

Original Article

The influence of moderate physical activities on the psychophysical state of children with minimal brain dysfunctions

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Published online: October 31, 2018
(Accepted for publication September 22, 2018)
DOI:10.7752/jpes.2018.s4282

Abstract

Recently in Ukraine the number of children with deviations in psychological development has been increasing. Children with minimal brain dysfunction have motion disorders in the form of deviations of fine motor hand skills, coordination of motions, balance, and speech. Few studies are available on children's minimal brain dysfunction and its correlation with physical activity. The purpose of the present paper is to reorganize emotional, volitional, behavioral and other adaptive manifestations of children with minimal brain dysfunction by means of moderate physical activities. Firstly, the research is focused on the creation of safe stimulating environment where children are faced with moderate physical challenges. All of them are aimed at motor skills development and gradual child's involvement into different activities. As a result, it stimulates brain growth. Secondly, an analysis is given of parents' applications, bringing up children, characterized by increased levels of excitability; have neurological symptoms (increased fatigue, speech disorders); demonstrate behavioral and learning difficulties; as well as children with psycho-neurological diagnosis, appointed in different periods of their ontogenesis. These children were integrated by one indicator - minimal brain dysfunction. Thirdly, in the process of forming the experiment we actively modeled a social profile of children with minimal brain dysfunction by means of psychocorrection and psychotherapy (using moderate physical activity). Hence, having carried out the empirical statement of psyche, we acquired positive changes in different psyche manifestations of these children. In particular, social and behavioral competences improved, changes of intellectual and psychomotor abilities took place. Thus, children with impaired brain structures maturation require correction. Among the most influential are increasing motivation to learn; organization of educational process considering children's psychophysiological peculiarities; development of deficiency functions, as well as development of constructive norms of interaction with adults and peers. Important components that can help with this are various forms of play activity that include moderate physical activity.

Key Words: minimal brain dysfunctions, stages of personality development, psychophysiological functions, disharmonious development, moderate physical activity, psychological correctional work.

Introduction

Child's mental development processes should be based on harmonious interrelation between psychophysiological capabilities of a child and social environment requirements where a child lives and develops. Forasmuch, a better understanding of personality development stages as phases of gradual child's inclusion into different social relations with simultaneous formation of holistic and hierarchical structure of personality is required. That is to say, emphasizing the child's social orientations towards oneself and others, formed in a process of his personality development, is necessary. Thus, different deviations, improper morphogenesis of a central nervous system lead to significant difficulties in child's socialization and personality becoming. In last years, several research teams have conducted studies of aforementioned issue. Presented aspects of a child's neurophysiologic and mental development were disclosed by such scholars as A.R. Luriya, L.S. Tsvietkova, T.P. Khrizman, B.A. Arkhipova, T.V. Akhutina, Ye. Yu. Balashova, I.P. Briazhunova, P. Dennison, V.D. Yeriemyeva, N.N. Zavadenko, Ye.V. Kasatikova, Yu.A. Kleiberh, N.K. Korsakova and others. Nevertheless, deeper investigation of the influence of physical activities on children with MBD is required. These considerations motivate the present paper on children with minimal brain dysfunctions in order to better understand the phenomena that occur during moderate physical activities influence on child's stage of personality development.

The purpose of the first part of this survey is to focus on the main peculiarities of children with minimal brain dysfunctions, which has been widely studied by different international and domestic research teams during last years.

The second part is dedicated to an overview of physical activities influence and their impact on the development of children. Most of studies have been performed among schoolchildren, whose state of personal

development is defined as norm. However, they will help to understand the influence of physical activity on young grown-up individual who has signs of pathology (MBD).

The purpose of the third part is to focus on the influence of moderate physical activities on the psychophysical state of children with minimal brain dysfunctions in the empirical investigation.

Ergo, different brain structures reach maturity at different ontogenesis stages (of human individual development, from conception to the end of life). So each age period is characterized by specific neurophysiologic conditions in formation and development of mental functions. In its turn, every child has individual peculiarities of development and education.

Brain cerebral hemispheres and especially the cerebral cortex are complex differentiated formations. Child's dysfunction or immaturity in different brain parts leads to appropriate disorders of higher mental functions (HMF). They are not given to a child initially in a ready-made form but undergo continuous heterochronous and asynchronous ways of development, beginning with prenatal period, when their preconditions are laid. As functional criteria for brain development scientists distinguish bioelectric, reflexive and behavioral indicators (Syrotiuk, 2001).

The condition for normal child's inclusion in civilization is unity of two developmental plans - natural (biological) and social (cultural). 'Every session of changes interpenetrates each other, in other words forming one line of social and biological formation of a child's personality' (Vyhotskyi, 1983, p. 31).

According to the principle of development in psychology, human personality development - is a constant process that manifests itself in quantitative and qualitative changes, according to Kostiuk H.S (as cited in Antoniuk, 2006). Quantitative changes, namely increasing one and reducing other features, predetermine the emergence of qualitatively new and the loss of acquired psychological properties.

Biological evolution of organism in ontogenesis is subordinated by strict regularities at all stages of its development. Each mental function and functional level has its own developmental program, which includes relative discreteness, heterochronism, and phase dynamic characteristics of formation processes. Knowledge of developmental scheme contributes to a more precise distinction of organic and functional brain insufficiency cases, variants of its perception. That is a differentiated approach to norm deviations (dysontogenesis) (Syrotiuk, 2001). It should be mentioned that ontogenesis is connected with physiological development, but yet is not merely determined by it. The acquirement of qualitatively new psychological properties is influenced by interaction with an external environment. In order to ensure changes both in single mental processes and psyche in general, it is important to establish a child's interaction with an adult. In a process of mental development of a child diffuse manifestations of its activity turn into actions, that are regulated by objects' images that cause them. At the same time mnemonic, reproductive actions are created; thoughts are developed; emotions and feelings are formed.

Our research was intended to find out the peculiarities of minimal brain dysfunctions manifestation and to reduce their level with the help of different methods of play therapy, art therapy, and also using moderate physical activities.

Minimal brain dysfunctions (MBD) is the notion that implies light behavior and education disorders without expressed intellectual deviations, that appear due to the insufficiency of the central nervous system functions, most often of residual-organic nature. It is the most common type of neuropsychiatric disorders in childhood. Generally scientists identify five types: asthenic, reactive, rigid, active, and subnormal. Children with increased fatigue level belong to the asthenic type (especially it refers to the intellectual sphere). Therefore, such children very often face with serious difficulties at school, study becomes a problem for such children. To the reactive type of children, who are often defined as "hyperactive", they are characterized by motor disinhibition, increased excitability. It is difficult for them to control their own behavior. Such behavior annoys people around them, inducing their non-acceptance, and that, in turn calls an aggressive reaction from a child's side. The rigid type characterizes a child as slow, quickly tired out, sometimes falling out from reality. To the active type of minimal brain dysfunctions belong children who are unorganized, impulsive, it is difficult for them to regulate their own efficiency.

According to domestic and foreign researchers, represented disorder takes place as a result of early local brain injuries, which is expressed in age immaturity of particular higher mental functions and their disharmonious development. Retardment in development standards of functional brain systems is observed with MBD, that stand for such complex integrative functions as language, attention, memory, perception and other forms of higher mental activity. And though such children tend to meet age norms in intellectual development. However, they experience difficulties in social adaptation, have problems with behavior and education. Whereas the most common variant of MBD is attention deficit hyperactivity disorder (ADHD) syndrome.

By its origin and course (as cited in Minimal cerebral dysfunction book, 2016), all perinatal period brain injuries can be conditionally divided into: hypoxic ischemic, resulting from an oxygen lack in a fetus body or its utilization during pregnancy (chronic perinatal fetal hypoxia) or birth (acute fetal hypoxia, asphyxia), trauma, often caused by a fetal head traumatic injury during a birth time and mixed, hypoxic traumatic central nervous system injuries.

In MBD prevention of great importance (as cited in Minimal cerebral dysfunction. book, 2012) are issues of help assistance to children with MBD. They should be oriented at an early age, when brain compensatory capabilities are great and pathological stereotypes did not have time to be formed. Children who have neurological disorders detected at an early age stage should be dispensary registered and systematically examined by a neurologist, psychiatrist, psychologist, speech therapist in order to identify and correct clinical MBD manifestations before school entering.

Materials and methods

Participants. 50 children participated in our research, attending group psychological correctional classes at the Faculty of Psychology and Sociology of Lesya Ukrainka Eastern European National University. Age of understudied children - from 6 to 10 years, mostly boys. The research was conducted during 2015-2017 years.

The main parents' complaints considering their children were: excessive excitability, complex behavioral disorders, inattention, distraction, lack of self-control, aggressiveness, relationships violations with peers and family; bad social orientation at school, difficulties in establishing contacts, the impossibility of expressing their conflicts on the speech level, stuttering and many other symptoms, which require active social and psychological measures in leveling personal problems and harmonizing a child's inner world, etc.

Procedure and measure. During the anamnesis course, we found out that MBD reasons were: pathological birth course (25% of understudied), fetal prematurity (35%), adverse environment effect (37%) and 3% of understudied genetic precondition of rendered development disorder.

We suggested that it would be possible to reduce the MBD manifestation level by the play therapy, using motor exercises and motion games as moderate physical activity. At the beginning of our research we conducted an examination survey, using the following methods: "**Social development profile of a child**", in order to determine the level of social behavior competence and communicative skills as indicators of child social maturity aspects. This method is an expert assessment of a child by educators and parents. The method is based on the principle of semantic differential. It's a list of paired opposite statements, which includes an evaluation scale from +2 to -2, indicating the manifestation extent of a child's certain characteristic. Represented method allowed us not only to apply our children's observation, but also to find out the people's opinion interacting with children every day. *Kern-Jirasek (2014) "Psychomotor diagnosis" test (subtest 1- "Human portrayal")* for identifying intellectual and psychomotor abilities. *Method of motor coordination by V.V. Tarasun* (as cited in Teiومان, 2009) (*receptor coordination of hands*) in order to determine the hands motor skills level.

Studies in the field of age psychology and physiology show that different stages of brain function and responsiveness are changing in ontogenesis, whilst new forms do not substitute the old ones, but subordinate them (Ushakov, 1997). 6-10 years age range is characterized as an effective stage of development, when a child experiments with behavioral reactions, changes the game motivation for an educational one, masters new social roles, etcetera. In the context of our research, the age crisis presence combined with physiological and psychophysiological developmental deviations, provokes mental disorders. That is, as mentioned by V.V. Kovalev (1990) and Schwalbe (as cited in Lebedinskii, 1977), a child's development runs through dysontogenesis, caused by the cerebrum's structures and functions formation and maturation disorders.

Having studied the factors that adversely weigh on a children's functioning, we had the opportunity to direct the correctional process of overcoming the primary defect and to reduce its manifestations, based on those functions that have been sufficiently developed. As far as L.S. Vyhotskyi in his works affirmed (1983), that the main sources of both normal and abnormal child higher mental functions formation are different types of interaction with micro-, meso- and macro- environments; and this close contact continuously affects the mental development. We prepared conditions (play room), where we created new psychosocial formations by moderate physical activities and other psychotherapeutic means.

In contemporary sense of physiology and psychology, new qualities appear as a result of internal systemic relations rearrangement. During the formation of different types of activities, the psychological properties of individual are formed.

The main tasks in the work were:

Task 1: Correctional and educational function, based on psycho gymnastic and psycho prophylactic steps, formation of adequate reactions, development of emotional and cognitive processes.

Task 2: Family support (informative, elucidative and correctional work with parents).

Children who participated in our research were at the stage of effective period of development; this is the time when a child experiments with behavioral reactions, changes motivation from play to education, adopts new social roles. Indicated aspects of ontogenesis, complicated by the crisis period and violation of relative physiological and psychophysiological balance, contribute to demonstration of mental disorders that are expressed in the form of social disadaptation. Understanding the fact that mental functions built on the principle of hierarchy can only be formed in the process of complication of object activity and communication, made it possible to construct the psychological correctional program.

Our research was based on the following stages: the first one was diagnostic. At this stage the main objectives were to diagnose the mental manifestations of social disadaptation, to define the psychological factors

of social disadaptation, to form the correctional activity strategies and to shape the program. Basic methods: psychological analysis of a child's biographical data, play activity psychological analysis, interaction with adults and peers analysis.

The next stage we defined as constituent. The important tasks of this phase are removal of anxiety in children and their parents, achievement of trusting relationships and formation of active settings on psycho correctional work. Methods that were used: psycho correctional exercises, psycho gymnastics, psychological etudes and psychological analysis of children's pictures.

The third phase of our research we have identified as correctional. The aim of this correctional phase primarily is harmonization of the development process, and secondly, the development of motor and communicative skills by means of playing activities. Methods that were used: play therapy, individual correctional play exercises, and relaxation methods.

And the fourth stage served to evaluate the effectiveness of our program. The aim is to assess the changes in psychological factors of social disadaptation, to determine the changes in behavioral and emotional spheres of a child, to evaluate the effectiveness of correction and to determine the level of stability of deprivation of disadaptational manifestations and emersion of new effective, socially acceptable forms of behavior.

The main stages of correction take place in the group work process, in so much as group dynamics is important and determinable in the process of formation of individual characteristics of children with minimal brain dysfunctions.

The basic context of group classes consists of games and psycho techniques, aimed at the development of emotional and volitional spheres, lowering an anxiety level and development of social behavior skills. During the work it is important to create a positive microclimate in the group, to ensure group dynamics and interaction between children and group coach.

Data Collection and analysis. According to the parents opinion survey of the studied children, the increase of MBD symptoms to a greater extent manifested with the beginning of study at school. This, in our opinion, may be connected with the inability of their central nervous system to cope with new, complex demands of contemporary school to these children. Because of "immature" brain functional sections, in conditions of increased mental and physical activities, a child is unable to handle school curriculum, demonstrates protest, aggressiveness, shows obstinacy, disobedience, and negative attitude toward school and education in general.

In addition, according to psychophysicologists and neuropsychologists, the maximum MBD expressiveness often coincides with critical periods of psycho-emotional development. The first period comprises the age of 1-2 years, when an intensive development of cortical speech zones and active formation of spoken language skills take place. Second period accounts for the age of 3 years. During this stage the fund of actively used words is increasing, the phrasal language is improving, attention and memory is actively developing. At this time many children with MBD have retardation of language development and disorder of articulation. The third critical period refers to the age of 6-7 years and coincides with the beginning of the written skills development (writing, reading). This age is characterized by formation of school disadaptation and behavioral problems of children with MBD. Significant difficulties of psychological nature often cause different psychosomatic disorders, manifestations of vegetative-vascular dystonia (Khomskaya, 2005).

We proposed the correctional program for these children, that included moderate, and controlled physical activities. At once a week classes conducted by team-coaches the following were used: KidsYoga exercises ("look at me - do like me", "who is flying?", "a present", games with imaginary objects, etc.); motion folk games ("tag", "sea is worrying", "hide and seek", "sparrows and crows", "we are together in the garden", etc.); games aimed at the development and ability to recognize other people's emotions ("An enchanted child", "a little fox is afraid", "affectionate paws", "little dinosaurs", "three pebbles", "potatoes duel", etc.).

It should be remembered, that developmental effect must be achieved not due to the increase of psycho techniques, but due to the full range of potential power of every complex exercise selected for the classes. Thus, for example, an exercise aimed at correction of horrors can simultaneously promote formation of communication skills, group cohesion; create conditions for self-knowledge, etc. Particular exercises can be used repeatedly, with complications, by transferring a leader function from adults to children, with different variations. If an exercise is fully worked out, but is very pleased by children, it should be included into the group work as long as a desire remains to do it.

M.R. Bitianova (2000) suggests the following structure of correctional classes: greeting ritual, warming-up, main occupation content, reflexion, farewell ritual.

Greeting-farewell rituals are important moments of group work, allowing children to unite, to create an atmosphere of group trust and acceptance that, in its turn, is extremely important for productive work. Rituals might be made up by group during the discussion, or proposed by a psychologist. Rituals are implemented at each meeting and all children must take part in them. Overtime, control over the rituals execution passes from an adult to group members.

Warming-up is a way of influence on emotional state of children, their activity level, stimulates inclusion to the productive functioning. Warming-up can be carried out not only at the beginning of the classes, but also between some exercises, as well as in that case, when a coach feels a need to change the current

emotional state of children. Warming-up exercises are selected taking into account the content and tasks of a specific lesson.

The main content of the correctional class during the project is a set of exercises and techniques aimed at solving problems of the developmental complex. Priority here belongs to multifunctional techniques that contribute to the development of emotional sphere and social skills of children, which were under research condition. The sequence of exercises foresaw activity types changes and psychophysiological states of children: from agile to calm, from difficult, intense play to relaxation, etc. Exercises are used taking into account the factor of children's fatigue. Plays was not overmuch; it was desirable to start and to end the lesson by one of the favorite children's exercises, consonant with the topic of the lesson.

Reflexion provided a retrospective assessment of a lesson in two aspects: emotional (what did you like – what did not you like, was it good – was it bad and why) and semantic (why is it important, why we did it, what new have you learned, what have you learned).

Results

As a result from the conducted interviews, as well as observations of children's behavior during correction classes and expert surveys of parents, we obtained the following results: first, by the developmental level of motor coordination - only 3 understudied performed the tasks correctly and independently representing 6% of respondents, 36 children handled tasks with the researchers' help and tips, which corresponds to 72% of the sample. But 22% of the respondents who participated in our research did not manage with the tasks at all.

Second, by the "Social development profile of a child" method we identified the following levels of social and communicative competence of children. High level was not detected in anyone of the understudied; the average level - 84% of the respondents, and the low level corresponds to 6% of the children who participated in our research.

Third, by the Kern-Jirasek (2014) "Psychomotor diagnosis" test we identified the following psychomotor development levels of these children: high level - 8% of the respondents, the average level - 26%, and low development level was detected in 66% of the respondents (as shown in Figure 1).

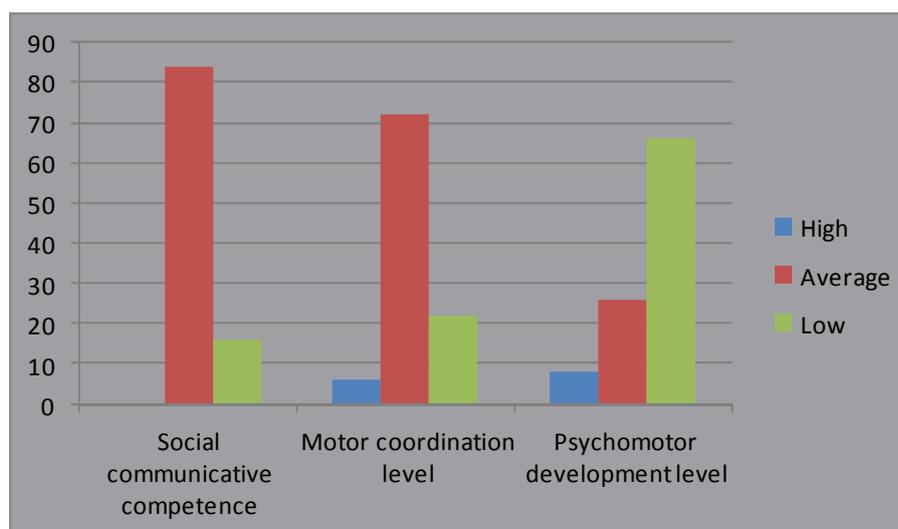


Fig.1. Characteristic of psychomotor development results at the beginning of the correction program

During the correctional program realization, children acquired practical experience, developed and improved the objective activity, that became a source of progressive changes in emotional, volitional, motivational and behavioral spheres of personality. Having carried out the major correctional actions and having conducted correctional classes, we can make certain conclusions that the influence of moderate physical activities in combination with other psychological means of correction show a positive result. First of all, such conclusions can be made on the basis of observation, which, in the context of the research, has become an important link.

Exactly the children's observation who have behavioral problems is one of the forms of active knowledge of reactions and behavioral manifestations. Having observed the changes in children's behavior, improvement of their communication skills and psychomotor actions, having added the results of repeated tests, we formed a new profile of social development of children with minimal brain dysfunctions (as shown in Figure2).

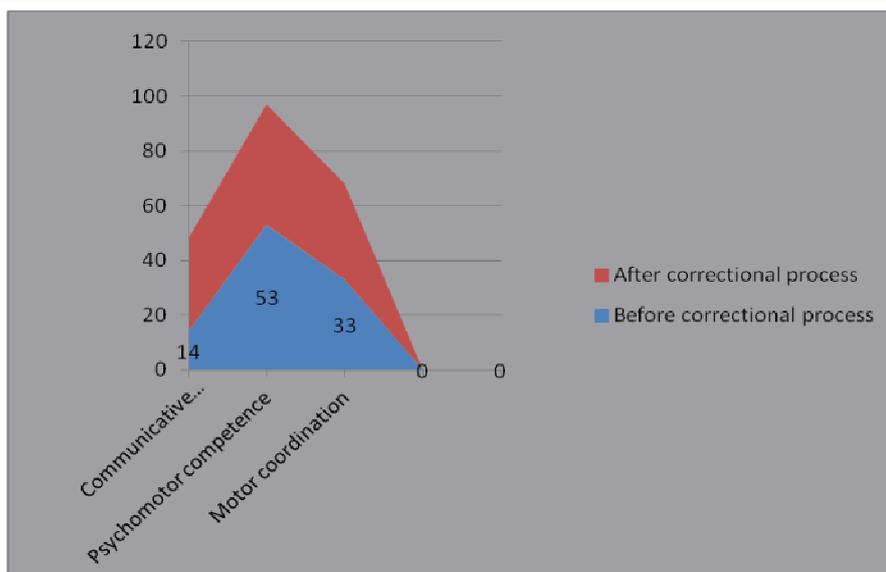


Fig.2. Profile of social development of children with MBD

The results showed the increasing role of our methods in the above mentioned phenomenon and its influence on the child with this particular disorders.

Hence, according to the empirical results, we can distinguish the dramatic effect of correctional program on the psychophysical state of children with minimal brain dysfunctions. The fulfilment of the program with a particular set of physical activity exercises, among which KidsYoga exercises, motion folk games, games aimed at the development and ability to recognize other people's emotions and others, favored the stabilization of the psychophysical state of children with minimal brain dysfunctions. Among the main symptoms which received positive correctional state are excitability, behavior, level of attention and self-control, stabilization of aggressiveness, ability in establishing contacts, speech level and others. Especially, Communicative, psychomotor, and motor coordination competences were improved and even reclaimed. The prior parents' requests in correction MBD of their children was satisfying. All symptoms were changed to the direction of positive side with the help of active engraining moderate physical therapy. To conclude, social and psychological measures in leveling personal problems and harmonizing a child's inner world can be realized with the help of moderate gymnastics and active games.

Discussion

Formation of brain cells takes place in a uterus, not long after a child's birth and continues (yet much slower) to four years. Processes connected with the brain maturation proceed in certain fields up to the age of 25 years (prefrontal cortex, anterior part of a brain). Obviously exist external factors (social environment, ecology, mother's "healthy" behavior) and internal mechanisms that can inhibit the brain development and maturation. In the early stages of development are important different types of stimulation from the environment, which should be perceived by a child as safe and familiar. A stimulating environment is necessary for normal and effective brain development after birth. In our research such incentives stand physical activity and create an active linguistic environment, which moderate a dramatic progress.

Conclusions

The study considered the influence of physical activities on the psychophysical state of children with minimal brain dysfunctions in terms of moderate physical therapy, art therapy, and game therapy during psycho correctional program. The knowledge of these different dysfunctional parameters and types of activities, which can help to decrease the state of intensity of the former, is of major importance. It is also vital nowadays in Ukraine and all over the world as far as the tendency of brain dysfunctions among newborns expands dramatically. Despite numerous studies, no generalized method for the prediction of moderate physical therapy influence on MBD state of child has been widely accepted in the literature. The lack of experimental studies among kids from 6 to 10 years old does not allow a good overview of the effect of the particular physical activities. Previous studies definitely showed a strong effect of physical training among healthy children, who are classified as norm, but no satisfactory correlation between moderate activity and MBD in children, classified as "patology" has been developed yet.

It has been showed that emphasizing the child's social orientations towards oneself and others during his personal development, is urgent. However, it has been studied, that different deviations, improper

morphogenesis of a central nervous system bring noticeable difficulties in child's socialization and personality becoming. Nevertheless, the proper influential instruments and correction programs has not been developed yet.

The literature showed that children's personal development - is a constant process that manifests itself in quantitative and qualitative changes. Quantitative changes predetermine the emergence of qualitatively new and the loss of acquired psychological properties. That is why it is necessary to define the main influence of activity which will help to save these psychological traits. We postulated that among all kinds of activities, physical activity will become the most efficient, especially, its moderate state.

To put the issue into perspective, we strongly assert that children who have minimal brain dysfunctions, for instance, behavioral problems, demonstrate forms of active knowledge in reactions and behavioral manifestations during the correctional program. Consequently, children acquired practical experience, developed and improved objective activities that became a source of progressive changes in emotional, volitional, motivational and behavioral spheres of personality. The influence of moderate physical activities in combination with other psychological means of correction show a positive result. The results of this research showed the improvement of communication skills and psychomotor actions, and level of motor coordination among young recipients.

Perspectives of our future work seemed to be investigated in the field of gender on the aforementioned topic. The experimental program should be designed to measure not only the influence of moderate exercising on children in general, but also the most critical aspects of physical actions in gender perspective. As far as male and female brain works differently, involving different parts of the brain. Thus, proposed activities can instigate different parts of the brain, which can influence girl's or boy's behavior and functioning in different extent, because of the gender peculiarities. This approach would require more sophisticated experimental research and correction program for children with minimal brain disorders according to their gender traits in our future investigations.

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