

KINESIOLOGY EXERCISES AND GAMES AS A MEANS OF DEVELOPING COORDINATION AND SPEECH ABILITIES OF PRESCHOOL CHILDREN

Aleksandra Siedlaszek-Szwed

<https://orcid.org/0000-0002-1934-3535>

Jan Dlugosz University in Czestochowa, Poland

corresponding author: A. Siedlaszek-Szwed – a.siedlaszek-szwed@ujd.edu.pl

DOI: [https://doi.org/10.32626/2309-8082.2026-31\(1\).5-11](https://doi.org/10.32626/2309-8082.2026-31(1).5-11)

Contemporary European approaches to early childhood education emphasize the necessity of holistic child development, which involves the integration of motor, cognitive, and speech domains. In this context, the use of kinesiology exercises becomes particularly significant as a means of activating sensorimotor integration and interhemispheric interaction, which are considered key mechanisms in the development of speech and cognitive functions. *The purpose of the article* is to provide a theoretical substantiation and experimental verification of the effectiveness of kinesiology exercises and games in the development of coordination and speech abilities of senior preschool children, based on contemporary international scientific approaches. *Methods and organization of the study.* The study involved 32 children aged 5–6 years, who were divided into experimental and control groups. Assessment was carried out according to coordination, speech, and cognitive-processual criteria using pedagogical observation, diagnostic tasks, and analysis of speech activity. The formative experiment lasted 12 weeks and involved the systematic implementation of a set of kinesiology exercises. Statistical analysis of the results was performed using t-test ($p < 0.05$). *Results.* The proposed methodology was based on the integration of cross-body movements, dynamic and reciprocal coordination exercises, fine motor development, rhythm-and-speech activities, as well as breathing and balance exercises combined with verbal support. A statistically significant positive dynamic was identified in the development of coordination and speech abilities in children of the experimental group. This was reflected in improved movement accuracy and coordination, enhanced ability to program and switch motor actions, enrichment of vocabulary, and increased speech coherence. The obtained results are consistent with contemporary international studies confirming the interdependence of motor and speech development in children. *Conclusion.* The implementation of kinesiology exercises and games in the educational process of preschool institutions ensures the integrated development of motor and speech domains, enhances the level of psychomotor development of children, and increases the effectiveness of pedagogical influence. The findings confirm the feasibility of applying the kinesiology approach as an innovative direction for modernizing the content of preschool education in accordance with current European educational trends.

Keywords: kinesiology exercises, preschool age, coordination abilities, speech development, psychomotor development, interhemispheric interaction, motor activity, logorhythmic.

Introduction

Current trends in the development of preschool education indicate the necessity of an integrated approach to child development, which involves the coordinated formation of speech and psychomotor domains. An analysis of preschool education practice reveals a contradiction between the need for comprehensive development of speech and motor skills and the limited use of kinesiology-

Siedlaszek-Szwed, Aleksandra. Кінезіологічні вправи та ігри як засіб розвитку координаційних і мовленнєвих здібностей дітей дошкільного віку

Анотація. Сучасні європейські підходи до дошкільної освіти акцентують на необхідності цілісного розвитку дитини, що передбачає інтеграцію моторної, когнітивної та мовленнєвої сфер. У цьому контексті особливої значущості набуває використання кінезіологічних вправ як засобу активізації сенсомоторної інтеграції та міжпівкульної взаємодії, що розглядаються як важливі механізми формування мовлення та когнітивних функцій. *Мета дослідження* – теоретично обґрунтувати та експериментально перевірити ефективність використання кінезіологічних вправ і ігор у розвитку координаційних і мовленнєвих здібностей дітей старшого дошкільного віку на основі сучасних міжнародних наукових підходів. *Методи та організація дослідження.* У дослідженні взяли участь 32 дитини 5–6 років, які були розподілені методом випадкової вибірки на експериментальну та контрольну групи. Оцінювання здійснювалося за координаційними, мовленнєвими та когнітивно-процесуальними показниками з використанням педагогічних тестування і спостереження, а також методу психологічного аналізу мовленнєвої діяльності. Формувальний експеримент тривав 12 тижнів і передбачав використання експериментального чинника, – змісту рухової активності, методика організації і реалізації якого базувався на інтеграції перехресних рухів, вправ на динамічну і реципрокную координацію, розвиток дрібної моторики, ритміко-мовленнєвих ігор, дихальних і балансувальних вправ, поєднаних із мовленнєвим супроводом. Статистична обробка результатів здійснювалась із застосуванням адекватних методів математичної статистики. *Результати.* Встановлено статистично значущу позитивну динаміку у розвитку координаційних і мовленнєвих здібностей дітей експериментальної групи, що проявилось у підвищенні точності та узгодженості рухів, покращенні здатності до програмування і переключення рухових дій, збагаченні словникового запасу та підвищенні зв'язності мовлення. Отримані результати узгоджуються з сучасними міжнародними дослідженнями, що підтверджують взаємозв'язок моторного і мовленнєвого розвитку дітей. *Висновок.* Впровадження кінезіологічних вправ і ігор у освітній процес закладів дошкільної освіти забезпечує інтегрований розвиток моторної та мовленнєвої сфер, підвищує рівень психомоторного розвитку дітей, ефективність педагогічного впливу за іншими напрямками їхнього розвитку. Отримані результати підтверджують доцільність використання кінезіологічного підходу як інноваційного напряму модернізації змісту дошкільної освіти відповідно до сучасних європейських освітніх тенденцій.

Ключові слова: кінезіологічні вправи, дошкільний вік, координаційні здібності, мовленнєвий розвиток, психомоторика, міжпівкульна взаємодія, рухова активність, логоритміка.

based methods in pedagogical activities. In this context, kinesiology exercises can be appropriately interpreted as a tool for activating interhemispheric interaction, which mediates the development of speech processes [15; 17]. In contemporary European educational discourse, the issue of preschool child development is considered through the lens of a holistic approach, which involves the integration of cognitive, speech, and psychomotor development [24].

Particular attention is given to the relationship between motor activity and speech, as numerous studies indicate that the development of speech abilities is directly related to the level of a child's sensorimotor development, as noted by A. Ayres [3], H. Dong and Y. Wong [6]. In this context, kinesiology exercises and games are regarded as an effective means of stimulating interhemispheric interaction, thereby promoting the activation of cognitive processes and speech activity.

An analysis of contemporary international research confirms that motor activity is an important factor in the development of higher mental functions, including attention, memory, and executive functions, which directly influence a child's speech. According to the concept of sensorimotor integration proposed by A. Ayres, the effectiveness of cognitive activity depends on the brain's ability to process and integrate sensory information received during motor activity [3]. Therefore, the systematic use of specially organized motor exercises provides a foundation for the harmonious development of the child. Within the framework of educational kinesiology developed by P. Dennison and G. Dennison [5], movement is considered the basis of learning, while specifically selected exercises contribute to the coordinated functioning of both cerebral hemispheres, which positively affects speech processes. At the same time, contemporary studies demonstrate that regular motor activity in preschool age contributes to the formation of fundamental cognitive and speech competencies that determine future academic success [17; 23].

In scientific studies by Polish researchers, considerable attention is paid to the issue of early diagnosis and prevention of speech disorders in preschool children. In particular, works devoted to speech therapy practice emphasize that speech difficulties are often associated with an insufficient level of motor coordination development, which necessitates a comprehensive approach to the organization of the educational process [12; 15; 22]. Polish scholars also highlight the effectiveness of combining motor and speech exercises in working with children, as this approach ensures not only the development of speech but also the overall activation of cognitive activity [12; 16; 19].

Despite the considerable number of studies in this field, the issue of using kinesiology exercises and games as a means of integrated development of coordination and speech abilities in preschool children requires further experimental investigation, particularly in the context of their practical implementation in the educational process. This determines the need for a targeted study aimed at verifying the effectiveness of this approach.

The aim of the article is to provide a theoretical justification and experimental verification of the effectiveness of using kinesiology exercises and games in the

development of coordination and speech abilities of preschool children within the context of contemporary European approaches to early childhood education.

Materials and Methods

The methodological foundation of the study is based on contemporary principles of European preschool pedagogy, neuropsychology, and the theory of sensorimotor integration, which consider child development as a holistic process in which motor activity serves as an important factor in the formation of speech and cognitive functions [15, p. 34]. Conceptually, the study is grounded in the ideas of the interrelationship between motor and speech development, substantiated in the works of foreign scholars, according to which coordination abilities and speech are formed in close interaction and interdependence (N. Močko et al., S. Wang, A. Ayres, F. Kamelia et al.). An important theoretical basis is provided by the provisions of A. Ayres' theory of sensorimotor integration, according to which the effectiveness of cognitive activity is determined by the brain's ability to integrate sensory and motor signals [3, p. 11], as well as the concept of educational kinesiology developed by the Dennisons, which emphasizes the role of specially organized motor exercises in stimulating interhemispheric interaction and activating speech processes [5, p. 5-6].

Achieving this aim involves addressing a set of inter-related objectives that logically derive from the research problem. The study is intended to analyze international scientific sources devoted to the relationship between motor and speech development in children, particularly in the works of Polish and other foreign researchers. An important objective is also to define the criteria, indicators, and levels of development of coordination and speech abilities in preschool children based on contemporary scientific approaches. In addition, the study the development and implementation of a system of kinesiology exercises and games aimed at the integrated development of children's motor and speech domains, as well as the experimental verification of its effectiveness through a comparative analysis of the results obtained from the experimental and control groups. The generalization of the obtained results will make it possible to determine the pedagogical potential of kinesiology exercises as a means of comprehensive development of preschool children and to outline perspectives for further research in this field.

The experimental study was organized in accordance with the principles of scientific validity, systematicity, variability, and integration of different types of children's activities. The research was conducted on the basis of a kindergarten with the participation of senior preschool children aged 5–6 years. The total sample consisted of 32 children who were divided into two groups: an experimental group (16 participants) and a control group

(16 participants). The groups were formed taking into account a relatively similar level of overall development among the children, which ensured the validity of the comparative analysis of the results.

The study was planned and implemented by the principles of bioethics set out by the World Medical Association (WMA-2013) in the Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects and by UNESCO in the Universal Declaration on Bioethics and Human Rights. This helped to fulfill the requirements of voluntariness, anonymity, and trust; all girls provided informed written consent to participate in the study. The study protocol was approved by the Ethical Committee of Jan Dlugosz University in Czestochowa (Republic of Poland).

The organization of the study included three interrelated stages: the ascertaining, formative, and control stages. At the ascertaining stage, the initial level of development of coordination and speech abilities in children of both groups was determined. For this purpose, methods such as pedagogical observation, performance of diagnostic tasks, and analysis of children's speech production were employed. Particular attention was paid to assessing characteristics such as movement coordination and accuracy, the ability to perform coordinated actions, the level of active vocabulary development, speech coherence, and the correctness of pronunciation.

At the formative stage, a specially developed system of kinesiology exercises and games aimed at the integrated development of coordination and speech domains was implemented in the experimental group. The content of the formative intervention involved combining motor actions with verbal support, which was realized through cross-body movements, coordination and balance exercises, rhythm-and-speech games, and fine motor (finger) activities. The exercises were systematically incorporated into various types of children's activities, including motor, play-based, and speech-related activities, ensuring their natural integration into the educational process. Meanwhile, in the control group, the educational process was carried out according to a traditional program without the targeted use of kinesiology exercises. To be specific, we note that formative stage lasted 12 weeks and involved the systematic implementation of a set of kinesiology exercises into the educational process of the experimental group. The sessions were conducted three times a week, each lasting 20-25 minutes, while individual elements of the exercises were integrated into the children's daily activities (morning exercises, movement breaks, and speech-related activities). Such an organization ensured the regularity of the intervention and corresponded to the principle of the gradual increase in complexity of motor and speech tasks.

Structurally, each session consisted of three interrelated parts. The preparatory phase included exercises aimed at activating attention, spatial orientation, and general motor coordination. At this stage, simple kinesiology exercises were used, including synchronous hand movements, cross-body coordination exercises, as well as short rhythmic activities accompanied by speech. The main part of the session involved the performance of specially selected kinesiology exercises aimed at developing interhemispheric interaction, dynamic and reciprocal coordination, fine motor skills, and speech. At the final stage, relaxation exercises, breathing exercises, and speech-based play activities were applied, which contributed to the consolidation of the acquired skills.

The content of the experimental methodology included several functionally interrelated blocks. *The first* block consisted of cross-body movement exercises performed at a slow and moderate pace with gradual progression. Children combined movements of the arms and legs (e.g., touching the elbow to the opposite knee) with the articulation of words, syllables, or short phrases. This approach promoted the synchronization of motor and speech activity and stimulated interhemispheric interaction. *The second* block included exercises aimed at developing dynamic coordination, particularly serial movements such as "fist – edge – palm," which were initially performed with one hand and then with both hands simultaneously. During the exercises, children accompanied their movements with verbal instructions or rhythmic patterns, which contributed to the development of motor programming and speech. Such exercises correspond to neuropsychological approaches to the development of praxis and speech regulation [22]. *The third* block consisted of exercises for the development of fine motor skills, including finger games, manipulation of small objects, graphic exercises, and activities aimed at improving the precision of finger movements. These were combined with speech tasks involving repetition of words, sentence construction, or description of actions, which is consistent with evidence on the influence of fine motor skills on speech development [18; 22]. *The fourth* block included rhythm-and-speech and movement-based games that integrated movement, speech, and rhythm. Children performed movements according to a given rhythm, accompanied by poems, rhymes, or short texts. This approach corresponds to contemporary views on the effectiveness of logorhythmic as a means of developing speech and coordination [17]. *The fifth* block consisted of exercises aimed at balance and spatial coordination, including walking along a line, balancing, and performing movements in заданих directions. During these exercises, children received verbal instructions, which required them to simultaneously process motor and speech information,

thereby contributing to the development of cognitive-processual functions.

The control stage involved a repeated assessment of the level of development of coordination and speech abilities in children of both groups using similar methods, which made it possible to conduct a comparative analysis of the obtained results. The assessment was carried out according to predefined criteria covering coordination, speech, and cognitive-processual aspects of development. For each criterion, specific indicators and levels of development (high, medium, and low) were identified, which ensured the possibility of both quantitative and qualitative analysis of the research results.

The processing of the experimental results was carried out using methods of mathematical statistics, which made it possible to determine the dynamics of changes in the development of children in the experimental and control groups. A comparative analysis of the obtained data allowed for the assessment of the effectiveness of the proposed system of kinesiology exercises and games and confirmed its impact on the development of coordination and speech abilities in preschool children. Thus, the selected research methodology made it possible to comprehensively examine the relationship between motor and speech activity and ensured the scientific validity of the obtained results within the context of contemporary European approaches to child development.

Results

The results of the experimental study demonstrate the effectiveness of the targeted use of kinesiology exercises and games in the development of coordination and speech abilities in preschool children.

The analysis of the results of the ascertaining stage revealed that the majority of children demonstrated medium and low levels of development of the studied abilities, which is consistent with findings from contemporary research indicating an insufficient level of development of motor and speech functions in children with speech disorders [19; 24]. In particular, a significant proportion of children exhibited difficulties in performing coordination exercises, disturbances in movement rhythm, and a low level of speech activity.

The organization of the formative intervention was based on the integration of motor and speech activities, which corresponds to contemporary scientific approaches to child development, according to which speech formation occurs in close interrelation with the development of motor functions [3; 5; 21]. During the formative intervention, a gradual improvement in developmental indicators was observed in the experimental group (EG). The children demonstrated increased movement accuracy, enhanced ability to program and switch motor actions, and improved coordination of both hands (Table 1).

Table 1 – Dynamics of the Development of Children’s Coordination Abilities, %

Group	Stage	High level	Medium level	Low level	t-test, p
EG	pre-experiment	18.8	43.7	37.5	t=2.31; p<0.05
EG	post-experiment	50.0	37.5	12.5	
CG	pre-experiment	18.7	43.8	37.5	t=1.02; p>0.05
CG	post-experiment	25.0	43.7	31.3	

At the same time, an increase in speech activity was observed, which was manifested in vocabulary expansion, improvement in the grammatical structure of speech, and greater coherence of utterances. Such results are consistent with studies demonstrating that the use of movement-based and kinesiology exercises contributes to the development of speech and cognitive functions [16; 17].

The control stage of the study revealed significant differences in the level of development of children in the experimental group compared to the control group (CG), which is confirmed by quantitative indicators.

The obtained results indicate a significant increase in the proportion of children with a high level of development and a decrease in the proportion of children with a low level in the experimental group (Table 2).

Table 2 – Dynamics of the Development of Children’s Speech Abilities, %

Group	Stage	High level	Medium level	Low level	t-test, p
EG	pre-experiment	12.5	50.0	37.5	t = 2.56; p <0.05
EG	post-experiment	43.7	43.8	12.5	
CG	pre-experiment	12.5	50.0	37.5	t = 0.98; p >0.05
CG	post-experiment	18.8	50.0	31.2	

In the control group, the changes were less pronounced, which confirms the effectiveness of the targeted pedagogical intervention. Thus, the detailed experimental methodology, which involves the systematic use of kinesiology exercises in combination with speech activities, provides a comprehensive impact on child development and confirms its effectiveness in the formation of coordination and speech abilities in preschool children.

Discussion

The results of the experimental study confirm the proposition of a close functional relationship between the development of motor and speech domains in preschool children and are consistent with contemporary European scientific approaches to understanding the mechanisms of psychomotor development. The identified positive dynamics in the development of coordination and speech abilities in children of the experimental group indicate the effectiveness of integrating kinesiology exercises into the educational process as a means of comprehensive influence on child development. In particular, the significant improvement in coordination and speech indicators observed in the study supports the findings of foreign researchers such as N. Moćko et al. [16], H. Dong and Y. Wang [6], and K. Libertus and P. Hauf [14], who emphasize the interdependence of these domains. Studies on motor development in children demonstrate that the formation of motor skills serves as a foundation for the development of cognitive and speech functions, as motor activity stimulates brain functioning and facilitates the integration of sensory information [5]. In this context, the obtained results are consistent with research findings highlighting that the development of both fine and gross motor skills is an important factor in enhancing speech and communicative abilities in children [4; 24].

Of particular importance is the fact that during the formative experiment, not only an improvement in motor indicators was observed, but also a significant increase in children's speech activity, manifested in vocabulary enrichment, improved grammatical accuracy, and enhanced coherence of utterances [13]. This confirms the proposition that speech develops in close connection with motor activity, particularly through the mechanisms of interhemispheric interaction and sensorimotor integration [5].

The obtained results are also consistent with contemporary studies in the field of physical education of children with speech disorders, which indicate that the majority of such children demonstrate an insufficient level of development of coordination abilities, difficulties in performing motor tasks, and delays in the formation of motor skills, as reported in scientific reviews and research reports [17; 18; 20]. At the same time, researchers emphasize the importance of using comprehensive means of physical education, including movement-based games,

logorhythmics, coordination exercises, as well as breathing and rhythmic activities, which have a positive impact on children's speech development [7; 20]. It is precisely these means that formed the basis of the developed experimental methodology, which led to the achievement of positive results.

Special studies [1; 8] have established the effectiveness of preventive development of motor function and various manifestations of coordination associated with it, which occurs using the author's approach to the performance and training of motor actions. This approach involves the performance of motor actions with the leading and non-leading hands in a specific sequence during training [9]. Some of the ideas of this researcher used in our study were one of the reasons for the obtained result, which confirms the conclusion about the necessity [2; 10; 11].

An important finding of the study is the confirmation of a correlation between the levels of development of coordination and speech abilities. The identified positive dynamics in both indicators indicate their interdependent nature and support the results of previous studies, which have established a statistically significant relationship between motor and speech development in preschool children [3; 6; 16; 19].

At the same time, the results of the study expand existing scientific understanding of the potential of the kinesiology approach in preschool education. Unlike individual studies in which physical education tools or speech therapy methods are considered in isolation, this study implements an integrated approach that combines motor activity and speech activity into a unified system. This made it possible to achieve a more pronounced effect, manifested in a significant increase in the proportion of children with a high level of development and a decrease in the proportion of children with a low level.

At the same time, the results of the study have certain limitations related to the relatively small sample size and the limited duration of the experiment. This is consistent with the conclusions of researchers who emphasize the need for prolonged and systematic intervention to achieve stable results in the development of children's speech and motor skills [12; 22]. In this regard, promising directions for future research include expanding the sample size, extending the duration of the experiment, and developing variable programs of kinesiology exercises that take into account the individual characteristics of children.

Thus, the results of the study confirm the feasibility of using kinesiology exercises and games as an effective means of developing coordination and speech abilities in preschool children and substantiate the need for their widespread implementation in preschool education practice within the context of contemporary European approaches.

Conclusions

The generalization of the experimental results demonstrated a stable positive dynamic of indicators in the experimental group, which allows kinesiology exercises to be interpreted as an effective tool for the integrated development of coordination and speech abilities. The obtained data confirm the feasibility of their systematic implementation in preschool education practice; the differences between the groups are statistically significant ($p < 0.05$).

The results of the conducted study make it possible to assert that the use of kinesiology exercises and games is an effective means of the integrated development of coordination and speech abilities in preschool children. The theoretical analysis of international scientific sources confirmed the existence of a close relationship between motor and speech domains, which determines the feasibility of their purposeful integration in the pedagogical process. It has been experimentally proven that the systematic implementation of kinesiology exercises, based on the principles of combining movement and speech, contributes to the improvement of children's coordination abilities, enhances the accuracy and consistency of movements, and stimulates speech activity, manifested in vocabulary enrichment and increased speech coherence.

It has been established that the integration of motor, rhythmic, and speech exercises provides a comprehensive impact on child development and is more effective compared to traditional approaches that do not involve the systematic combination of motor and speech activities.

The positive dynamics of indicators in the experimental group confirm the effectiveness of the developed methodology. The obtained results also demonstrate the interdependence between the levels of development of coordination and speech abilities, which allows motor development to be considered an important factor in stimulating speech in preschool children.

Prospects for further research are associated with expanding the sample size, improving the methodological support for the use of kinesiology exercises, and developing variable programs for their application, taking into account the individual characteristics of children.

Conflict of Interest. The author declare no conflict of interest.

Data Availability Statement. Data supporting the findings of this study are available upon request from the corresponding author. Data are not publicly available due to confidentiality and ethical constraints.

Ethical Disclosure Statement. The study was conducted in accordance with the World Medical Association (WMA-2013) principles of bioethics as outlined in the Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects.

AI Transparency Statement. The author declares that no generative AI or AI-enabled technologies were used in the writing, editing, or preparation of this manuscript.

Funding Statement. This study received no external funding. The author received no financial support for the research, writing, or publication of this article.

References

- Galamanzhuk, L. (2015). *Preventyvnyy rozvytok rukhovoyi aktyvnosti ditey doshkil'noho viku* [Preventive development of motor activity of preschool children]. Medobory-2006, Kamianets-Podilskyi. 500 p. [in Ukraine].
- Iedyak, G. A., Siedlaczek-Szwed A., Galamanzhuk, L. (2020), "Rozumova pratsездatnist' suchasnykh 6-richnykh uchniv nachatkovoyi shkoly" [Mental performance of modern 6-year-old primary school students]. *Scientific works of the Ivan Ohienko Kamianets-Podilskyi National University: collection of the results of the reporting scientific conference of teachers, doctoral students and postgraduates: in 3 Vol.* Ivan Ohienko Kamianets-Podilskyi National University, Kamianets-Podilskyi, Vol. 2. pp. 91-93. МИНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ [in Ukraine]
- Ayres, A. J. (2005). *Sensory Integration and the Child: Understanding Hidden Sensory Challenges*. Los Angeles: Western Psychological Services. URL: <https://wpspublish.com/sensory-integration-and-the-child>
- Cameron, C. E., et al. (2012). Fine motor skills and executive function both contribute to kindergarten achievement. *Child Development*, 83(4), 1229–1244. <https://doi.org/10.1111/j.1467-8624.2012.01768.x>
- Dennison, P., & Dennison, G. (2010). *Brain Gym: Teacher's Edition*. Ventura: Edu-Kinesthetics. URL: <https://braingym.org>
- Dong, H., & Wang, Y. (2025). Impact of physical activity on children's cognitive function and its educational applications: A narrative literature review. *Frontiers in Physiology*, 16. <https://doi.org/10.3389/fpsyg.2025.1720391>

Джерела та література

- Галаманжук Л. Л. Превентивний розвиток рухової активності дітей дошкільного віку : монографія. Кам'янець-Подільський : ПП «Медобори-2006», 2015. 500 с.
- Єдинак Г. А., Siedlaczek-Szwed A., Галаманжук Л. Л. Розумова працездатність сучасних 6-річних учнів початкової школи. *Наукові праці Кам'янець-Подільського національного університету імені Івана Огієнка* : зб. за підсумками звітної наукової конференції викладачів, докторантів і аспірантів : у 3-х Т. Кам'янець-Подільський : Кам'янець-Подільський національний університет імені Івана Огієнка, 2020. Вип. 19. Т. 2. С. 91-93. МИНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
- Ayres, A. J. (2005). *Sensory Integration and the Child: Understanding Hidden Sensory Challenges*. Los Angeles: Western Psychological Services. URL: <https://wpspublish.com/sensory-integration-and-the-child>
- Cameron, C. E., et al. (2012). Fine motor skills and executive function both contribute to kindergarten achievement. *Child Development*, 83(4), 1229–1244. <https://doi.org/10.1111/j.1467-8624.2012.01768.x>
- Dennison, P., & Dennison, G. (2010). *Brain Gym: Teacher's Edition*. Ventura: Edu-Kinesthetics. URL: <https://braingym.org>
- Dong, H., & Wang, Y. (2025). Impact of physical activity on children's cognitive function and its educational applications: A narrative literature review. *Frontiers in Physiology*, 16. <https://doi.org/10.3389/fpsyg.2025.1720391>

7. Halamanzhuk, L., Zelinsky, G., Dorozh, I., Chaplinskyi, R. (2025). Psychological and pedagogical conditions for ensuring the continuity of health preserving education between preschool education institutions and primary school. *Вісник Кам'янець-Подільського нац. ун-ту імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини*, 30(4), 181-194. [https://doi.org/10.32626/2309-8082.2025-30\(4\).181-194](https://doi.org/10.32626/2309-8082.2025-30(4).181-194)
8. Galamanzhuk, L., Gerasymchuk, A. (2014). Efficiency of prevention-targeted curriculum in the correction of children's physical condition and dynamics of their mental activity during physical exercising. *J of Health Sciences*, 4(10), 357-370.
9. Galamanzhuk, L., Smolianko, Yu., Hudyma, N., Balatska, L., Mytskan, T., Mysiv, V., & Marchuk, V. (2022). Performance of Hand Movements by 3-5-Year-Old Girls with Different Handedness. *Physical Education Theory and Methodology*, 22(4), 551-560. <https://doi.org/10.17309/tmfv.2022.4.145>.
10. Iedynak, G., Galamandjuk, L., Dutchak, M., Balatska, L., Herasymchuk, A., Mazur, V. (2017). Effectiveness of different options for teaching children basic movements due to certain handedness. *J of Physical Education and Sport*, 17(2), 582-589. DOI:10.7752/jpes.2017.02088
11. Iedynak G., Galamandjuk L., Ivashchenko V., Stasjuk I., Prozar M., Mazur V., Sliusarchuk V. Psychosocial aspects of improving physical activity of children with chronic diseases. *J of Physical Education and Sport*. 2017. Vol. 17(3). 1186-1891. DOI:10.7752/jpes.2017.03183
12. Kaczmarek, L. (1977). *Nasze dziecko uczy się mowy*. Lublin: Wydawnictwo UMCS.
13. Kamelia, F., Margana, M., & Widyantoro, A. (2025). The influence of physical activities on children language development: A systematic literature review. *Retos*, 66, 620-627. <https://doi.org/10.47197/retos.v66.111929>
14. Libertus, K., & Hauf, P. (2017). Motor skills and their foundational role for perceptual, social, and cognitive development. *Frontiers in Psychology*, 8, 301. <https://doi.org/10.3389/fpsyg.2017.00301>
15. *Logopedia przedszkolna i wczesnoszkolna* (2022). Warszawa: Harmonia.
16. Moćko, N., Rudzki, M., Miodońska, Z., et al. (2025). Development of speech and communication in Polish children. *Brain Sciences*, 15(1). <https://doi.org/10.3390/brainsci15010024>
17. Motor development and language acquisition in early childhood: A systematic review (2022). URL: <https://www.frontiersin.org>
18. Physical activity and cognitive development in preschool children (2021). URL: <https://www.mdpi.com>
19. Piotrowski, T., Makaruk, H., Tekien, E., et al. (2025). Fundamental movement/motor skills as an important component of physical literacy and bridge to physical activity: A scoping review. *Children*, 12(10). <https://doi.org/10.3390/children12101406>
20. Preventive interventions for speech development in preschool children (2023). *Research report*. URL: <https://www.researchgate.net/publication/393212250>
21. Siedlaczek-Szwed, A., Galamanzhuk, L., Iedynak, G., Blavt, O. (2025). Instrumental fixation of lower limb movements coordination in preschool children. *Вісник Кам'янець-Подільського національного університету імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини*, 30(3), 77-85. doi: 10.32626/2309-8082.2025-30(2).77-85
22. Skalny, M. (2023). Effective stimulation of linguistic development in children up to the age of two: Case study. *Logopedia Silesiana*, 12(1). <https://doi.org/10.31261/LOGOPEDIASILESIANA.2023.12.01.03>
23. World Health Organization (2019). *Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age*. Geneva: WHO. URL: <https://www.who.int/publications/i/item/9789241550536>
24. Zhou, Z., Deng, C., Yin, D., et al. (2025). Digital interventions for children with developmental language disorders. *JMIR mHealth and uHealth*. <https://doi.org/10.2196/59992>
7. Halamanzhuk, L., Zelinsky, G., Dorozh, I., Chaplinskyi, R. (2025). Psychological and pedagogical conditions for ensuring the continuity of health preserving education between preschool education institutions and primary school. *Вісник Кам'янець-Подільського нац. ун-ту імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини*, 30(4), 181-194. DOI: 10.32626/2309-8082.2025-30(4).181-194
8. Galamanzhuk, L., Gerasymchuk, A. (2014). Efficiency of prevention-targeted curriculum in the correction of children's physical condition and dynamics of their mental activity during physical exercising. *J of Health Sciences*, 4(10), 357-370.
9. Galamanzhuk, L., Smolianko, Yu., Hudyma, N., Balatska, L., Mytskan, T., Mysiv, V., & Marchuk, V. (2022). Performance of Hand Movements by 3-5-Year-Old Girls with Different Handedness. *Physical Education Theory and Methodology*, 22(4), 551-560. <https://doi.org/10.17309/tmfv.2022.4.145>.
10. Iedynak, G., Galamandjuk, L., Dutchak, M., Balatska, L., Herasymchuk, A., Mazur, V. (2017). Effectiveness of different options for teaching children basic movements due to certain handedness. *J of Physical Education and Sport*, 17(2), 582-589. DOI:10.7752/jpes.2017.02088
11. Iedynak G., Galamandjuk L., Ivashchenko V., Stasjuk I., Prozar M., Mazur V., Sliusarchuk V. Psychosocial aspects of improving physical activity of children with chronic diseases. *J of Physical Education and Sport*. 2017. Vol. 17(3). 1186-1891. DOI:10.7752/jpes.2017.03183
12. Kaczmarek, L. (1977). *Nasze dziecko uczy się mowy*. Lublin: Wydawnictwo UMCS.
13. Kamelia, F., Margana, M., & Widyantoro, A. (2025). The influence of physical activities on children language development: A systematic literature review. *Retos*, 66, 620-627. <https://doi.org/10.47197/retos.v66.111929>
14. Libertus, K., & Hauf, P. (2017). Motor skills and their foundational role for perceptual, social, and cognitive development. *Frontiers in Psychology*, 8, 301. <https://doi.org/10.3389/fpsyg.2017.00301>
15. *Logopedia przedszkolna i wczesnoszkolna* (2022). Warszawa: Harmonia.
16. Moćko, N., Rudzki, M., Miodońska, Z., et al. (2025). Development of speech and communication in Polish children. *Brain Sciences*, 15(1). <https://doi.org/10.3390/brainsci15010024>
17. Motor development and language acquisition in early childhood: A systematic review (2022). URL: <https://www.frontiersin.org>
18. Physical activity and cognitive development in preschool children (2021). URL: <https://www.mdpi.com>
19. Piotrowski, T., Makaruk, H., Tekien, E., et al. (2025). Fundamental movement/motor skills as an important component of physical literacy and bridge to physical activity: A scoping review. *Children*, 12(10). <https://doi.org/10.3390/children12101406>
20. Preventive interventions for speech development in preschool children (2023). *Research report*. URL: <https://www.researchgate.net/publication/393212250>
21. Siedlaczek-Szwed, A., Galamanzhuk, L., Iedynak, G., Blavt, O. (2025). Instrumental fixation of lower limb movements coordination in preschool children. *Вісник Кам'янець-Подільського національного університету імені Івана Огієнка. Фізичне виховання, спорт і здоров'я людини*, 30(3), 77-85. doi: 10.32626/2309-8082.2025-30(2).77-85
22. Skalny, M. (2023). Effective stimulation of linguistic development in children up to the age of two: Case study. *Logopedia Silesiana*, 12(1). <https://doi.org/10.31261/LOGOPEDIASILESIANA.2023.12.01.03>
23. World Health Organization (2019). *Guidelines on physical activity, sedentary behaviour and sleep for children under 5 years of age*. Geneva: WHO. URL: <https://www.who.int/publications/i/item/9789241550536>
24. Zhou, Z., Deng, C., Yin, D., et al. (2025). Digital interventions for children with developmental language disorders. *JMIR mHealth and uHealth*. <https://doi.org/10.2196/59992>

Date of first submission of article for publication: 12.03.2026

Date of acceptance of the article for publication after review: 07.04.2026

Publication date: 25.04.2026