ wellbeing. The health of the people must always be a national priority: government responsibility for it is continuous and permanent. The tasks and vision of each public policy need to defined, in accordance with public interest and priorities. Consequently, exceptional knowledge and skills - competences have been required (8). Representatives of public institutions have a key role in both formulating and implementing government policies. In addition to this, they have an obligation to devote their entire capacities for the purpose of achieving public interest (9).

The aim of the study was to examine the connection between manipulative manual dexterity, oral practice and lateralization with the development and speech (articulation) in children and their potential for the development of prevention programs.

Methods

The research is organised as a quasi-experiment with two observed groups. It was conducted in Belgrade, in the Institute for Psychophysiological Disorders and Speech Pathology “Cvetko Brajovic”, and in part in the Children’s University Clinic, as well as in the development counselling service of the Medical Centre Voždovac, in 2016. The study has followed the tenets of the Declaration of Helsinki, and was approved by the Ethics Committee of the Medical Centre Voždovac. Taking into account that the research participants were children, the informed consent was obtained from the parents/guardians.

The sample included 60 children of both sexes, aged between 5.5 and 7 years. The experimental group (E) consisted of 30 children with diagnosed speech (articulation) and development disorders, which were on a continuous treatment. The
control group (C) of 30 children comprised typically developing children. We used the technique of individual testing for both E and C group.

The instruments used in the research were the Manipulative Manual Dexterity Test (Lafayette), Oral Praxis Test, and part of the Test for assessing lateralisation (auditory, visual, and functional). Manipulative Manual Dexterity (Lafayette) is examined using two tests. The aspects monitored during the tests are hand dominance, manner of selecting materials, presence of involuntary movements of extremities and facial musculature. In the first test, examinees are given a box containing balls of four different colours and a wire on which they need to slide coloured balls in a specific order. On the agreed command, the examinee starts sliding the balls and stops doing so after 2 minutes, on the examiner’s signal. The balls slid down the wire are then counted. In the second test, examinees are given a long bolt with corresponding nuts. They are required to place as many nuts as possible on the bolt within 4 minutes. Both tests monitor which hand is used to pick up the ball/nut and whether the same hand is used all along, then what type of hand grip is used (the pincer, the tripod, or the palmar-for fingers hand grip or whole hand grip) and the presence of involuntary movements. The test for examining oral praxis is conducted by way of acting in imitation of the examiner, who asks the child to repeat the same model. The test contains 22 items (motor patterns for the orofacial region). The maximum number of points is 22 (22 actions are being investigated), and the minimum is 0 (which would mean that the respondent cannot report any movement). The examination begins with the simplest motor patterns and, if the examinee successfully repeats a given model, proceeds toward the next – more difficult ones. By using this test, we accurately identify the condition of the orofacial region and, based on the established condition, also the cause of occurrence of articulation - speech disorder. The assessment of lateralisation was conducted in respect of eyes, ears, and hand use. The examinees were asked to perform certain actions as instructed using the specific objects. The examiner records the responses by monitoring the assessed lateralisation of a sense or a hand.

Results obtained from the research were statistically processed by the appropriate selection of statistical methods. Statistical data processing was performed using the software SPSS ver. 20 (Statistical Package for the Social Sciences). Of the descriptive statistics measures, we used arithmetic mean with the associated standard deviation, as well as the minimum and the maximum. We also used frequency and percent. The Chi-square test was used to examine the relationship between two
categorical variables, then t-test for large independent samples, as well as univariate logistic regression and multivariate regression analysis.

**Results**

This research involved children of ages from 5.5 to 7 years. There were 60 participants, 36 of which were male and 24 female, divided into two groups. As this is a prospective cross-sectional study, the structure of the sample by gender reflects the numerical representation of the groups in the population as well. In this way a larger number of participants within the experimental group are boys (76.7%), while a larger number of girls are within the control group (56.7%) (Figure 1.) The result shows that articulation speech disorders are more common in boys than in girls, as shown by other studies (10,11,12). The average age of sample participants in the E group was M=6.07±0.5 years, and in the C group M=6.34±0.46.

The Manipulative Manual Dexterity Test showed that the hand dominance, the hand grip evolution level and the presence of involuntary movements were statistically significant different between the examinees of the E and C groups on both trials. In the hand dominance subtest in both trials, right-handers were dominant in both groups with 60% frequency. However, there were more left-handers (40%) in the C group than in the E group (23.3%).

The hand grip evolution level showed a statistically significant difference between the E and C groups ($\chi^2 = 21.40$, df = 3, p <0.01). In the C group, most are those with a group - grip with three fingers (50%) and those with a pincher grip (46.7%), while in the E group, those examinees whose hand grip is with four fingers (36.7%) and three fingers (40%) are dominant. The presence of involuntary movements are significantly different in the subjects of the E and C groups ($\chi^2 = 10.58$, df = 1, p <0.01). In the second trial, there was a statistically significant difference in the hand grip development level ($\chi^2 = 21.40$, df = 3, p <0.01). Also, on the presence of involuntary movements subtest, the inverse results were identical to the first trial ($\chi^2 = 10.58$, df = 1, p <0.01). The results obtained from the tests were summarised and the analysis conducted of the differences between the E and the C group on three items. Statistically significant differences were found on all three items: hand dominance ($\chi^2=6.31$, df=2, p<0.05), hand grip development level ($\chi^2=20.25$, df=3, p<0.01) and presence of involuntary movements ($\chi^2=12.00$, df=1, p<0.01) (Figure 2).

The score on the Oral Praxis Test was obtained by adding the movements that are possible, ie. where they exist. The results of the Oral Praxis Test show a statistically significant difference between the E and the C group regarding the overall test score
(t=2.01, p<0.05). The average number of proper movements of the oral region in the C group (M=19.6±2.20) is higher than in the E group (M=18.1±3.64).

With the lateralization assessment, we examined: Hands use lateralization, Visual lateralization and Auditory lateralization. A statistically significant difference between the E and C groups exists on the subtest Visual lateralization (χ² = 9.32, p <0.01). The largest number of subjects in the C group belonged to the group with right lateralization (83.3%), while in the E group (36.7%) subjects belong to the group with left lateralization and 13.3% of them to the group ambidextrous. The Figure 3. shows that both groups are predominantly right lateralised regarding Hand use lateralisation. By careful analysis, we can observe that the C group has more functionally left-handed (6.7%) compared to the E group (3.3%), with the number of the ambidextrous also being higher in the E group (13.3%) than in the C group (3.3%). On the subtest Auditory lateralization both groups are predominantly right lateralised, but the number of the ambidextrous subjects is higher in E group (16.7%) than in the C group. After obtaining the results of the E and C groups on each subtest, we presented the results of both groups on all three subtests of lateralization (Figure 3.).

Univariate logistic regression was performed to determine the individual influence of indicators-predictors on the existence / non-existence of development and speech pathology. The predictive value of the following variables was examined: Hand-use lateralization, Visual lateralization, Auditory lateralization, Assessment of oral practice, Dominance of the hand, the hand grip development level, Presence of involuntary movements Cox & Snell R Square were used as a substitute for the coefficient of determination showing the percentage of explained variance. Univariate logistic regression revealed that the predictors of speech pathology (articulation disorders) were: Visual lateralization (OR = 0.43; 95% CI = 0.225-0.951; p = 0.015), Oral practice (OR = 0.82; 95% CI = 0.674- 1.00; p = 0.050), Hand dominance (OR = 2.82; 95% CI = 1.08-7.36; p = 0.034), The hand grip development level (OR = 0.19; 95% CI = 0.079) -0.495; p = 0.001) (Table 2). When all predictors are taken into account, in the multiple regression model a statistically significant contribution to the explanation of the existence of speech (articulation) pathology is given by the variables: Visual lateralization (OR = 0.38; 95% CI = 0.179-0.832; p = 0.015) and The hand grip development level (OR = 0.23; 95% CI = 0.082-0.699; p = 0.009). These two variables together explain as much as 48% of the variance of the dependent variable (Table 3).
Discussion

The age of examinees for purposes of this research is selected according to the opinion that in that age children reach a certain degree of maturity of motor, speech, and social abilities. Timely and appropriate assessment of these abilities can point to potential deviations and deficits in the child’s development. In order for a child to become fully developed, it must reach a certain degree of maturity of the nervous system, which allows it to connect with the external world (10). Each stage of child development is characterised by certain abilities that constitute the preparatory ‘elements’ and a base for a more complex and mature development. Psychomotor ability of hands is essential to organising ways to exist in the social field. Its organisation indicates the development degree of speech, intelligence, opinion, and feelings. The results of the Manipulative Manual Dexterity Test (Lafayette) show that the first test records a statistically significant difference on the item “hand dominance”, the right-handers being dominant in both groups with 60% prevalence in each. However, the C group records more left-handers (40%) than the E group (23.3%). The E group records 16.7% ambidextrous children, showing that this group has considerably more children without differentiated lateralisation, which indicates slow maturation of the structures and functions that determine movement lateralisation. While around 40% of children aged between 4 and 5 are weakly lateralised, this percentage drops to about 30% among those aged between 5 and 7 (11). The hand grip development level is another item recording a statistically significant difference between the E and the C group. More dominant in the E group are those with four-finger and three-finger grip, while in the C group, those with three-finger (tripod) grip and pincer grip prevail. The presence of involuntary movements statistically significantly differs between the E and the C group examinees. These movements are not recorded in the C group; however, they are found in 33.3% of examinees of the E group. In the second test, there is a statistically significant difference in the hand grip development level. The results show us that hand grip is better developed among the C group examinees compared to the E group examinees. In a hierarchical development, a child first acquires simpler manipulative hand movements, such as palmar grip, that eventually evolve into the pincer grip. In the C group, we had considerably more of those using the pincer grip, which involves the ability of proper grip (appropriate to the examined age group), characterised by thumb opposition and meaningful coordination of movements of hand segments in performing manipulative activities (12, 13). Statistical difference was also found on the item “presence of involuntary movements”. The lower prevalence of
involuntary movements among the examinees of the C group relative to the E group indicates better neuromaturation of CNS within the C group. The obtained results show that differentiated hand motor patterns are better developed in typically developing children, that is, ones in the C group. Given that differentiated hand motor patterns hierarchically develop before oral motor patterns (responsible for oral praxis), some deficits in speech development can be expected and predicted in children without differentiated hand motor movements at certain age (14). The results of the Oral Praxis Test show a statistically significant difference between the E and the C group, which shows us that children with some developmental speech (articulation) deviations have a less developed oral praxis relative to typically developing children (15). In the development and maturation of orofacial musculature, the first acts to evolve are swallowing, sucking, and chewing. Deficits in these functions at certain stages of development are the first indication of poor oral praxis (16, 17).

Laterisation assessment has revealed a statistically significant difference between the E and the C group concerning visual laterality. Figure 3. shows a higher number of examinees with non-differentiated laterality in the E group and indicate the existence of disharmonic laterality, concurrently indicating the slow maturation of certain functions among these examinees (18). From further processing of research results we found the following as the predictors of the existence of speech pathology (articulation disorders): hand dominance, hand grip development level, oral praxis and visual laterality. After conducting a univariate regression analysis, the variables that proved to be statistically significant predictors in the explanation of the speech (articulation) disorders entered the multivariate regression analysis. The results showed that poorer visual lateralization increased the chance that the subject would have speech pathology by 62%, and that gripping with the whole hand and with four fingers increased the chance of developing speech (articulation) pathology by 77%. These two variables accurately classify 80% of participants.

These findings show that it is the inability to learn or immaturity of any of these functions that can provide a timely indication of the delays in child development and predict future deficits in the development of speech as a more complex function. It is crucial to timely recognise disharmony and to include the child in stimulating treatments to prevent potential disorders to any extent. All obtained results point to the necessity of preventive action, which should be conducted at the level of primary health care with a view to timely preventing the occurrence of developmental disabilities. The psychophysiological growth and development of a child must be appropriate to its age;
if not synchronised, whether from objective or subjective reasons, it creates disharmony in the child’s development, which can particularly be observed in speech development. With a view to developing the health care system in the Republic of Serbia, special consideration is given to the protection, improvement, and promotion of health of the youngest generation. Determination of causes of disorders as well as early detection and prevention are the main aim of all health systems, including both that of our country and those of Europe and the rest of the world. For this exact reason it is necessary to develop a detailed and precise Programme for preventive child protection at the national level, which would be implemented through the level of primary health care, by monitoring the child from the birth. The main goals of the Programme would be the promotion of and support for the health and healthy development of all children in the first years of life, and particularly those with present developmental risks and disabilities. The Programmes would be aimed at primary prevention of developmental disorders, though reducing and preventing the influence of risk factors, and would assume the engagement of the health system and intersectoral cooperation. Another major precondition for the successful implementation of the Programme is a developing partnership with families using the family orientation approach in work.

The aim of developing a National Prevention Programme is to decrease the number of children with psychophysiological and speech disorders. One of the preventive measures is early detection, timely diagnosis, and treatment of children with developmental disabilities (Government of the Republic of Serbia, 2004). This national programme is one of the priority programmes of the Ministry of Health, the implementation of which requires the involvement of all the defined tiers of health care delivery. The development/review of the National Programme for the prevention and treatment of psychophysiological disorders is in line with recommendations of the World Health Organisation, the aim of which is early detection of psychophysiological disorders and speech pathology, appropriate diagnostics, and therapy aimed at decreasing the frequency of psychophysiological and speech disorders and improving the quality of life of persons with developmental disabilities and their families. The government mission is to ensure coherence and consistency across departments and sectors, by an overall reform of public administration (19).

Health care system and the organisation of health service are regulated by the Health Care Act (20). Decree on the National Program of Preventive Health Care of Children with Psychophysiological Disorders and Speech Pathology establishes the National programme for preventive health care of children with psychophysiological
disorders and speech pathology and regulates the activities on early detection of children with psychophysiological and speech disorders, at all tiers of health care delivery. In accordance with the objectives of the proposed National Programme, the strategy has been defined for information, education, communication, and social mobilisation, along with the action plan for its implementation, time frames, and entities responsible for the implementation of the set activities in primary health care.

The key limitation of this study is small sample size. These data can be the basis for future research in order to develop preventive and therapeutic programs.

Conclusion

The research results show that visual lateralization and the level of hand grip are worse in children with impaired speech (articulation) compared to typically developing children. The poorer visual lateralization increased the chance that the subject would have speech pathology by 62%, and that griping with the whole hand and with four fingers increased the chance of developing speech-articulation pathology by 77%. The ability of fine motor coordination, visuomotor control, and differentiated lateralisation are all associated with the development of speech and higher nervous activities, which means that they can be helpful in assessing the child’s developmental level and maturity. It is this fact that should be considered in creating the assessment and prevention programmes in the health care system.

Figure 1. Sample structure according to gender of the participants

Figure 2. The Manipulative Manual Dexterity Test – difference between the E and C group
Figure 3. The assessment of lateralisation - difference between the E and C group
### Table 2. Predictive properties of measured parameters on the existence of pathology in development and speech (articulation) - univariate logistic regression

| Parameter                        | P     | Exp(B) | 95% C.I.for EXP(B) | Cox & Snell R Square | Percentage of well-classified |
|----------------------------------|-------|--------|---------------------|----------------------|-----------------------------|
| Hands use laterization           | 0.583 | 1.373  | 0.443 - 4.249       | 0.005                | 51.7                        |
| **Visual lateralization**        | *0.015* | 0.438  | 0.225 - 0.851       | 0.106                | 66.7                        |
| Auditory lateralization          | 0.861 | 0.940  | 0.473 - 1.870       | 0.001                | 53.3                        |
| Oral Praxis Test                 | *0.050* | 0.824  | 0.674 - 1.008       | 0.067                | 60.0                        |
| Hand dominance                   | *0.034* | 2.822  | 1.081 - 7.368       | 0.080                | 58.3                        |
| Hand grip development level      | *0.001* | 0.198  | 0.079 - 0.495       | 0.272                | 73.3                        |
| Presence of involuntary movements| 0.999 | 0.000  | 0.000 - 0.032       | 0.032                | 66.7                        |

### Table 3. Predictive properties of measured parameters on the existence of pathology in development and speech (articulation) – multivariate regression analysis

| Parameter                        | P     | Exp(B) | 95% C.I.for EXP(B) | Cox & Snell R Square | Percentage of well-classified |
|----------------------------------|-------|--------|---------------------|----------------------|-----------------------------|
| **Visual lateralization**        | *0.015* | 0.386  | 0.179 - 0.832       | 0.480                | 80.0                        |
| Oral Praxis Test                 | 0.578 | 0.906  | 0.641 - 1.282       | 0.480                | 80.0                        |
| Hand dominance                   | 0.214 | 2.586  | 0.577 - 11.584      | 0.480                | 80.0                        |
Hand grip development level

| Level  | Value  |
|--------|--------|
| 0.009  | 0.239  |
| 0.082  | 0.699  |

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