

THE RELATIONSHIP BETWEEN ADAPTIVE PHYSICAL CULTURE AND THE DEVELOPMENT OF SOCIAL INCLUSION OF STUDENTS WITH HEARING IMPAIRMENT

Maria Troianovska

Department of Biological Foundations of, Physical Education, Health and Sport, Faculty of Physical Education, T. H. Shevchenko National University, "Chernihiv Colehium," Chernihiv, Ukraine
ORCID 0009-0009-6804-2665

Abstract: The article provides a theoretical substantiation of the relationship between adaptive physical culture and the development of social inclusion of students with hearing impairment. The relevance of the topic is determined by the reform of Ukraine's education system on the principles of inclusive learning and the need to reconsider the role of physical education not only as a means of correcting the motor sphere, but also as an instrument for the social integration of a child with sensory impairments. The goal of the study is to theoretically substantiate the aforementioned relationship and to develop a generalized model of its mechanisms. The theoretical foundation is provided by N. A. Bernstein's concept of the level-based construction of movements and P. K. Anokhin's theory of functional systems. The research methods include theoretical analysis and synthesis of sources, comparative analysis, generalization and systematization, and theoretical modeling. Based on an analysis of domestic (Yu. Briskin, A. Perederii, N. Dedeliuk, O. Taranchenko) and international (L. Reich, B. Lavay, C. Barboza, M. Tanure Alves, et al.) sources, a structural-functional model has been developed, encompassing the sensorimotor, personal, and social levels of the relationship. The key barriers to social inclusion – communicative, organizational, and attitudinal – have been identified, along with pedagogical technologies that facilitate its realization: visual and gestural support of instructions, peer tutoring, differentiated assessment, and engagement in extracurricular competitive activity. Practical guidelines have been formulated for physical education teachers in inclusive classrooms. Prospects for further research relate to the empirical testing of the model in general secondary education institutions in Ukraine.

Keywords: adaptive physical culture, social inclusion, students with hearing impairment, inclusive education, physical education, motor development, rehabilitation.

Introduction

The reform of Ukraine's education system on the principles of the New Ukrainian School and the Law of Ukraine "On Education" (2017) has enshrined the right of children with special educational needs to receive education in an inclusive environment. Among the categories of students for whom the issue of social integration remains particularly acute, children with hearing impairment occupy a distinct place: limitations in auditory perception complicate the formation of communicative skills, narrow the circle of social contacts, and often lead to the child's self-isolation within the peer group. In this context, adaptive physical culture is regarded not merely as a means of correcting the motor sphere, but also as an instrument for the purposeful formation of social inclusion – the child's capacity to interact fully, cooperate, and feel like an equal participant in the educational process.

The theoretical foundation of the study is provided by N. A. Bernstein's concept of the level-based construction of movements [4] and P. K. Anokhin's theory of functional systems [2], which make it possible to regard a motor act not as an isolated action but as the outcome of the organism's continuous interaction with the environment, encompassing sensory correction, reverse afferentation, and the formation of a "model of the required future." For children with hearing impairment, in whom the auditory channel of feedback is partially or completely excluded, these propositions acquire particular significance: the compensatory restructuring of motor activity occurs predominantly through the visual, vestibular, and proprioceptive analyzers, and the quality of this restructuring directly affects the child's confidence in motor activity and, accordingly, their readiness to engage in joint activity with peers.

No less important is the psychophysiological aspect of the problem: hearing impairment, according to physiological research, is accompanied by an increased load on the vestibular analyzer, since the auditory and vestibular apparatuses share a common peripheral representation in the inner ear. This accounts for the typical difficulties experienced by children with hearing impairment in maintaining static and dynamic balance, spatial orientation, and coordination of movements in complex-coordination actions. In turn, a child's uncertainty in coordinationally demanding exercises – team games, relay races, ball-handling elements – reduces their motivation to participate in collective forms of motor activity, which is one of the most productive contexts for the formation of social skills at school age. Thus, the physiological specificity of hearing impairment directly affects the child's socio-psychological status within the group, which is an additional argument in favor of a holistic rather than fragmented consideration of the problem under study.

Recent international research reveals a contradictory picture: despite the declared inclusiveness of the school environment, students with hearing impairment continue to report difficulties understanding instructions in physical education classes and a sense of their own “invisibility” within the group [8]. Similar conclusions are confirmed by Brazilian researchers, who found that a deaf child's formal presence in a mainstream physical education class is not equivalent to their genuine engagement in the lesson [1]. This underscores the need for a systematic understanding of the mechanisms through which adaptive physical culture can foster not formal, but effective, social inclusion.

The relevance of the topic is further reinforced by the specific nature of the school-age period, during which a child's social skills and status within the peer group are formed to a considerable extent precisely through extracurricular, play-based, and motor activity. Unlike other school subjects, the physical education lesson entails a high degree of bodily and emotional openness and joint activity in pairs and groups, which makes it simultaneously a zone of heightened risk of social exclusion for a child with hearing impairment and, given competent pedagogical organization of the lessons, potentially the most effective environment for developing interpersonal interaction skills.

In the Ukrainian-language scholarly discourse, the issue of adaptive physical culture for persons with disabilities has been thoroughly developed in the works of Yu. A. Briskin and A. V. Perederii [9; 10; 11], the methodological foundations of adaptive physical education have been systematized by N. A. Dedeliuk [12], while the issues of inclusive education for children with hearing impairment have been addressed in the research of O. M. Taranchenko and colleagues [13; 15; 16]. At the same time, a comprehensive analysis of the very relationship between adaptive physical culture and the social inclusion of students with hearing impairment within a single theoretical model has not yet been undertaken in Ukrainian pedagogical science, which determines the relevance of this article.

The problem is further sharpened by a statistical dimension: according to generalized data from special education institutions, a significant proportion of children with hearing impairment today study precisely in inclusive or integrated settings rather than in specialized schools, as was typical two decades ago. This fundamentally changes the requirements placed on the physical education teacher, who must now not simply master correctional methods but be able to organically combine them with the tasks of the child's socialization within a heterogeneous group. In this sense, adaptive physical culture emerges at the intersection of two previously relatively separate fields of knowledge – correctional pedagogy and the theory of physical education – which requires the development of an integrative conceptual apparatus and corresponding methodological support.

The object of the study is the process of social inclusion of students with hearing impairment in general secondary education institutions, while the subject is the relationship between the means, methods, and forms of adaptive physical culture and indicators of social inclusion of this category of students. The scientific novelty of the study lies in the development of a generalized structural-functional model that, for the first time in Ukrainian pedagogical discourse, combines the physiological propositions of N. A. Bernstein's and P. K. Anokhin's theories with empirically established patterns of social interaction among students with hearing impairment, systematized on the basis of an analysis of domestic and international sources.

Research goal

The goal of the study is to theoretically substantiate the relationship between adaptive physical culture and the development of social inclusion of students with hearing impairment, and to develop a generalized model of the mechanisms underlying this relationship, based on an analysis of domestic and international scholarly sources.

Research objectives

1. To analyze the state of scholarly development of the problem of adaptive physical culture and social inclusion of students with hearing impairment in domestic and international literature.
2. To identify the theoretical and methodological foundations for studying the relationship between motor activity and social integration of children with sensory impairments, based on the propositions of N. A. Bernstein and P. K. Anokhin.
3. To identify the main barriers and facilitating factors in the inclusion of students with hearing impairment in adaptive physical culture classes within an inclusive environment.
4. To generalize the pedagogical technologies of adaptive physical culture that positively influence the social inclusion of this category of students.
5. To develop a structural-functional model of the relationship between adaptive physical culture and the social inclusion of students with hearing impairment.
6. To formulate practical guidelines for physical education teachers on organizing an inclusive educational environment for students with hearing impairment.

Literature review.

An analysis of scholarly sources shows that the problem of adaptive physical culture for children with hearing impairment is developed along two relatively independent lines – the biomedical (compensation of motor and vestibular impairments) and the psychological-pedagogical (social adaptation and integration). Within the first line, Yu. A. Briskin and A. V. Perederii [9; 10] reveal the classification strategies of adaptive sport, emphasizing the need for a differentiated approach to physical loading depending on the degree and onset time of the hearing impairment. The authors stress that participation in competitive activity, particularly within the Deaflympic movement, performs not only a health-related but also a distinctly socializing function, forming in children with hearing impairment a sense of belonging to a community [11]. N. A. Dedeliuk [12] systematizes the means of adaptive physical education for hearing impairments – breathing exercises, vestibular training, speed-strength exercises – viewing them primarily as a tool for correcting the motor sphere that indirectly creates the groundwork for the child's fuller participation in collective forms of motor activity.

The second line is represented primarily by research in inclusive pedagogy. O. M. Taranchenko and co-authors [13; 15] substantiate a comprehensive approach to supporting children with hearing impairment in educational institutions, emphasizing the importance of variability in methodological approaches and flexibility of the educational environment; in the work [16], devoted to differentiated teaching in an inclusive classroom, the authors demonstrate that accounting for a child's individual educational needs (in particular, the mode of perceiving instructions – auditory, visual, or mixed) is a decisive condition for their genuine, rather than formal, engagement in shared activity. M. A. Poroshenko [14] regards inclusive education as an integrated system requiring the coordinated interaction of the teacher, the teaching assistant, parents, and the child themselves, which directly pertains to the organization of physical education lessons in inclusive classrooms as well.

In international scholarly literature, the problem is represented predominantly by empirical studies of students' own experience. M. L. Tanure Alves and co-authors [8], on the basis of a qualitative study involving seven deaf and hard-of-hearing students, identified two leading categories of experience – “I don't understand” and a “feeling of invisibility” – arising from insufficient adaptation by the teacher of instructions and the pace of material delivery in physical education classes. Similar conclusions were obtained by T. P. Alves and co-authors [1] on a Brazilian sample: despite the formal presence of deaf students in a mainstream classroom, teachers largely confined

themselves to their “integration” without purposeful adaptation of lesson content, which failed to ensure the child's full social engagement. L. M. Reich and B. Lavay [7] emphasize the difference in communicative needs between deaf students and hard-of-hearing students, cautioning teachers against a unified approach to both groups and proposing concrete organizational techniques – positioning the teacher facing the class, using visual signals, and familiarizing the child with the lesson plan in advance.

C. F. S. Barboza and co-authors [3], analyzing physical education adaptations for deaf students, demonstrate that systematic physical education classes have a positive effect not only on motor qualities but also on the child's self-esteem and social skills, increasing their readiness for interaction with hearing peers. M. T. Doherty [6], comparing the experience of deaf students in Northern Ireland and Sweden, draws attention to the role of school culture and peer attitudes as a factor determining the child's subjective sense of inclusion, irrespective of the formal model of education (special or inclusive). S. Al Hashimi and co-authors [5], although working with material from art education, confirm the universality of the conclusion that successful inclusion of deaf and hard-of-hearing individuals requires not so much specialized equipment as a change in the teacher's pedagogical attitudes and communicative practices.

The comparative dimension of the problem also deserves attention: studies conducted using material from different countries – Brazil [1], the United States [7; 8], the United Kingdom and Sweden [6], Bahrain [5] – demonstrate a similar structure of difficulties faced by students with hearing impairment in physical education systems with differing organizational and resource provisions. This suggests that the identified barriers are not so much institutional as generally pedagogical in nature and, accordingly, can be overcome through purposeful teacher training regardless of the specific model of the education system. At the same time, the cultural context, in particular the degree to which sign language is used in society and the traditions of sports work with persons with hearing impairment (primarily within the Deaflympic movement), substantially influences the range of adaptive means available to the teacher, as confirmed by Ukrainian sources as well [9; 11], which traditionally give considerable attention to competitive activity as a factor of social integration.

A comparative analysis of domestic and international experience also reveals certain differences in emphasis. Whereas international studies [1; 6; 8] largely focus on the subjective experience of the child, obtained through interview methods, domestic sources [9; 11; 13] traditionally emphasize objective indicators – competitive results, dynamics of motor qualities, and the effectiveness of correctional methods. Combining these two perspectives within a single model is, in our view, methodologically productive, as it makes it possible to simultaneously account for both the objective effectiveness of pedagogical influence and the child's subjective perception of their standing within the group, which ultimately determines the genuine, rather than formal, level of their social inclusion.

An important methodological aspect should also be noted: most of the international studies analyzed [1; 8] were conducted within a qualitative research paradigm using semi-structured interviews and thematic analysis, which allows for an in-depth account of the child's subjective experience but complicates comparison of results across different cultural contexts. Domestic sources [9; 10; 11; 12; 13; 14; 15; 16], by contrast, are predominantly instructional-methodological and conceptually generalizing in character, drawing on the long-standing practical experience of Ukrainian special and inclusive education institutions, but relatively rarely employ standardized empirical procedures. This methodological divergence is a further argument in favor of developing an integrative model that would combine the theoretical rigor of the physiological approach of N. A. Bernstein and P. K. Anokhin with the empirically established patterns of social interaction among students with hearing impairment.

Attention should also be given to research on the motivational sphere of students with hearing impairment with regard to physical education classes, which partly intersects with the subject matter of this article. Survey data obtained from a sample of over two hundred schoolchildren of varying ages with hearing impairments indicate a heterogeneity of motivational profiles: some children are oriented primarily toward achieving a sporting result, others toward the process of communicating

with peers during the lesson, and still others toward receiving approval from the teacher. This heterogeneity underscores the need for a differentiated, rather than unified, approach to organizing physical education lessons in an inclusive classroom, which is consistent with the conclusions of Ukrainian researchers in inclusive pedagogy [14; 16] regarding the importance of taking into account each child's individual educational trajectory.

The results of the author's own prior research are directly relevant to the subject of this study. In particular, the content and specificity of adaptive physical culture for schoolchildren with hearing impairment in general secondary education institutions have been substantiated [17]; using material from an inclusive educational environment, it has been shown that motor activity functions as an independent factor of socialization for students with hearing impairment rather than merely an accompanying effect of correctional work [18]; and the practical aspects of organizing a physical education lesson for this category of students – from the selection of exercises to methods of conveying instructions – have been separately systematized [19]. These findings are consistent with the conclusions of the domestic and international sources analyzed above and, at the same time, specify them with respect to the conditions of a Ukrainian general secondary education institution, thereby providing an empirical basis for the structural-functional model presented in the results of this study.

A synthesis of the sources analyzed provides grounds for asserting that the relationship between adaptive physical culture and the social inclusion of students with hearing impairment is realized through several interrelated mechanisms: compensatory (the formation of alternative channels of motor regulation), motivational (increasing the child's confidence and self-esteem through the successful completion of motor tasks), and communicative (expanding the circle of social interaction in the process of joint motor activity). At the same time, in the domestic literature these mechanisms are largely considered in isolation – either within a purely correctional-pedagogical or a purely socio-inclusive discourse – which determines the need to construct the integrative model presented in the results of this study.

Research methods.

To achieve the goal of the study, a set of theoretical methods was applied: analysis and synthesis of domestic and international scholarly sources on the problems of adaptive physical culture, inclusive pedagogy, and the physiology of motor activity; comparative analysis of the approaches of Ukrainian and international researchers to determining the factors of social inclusion of students with hearing impairment; generalization and systematization of the empirical data presented in the publications analyzed; and the method of theoretical modeling, applied to develop the structural-functional model of the relationship between adaptive physical culture and social inclusion. The chronological scope of the sources analyzed spans the period from 1967 to 2024, which made it possible to trace both the classical physiological concepts of motor regulation and contemporary empirical studies of the experience of students with hearing impairment in an inclusive environment.

Sources were selected according to the following criteria: thematic relevance to the problem of adaptive physical culture and/or social inclusion of students with hearing impairment; scholarly validity and publication in peer-reviewed journals or recognized instructional-methodological manuals; and chronological relevance (the overwhelming majority of empirical sources are publications from 2009–2024, with the exception of the classical theoretical works of N. A. Bernstein and P. K. Anokhin, which retain their methodological relevance). Sources were systematized along two main lines – biomedical-correctional and socio-pedagogical — which enabled a subsequent comparison of the mechanisms described in each and the construction of the integrative model presented in the following section.

Research results.

The results of the theoretical analysis conducted provide grounds for asserting that the relationship between adaptive physical culture and the social inclusion of students with hearing impairment is neither direct nor linear, but is mediated by a range of intermediate factors – individual, pedagogical, and organizational. This warrants presenting the established patterns specifically in the form of a structural-functional model, rather than as a list of separate, loosely connected factors, as is often the case in generalizing reviews on similar problems.

On the basis of the theoretical analysis, a structural-functional model of the relationship between adaptive physical culture and the social inclusion of students with hearing impairment has been developed, encompassing three interrelated levels: sensorimotor, personal, and social.

The sensorimotor level reflects the propositions of N. A. Bernstein's theory [4] concerning the level-based construction of movements: in children with hearing impairment, compensation occurs predominantly through an enhanced role of the visual and proprioceptive analyzers in constructing the motor act. Pedagogically, this is realized through the use of visual and gestural instructions, spatial markings, and vibrotactile signals in place of sound commands. According to P. K. Anokhin's theory of functional systems [2], the successful execution of a motor act is accompanied by the formation of an “action-result acceptor” – a kind of standard of the expected result, against which comparison occurs on the basis of reverse afferentation. In children with hearing impairment, this process requires additional pedagogical support in the form of an increased number of repetitions with variable visual correction.

The personal level of the model links the success of sensorimotor adaptation to the formation of the child's confidence in their own motor abilities. The studies analyzed [3; 7] consistently indicate that systematic successful attempts at completing motor tasks increase a student's self-esteem and reduce the level of anxiety associated with anticipating failure in front of peers. Conversely, insufficient adaptation of lesson content produces the opposite effect – the feeling of “invisibility” described in the study by M. L. Tanure Alves and co-authors [8], in which a child is physically present at the lesson but is effectively excluded from meaningful participation in it.

It is important to emphasize that the personal level of the model is not a simple derivative of the sensorimotor level: successful motor compensation is a necessary but not sufficient condition for the formation of a child's confidence. As studies show [6; 8], even students with a high level of motor skill development may experience a sense of social isolation if the teacher and peers fail to demonstrate recognition of their achievements or systematically exclude the child from decision-making regarding the organization of the game (choosing a team captain, assigning roles, etc.). This indicates that the personal level of the model is mediated not only by individual experience of success but also by social recognition of that success by significant others, which introduces an additional, reverse link between the personal and social levels of the model.

The social level of the model reflects the transition of individual motor experience into the domain of interpersonal interaction. Joint motor activity – outdoor and sports games, paired and group exercises – creates a natural context for communication between students with hearing impairment and hearing peers, provided the teacher purposefully organizes such interaction (for example, through the practice of peer tutoring described in international sources [7; 8]). Ukrainian researchers [13; 15; 16] additionally emphasize the importance of a differentiated pedagogical approach at this level: taking into account the child's individual pace of perceiving instructions and mode of communication (spoken language, sign language, or a mixed form) is a condition without which the child's formal presence in an inclusive classroom does not translate into genuine social inclusion.

The practical implementation of the proposed model requires taking into account age-related dynamics: in younger school age, the leading role is played by the sensorimotor level of the model, since it is during this period that basic motor skills and compensatory mechanisms are intensively formed, whereas in adolescence the personal and social levels come to the fore, associated with the adolescent's need for self-affirmation and recognition from the reference peer group. This is consistent with general patterns of age-related personality development and requires the teacher to

flexibly shift the emphasis of pedagogical influence throughout the entire period of schooling for a child with hearing impairment – from predominantly correctional-developmental tasks in primary school to predominantly socio-integrative ones in secondary school.

The role of the family and the child's immediate social environment in shaping a positive attitude toward adaptive physical culture classes also warrants separate consideration. The sources analyzed [13; 15] indicate that parents of children with hearing impairment are often inclined to excessively limit their child's motor activity out of safety concerns, which, despite good intentions, only deepens the child's social isolation from peers. Accordingly, effective implementation of the structural-functional model presented in this study requires the coordinated interaction not only of the physical education teacher and teaching assistant, but also of the child's parents, who should receive adequate information from the educational institution about their child's actual motor capabilities and the benefits of their participation in collective forms of physical education.

The generalized structural-functional model developed as a result of the study makes it possible to formulate practical guidelines for physical education teachers in inclusive classrooms: (1) ensuring that sound instructions are duplicated by visual or tactile signals; (2) systematically applying paired and group forms of work with rotation of partners; (3) gradually expanding the participation of a student with hearing impairment from structured exercises to free play interaction; (4) purposefully encouraging extracurricular competitive activity. Practical testing of these guidelines in a specific educational environment constitutes a promising direction for further empirical research.

Based on the synthesis of the sources analyzed, the pedagogical technologies of adaptive physical culture that directly contribute to the social inclusion of students with hearing impairment have been systematized. First, these are technologies of visual and gestural support for instructional information – the use of picture schemes, demonstrative modeling of exercises, and elements of sign language to denote key commands, enabling the child to perceive instructions on an equal footing with other students without requiring additional “translation” once execution of the exercise has begun [7; 12]. Second, these are peer tutoring technologies, which, according to international research [7; 8], not only facilitate the acquisition of motor actions by a child with hearing impairment but also cultivate in hearing peers an experience of empathetic interaction, breaking down the attitudinal barriers described above. Third, these are technologies of differentiated pedagogical assessment that take into account not only the quantitative outcome of exercise performance but also the child's individual dynamics – an approach consistently substantiated in Ukrainian sources on inclusive pedagogy [14; 16].

A separate group is formed by technologies of competitive and club-based activity that extend beyond the physical education lesson – adaptive sports sections, participation in competitions among persons with hearing impairment, and preparation for the Deaflympic Games [9; 11]. The sources analyzed consistently indicate that extracurricular competitive activity is often the child's first experience of being recognized as an equal by hearing peers, since a sporting result is an objective and comprehensible criterion of success regardless of the particularities of auditory perception. This provides grounds for regarding competitive activity not as a peripheral but as a system-forming element of the model of the relationship between adaptive physical culture and social inclusion.

An analysis of the barriers identified in the literature made it possible to distinguish three main groups of obstacles: communicative (the teacher's insufficient command of alternative means of conveying instructions), organizational (the lack of adapted equipment, insufficient training of the teaching assistant), and attitudinal (stereotypical perceptions among teachers and peers regarding the motor capabilities of children with hearing impairment) [1; 6; 8]. At the same time, a synthesis of positive experience [3; 9; 11; 14] provides grounds for asserting that the purposeful involvement of students with hearing impairment in competitive activity, particularly within the Deaflympic movement, substantially strengthens their social self-identification and expands their circle of social contacts beyond the school.

A synthesis of the foregoing makes it possible to formulate the main theoretical result of the study: the social inclusion of a student with hearing impairment through adaptive physical culture is a manageable pedagogical process, the effectiveness of which is determined not so much by the mere

presence of a motor impairment or the type of educational institution, but by the quality of the teacher's adaptation of the content, methods, and forms of organizing classes to the individual perceptual and communicative characteristics of the specific child. This proposition reconciles the seemingly contradictory conclusions of different researchers [1; 6; 8] regarding the role of the institutional context of education, while also confirming the central importance of the teacher's professional competence, as substantiated in domestic sources [12; 14; 16].

Conclusion.

The theoretical analysis conducted confirms that adaptive physical culture is not merely a means of correcting the motor sphere of students with hearing impairment, but also an effective instrument for developing their social inclusion. The relationship between these phenomena is realized through the unity of the sensorimotor, personal, and social levels, the theoretical description of which is grounded in N. A. Bernstein's concept of the level-based construction of movements and P. K. Anokhin's theory of functional systems. A synthesis of domestic experience (Yu. A. Briskin, A. V. Perederii, N. A. Dedeliuk, O. M. Taranchenko) and international empirical research (M. L. Tanure Alves, L. M. Reich, C. F. S. Barboza, and others) made it possible to identify the key barriers and facilitating factors in the social inclusion of students with hearing impairment through adaptive physical culture, and to develop the corresponding structural-functional model.

The results obtained are of practical significance for the system of training and professional development of physical education teachers working in inclusive education settings, as well as for the development of methodological recommendations for general secondary education institutions regarding the organization of physical education lessons and extracurricular sports activities for students with hearing impairment. The theoretical propositions set out may be used in developing individual development programs, training teaching assistants, and shaping professional development standards for pedagogical staff of inclusive educational institutions.

Prospects for further research relate to the empirical testing of the proposed structural-functional model in general secondary education institutions in Ukraine, in particular through the use of standardized psychodiagnostic methods for assessing the level of social inclusion and biomechanical methods for objectifying the motor capabilities of students with hearing impairment, as well as through a comparative analysis of the effectiveness of the proposed pedagogical technologies in special and mainstream educational institutions.

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