Journal of Physical Education and Sport ® (JPES),Vol 21 (Suppl. issue 5), Art 371 pp 2790 – 2795, Oct 2021
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Adaptive physical education for children with the Down syndrome

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Published online: October 30, 2021
(Accepted for publication October 15, 2021)
DOI:10.7752/jpes.2021.s5371

Abstract
Background. The purpose of the research is to justify the efficiency of using adaptive physical education for children with Down Syndrome. Material and methods. The research was conducted on the premises of the Center for Early Pedagogical Rehabilitation and Social Adaptation of Children "Pahinets". The children were randomly divided into two equal groups: the control group (n = 10) and the general group (n =10) taking into consideration the age and motor development of the children. The children from the control group were taught using the conventional methodology, while the children in the general group were exposed to the adaptive physical education methods. Results. The research was taking place over a period of 6 months, the sessions containing adaptive physical education methods were organized based on the results of the observational experiments and consisted of 3 parts: introduction, main part, and conclusion. At the end of the research, the results of the control group remained mostly unchanged with the only exception of walking the gymnastics bench while holding a ball, which showed a slight increase from 1,4±0,54 points to 1,8±0,42 points. The results prove that, with the help of systematic adaptive physical education sessions, children with Down Syndrome in the general group increased their speed and force indicators, as well as the scores in stamina and coordination. Conclusion. In the course of the research, it was established that under the influence of systematic adaptive physical education sessions children with the Down Syndrome from the general group their indicators of speed and strength qualities, as well as endurance and coordination of movements improved.
Key words: Down Syndrome, children, adaptive physical education.

Introduction.

Down syndrome is the most common and readily identifiable chromosomal condition associated with mental retardation. It is caused by a chromosomal abnormality: for some unexplained reason, an accident in cell development results in 47 instead of the usual 46 chromosomes. This extra chromosome changes the orderly development of the body and brain. In most cases, the diagnosis of Down syndrome is made according to results from a chromosome test administered shortly after birth (Kashuba, 2011; Nahorna, 2016).

Physical education is an important part of children's experiences, in which they not only learn to express themselves through movement but also obtain knowledge and understanding of principles, practices and values of physical expression through physical activity.

Adaptive physical education is aimed at providing the necessary conditions for the integral development of handicapped children (Osadchenko et al., 2014). Savliuk et al., 2020a; Savliuk et al., 2020b). One of such nosological groups comprises the pupils of the specialized pre-school educational institutions who suffer from Down Syndrome. The level of the physical preparation of such children is integral for their social adaptation. Therefore, motor activity, which stimulates the development of all systems and functions of the body, as well as corrects, compensates, and prevents all kinds of motor and mental disabilities, is critical for a child's growth (Arkhypova, 2017; Kovtun, 2010; Nahorna, 2016; Nesterchuk, Osipchuk, 2018; Gozhenko et al., 2018a; Gozhenko et al., 2018b).

Adaptive physical education for children with Down Syndrome has to take into consideration the initial parameters of their physical condition, in particular the level of physical qualities formation, which may be an obstacle to the process of learning motor actions. The motor development of a child suffering from Down Syndrome is largely dependent on the condition of its musculoskeletal system (Bihunyak, 2018; Kashuba, 2011; Ruban, Shchetynyna, 2015; Savytskyy, 2014).

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The purpose of the research – to justify the efficiency of using adaptive physical education for children with Down Syndrome.

Materials and Methods

Participants. The research was conducted on the premises of the Center for Early Pedagogical Rehabilitation and Social Adaptation of Children "Pahinets".

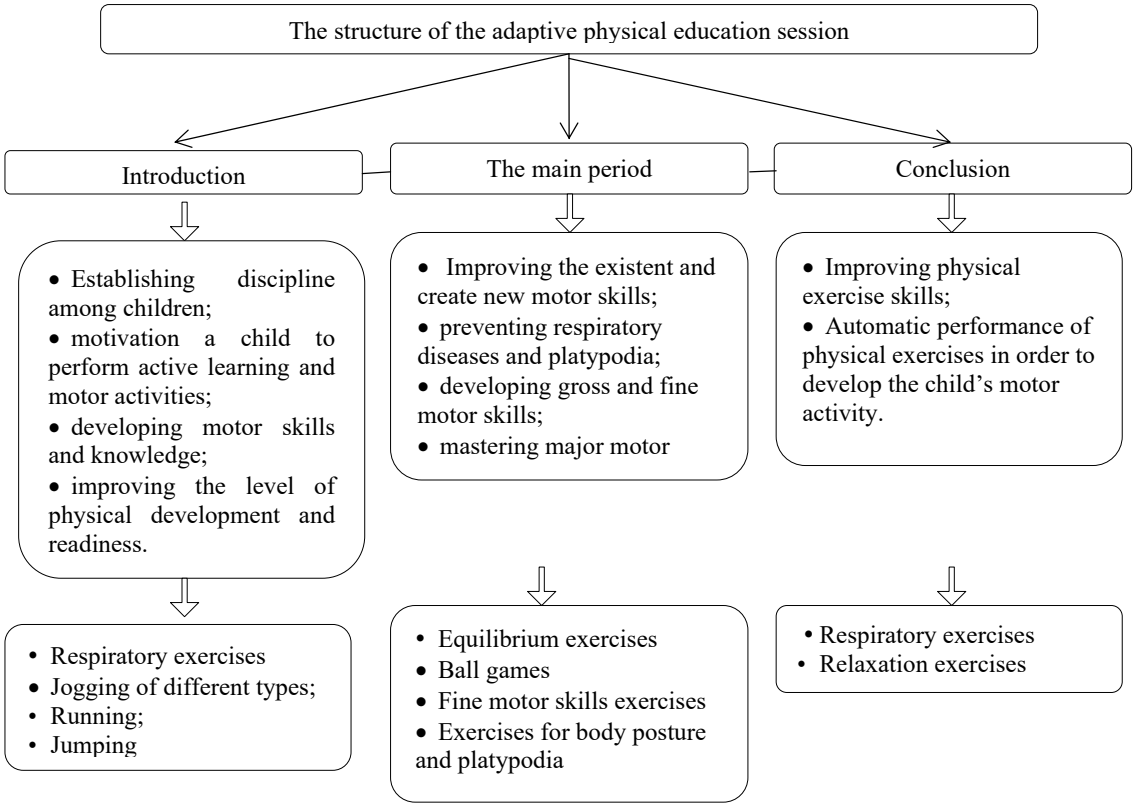
Procedure / Test protocol / Skill test trial / Measure / Instruments. The children were randomly divided into two equal groups: the control group (n = 10) and the general group (n =10) taking into consideration the age and motor development of the children. The children from the control group were taught using the conventional methodology, while the children in the general group were exposed to the adaptive physical education methods. The research was conducted on the premises of the Center for Early Pedagogical Rehabilitation and Social Adaptation of Children "Pahinets". It comprised ten children aged 5-6 suffering from Down Syndrome who were involved in the adaptive physical education on the premises of their educational institution, attending 3 sessions lasting for 45 minutes a week.

Data collection and analysis / Statistical analysis. The sessions containing adaptive physical education methods were organized based on the results of the observational experiments and consisted of 3 parts: introduction, main part, and conclusion (pic. 1).

The introduction stage involved the preparation of the body for the forthcoming exercise. During the main part of the session, the training took place, as well as the performance of general and special tasks in the process of gradual alteration of the physical pressure on the body. The conclusion stage entailed the reduction of physiological activity, the normalization of cardiovascular and respiratory systems functioning, the usage of facilitated exercises, and stress-relieving activities.

Results

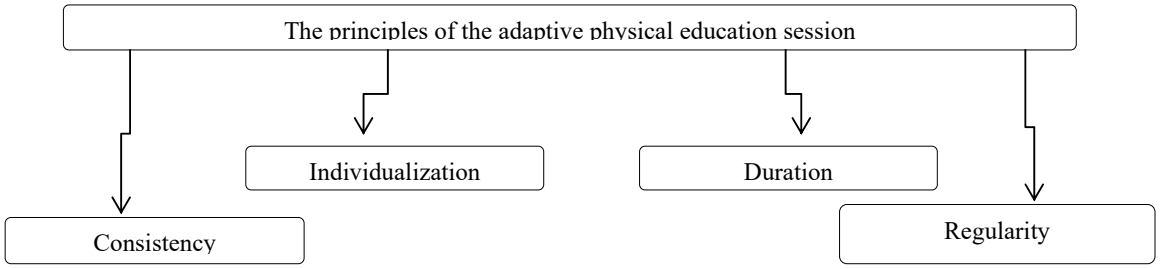
At this stage, great attention was also paid to the breathing exercises, as the right breathing techniques are beneficial for the nervous system. In this way, a slow deep inhale helps a person calm down, relieve pressure, and restore their physical powers after intense training. Here, the instructors also used exercises aimed at facial muscle relaxation, as well as limbs and organs relaxation.



Pic. 1. The structure of the adaptive physical education session

The specifics of the adaptive physical education sessions for children with Down Syndrome entailed:
- finding the individual approach to every child and developing a set of differentiated tasks for them;
- sessions of mixed and playful nature;
- development of voluntary attention;
- the lack of extra unnecessary objects during the session;
- alternative learning methods based on games;
- celebration of students' individual achievements;
- avoiding competitive situations.

In picture 2, there are general and compulsory principles of the adaptive physical education session.



Pic. 2. The principles of the adaptive physical education session

To assess the dynamics of the children's physical qualities, we use the tests that were methodically altered for children with Down Syndrome:
- balancing on one of the legs;
- hanging on the crossbar;
- running a 30-meter distance;
- walking the gymnastics bench while holding a ball;
- kicking a ball;
- throwing and catching a ball;

Table 1 illustrates data on the dynamics of the development of major physical qualities in children with Down Syndrome.

Table 1. Dynamics of physical qualities development in children with the Down Syndrome

Actions, performance			At the beginning of the research		At the end of the research	
			Control group, (n=10)	General group (n=10)	Control group, (n=10)	General group (n=10)
			$\overline{x}$ ± m	$\overline{x}$ ± m	$\overline{x}$ ± m	$\overline{x}$ ± m
1	Balancing on one leg, s	Left leg	4,32±0,22	4,42±0,17	4,82±0,42	5,24±0,13
		Right leg	4,26±0,16	4,32±0,22	4,88±0,31	5,22±0,18
2	The ability to hold to the crossbar, s		7,76±0,46	7,92±0,24	8,02±0,51	8,66±0,23
3	Running 30-meter distance, s		9,78±0,32	9,64±0,42	9,38±0,25	8,78±0,47

In the course of training, indicators of balance-keeping on one of the legs have undergone the following changes: balancing on the left leg among the children of the control group improved from 4,32±0,22 s to 4,82±0,42 s (by 0,5 s); in the general group – from 4,42±0,17 s to 5,24±0,13 s (by 0,82 s). Balancing on the right leg among the children of the control group improved from 4,26±0,16 s to 4,88±0,31 s (by 0,62 s); while in the general group the indicators improved significantly – from 4,32±0,22 s to 5,22±0,18 s (by 0,9 s).

The time of hanging on the crossbar; the results among the children of the control group improved from 7,76±0,46 s to 8,02±0,51 s (by 0,26 s); while in the general group they grew from 8,02±0,51 s to 8,66±0,23 s (by 0,64 s).

At the end of the research, running speed indicators increased in both groups. In the control group, this number fell from 9,78±0,32 s to 9,38±0,25 s (by 0,4 s). The results of the children from the general group were slightly better: the running time decreased from 9,64±0,42 s to 8,78±0,47 s (by 0,86 s).

Exercises with a ball were assessed using the International Gross Motor Function Classification System:
0 - cannot perform – was put if the child could not perform a certain exercise;
1 - tries to perform – was put if the child tries to perform a certain exercise or does it with the outside help;
2 - performs partially – if the child performs the exercise independently but makes major errors;
3 - performs fully – if the child performs a certain exercise independently, correctly, and adhering to the set rules (Kashuba, 2011; Nahorna, 2016).

Table 2. Marks for performing the exercises with a ball in the researched groups

Exercises		At the beginning of the research		At the end of the research	
		Control group, (n=10)	General group, (n=10)	Control group (n=10)	General group (n=10)
		$\overline{x}$ ± m	$\overline{x}$ ± m	$\overline{x}$ ± m	$\overline{x}$ ± m
1	Walking the gymnastics bench while holding a ball	1,4±0,54	1,4±0,54	1,8±0,42	2,6±0,58
2	Throwing and catching a ball with both hands	2±0,71	2±0,71	2±0,71	2,8±0,44
3	Kicking a ball with full force	2.2±0,68	2±0,71	2.2±0,68	3±0,34

At the beginning of the research, the majority of children with Down Syndrome performed the exercises with the help of an instructor (Table 2). At the end of the research, positive dynamics in performing ball games could be observed solely among the children of the general group. The indicators for walking the gymnastics bench while holding a ball changed from 1,4±0,54 points to 2,6±0,58 points; the results for throwing and catching a ball with both hands altered from 2±0,71 points to 2,8±0,44 points and kicking a ball with full force showed the change from 2±0,71 points to 3±0,34 points.

At the end of the research, the results of the control group remained mostly unchanged with the only exception of walking the gymnastics bench while holding a ball, which showed a slight increase from 1,4±0,54 points to 1,8±0,42 points.

The results prove that, with the help of systematic adaptive physical education sessions, children with Down Syndrome in the general group increased their speed and force indicators, as well as the scores in stamina and coordination.

Discussion.

The problem of correcting the motor disorders in children with Down Syndrome is still an essential one. Since these children are significantly behind the healthy ones in terms of their physical development, national scholars still argue on the ways of improving motor skills in children with Down Syndrome.

Modern scientific research proves that the said problem should be dealt with during the physical education sessions developed using methodology that is specifically modified to fit the needs of the children in question. Currently, there is a lack of research explicitly focused on physical activity and physical education and Down syndrome that provides a framework to support evidence based practice.More research needs to be conducted to formulate theories to explain, predict, and understand the phenomena being observed (Diachenko-Bohun et al., 2019a; Diachenko-Bohun et al., 2020; Diachenko-Bohun et al., 2019b; Diachenko-Bohun et al., 2019c; Grygus et al., 2020; Hrytsai et al., 2019; Hrytsai et al., 2020; Kashuba et al., 2020a; Kashuba et al., 2020b; Kashuba et al., 2020c).

Adapted physical education involves a process in which one professional helps other experts, parents and community members to work more successfully with students with disabilities within the school setting. Increasing access to adapted physical education services can have a substantial impact on youth physical education.

Additionally, the issue of the organization of adaptive physical education sessions for children with Down Syndrome remains unsolved until the present day. It should be noted that physical exercises that are aimed at the development of muscle control and balance reactions can significantly accelerate the motor development of the child and the acquisition of basic motor skills (Lavrin et al., 2019; Lavrin et al., 2019; Momot et al., 2020; Nesterchuk et al., 2020; Novopysmennyi et al., 2020; Savliuk et al., 2020a; Savliuk et al., 2020b; Sereda et al., 2020; Shevtsiv et al., 2020; Tomanek, Lis, 2020; Gozhenko et al., 2018a; Gozhenko et al., 2018b).

Conclusion.

Children with Down syndrome have a range of physical problems and difficulties that may affect their motor development. Therefore, it is important that programming which is directed towards facilitating motor skill development reflect quality practices.

The suggested adaptive physical education sessions were of the systematic, regular, continuous, and individual nature. The acquired results prove that all indicators improved among the children of the general group. However, it should be noted that such skills as running, balancing on one foot, and throwing a ball require extra attention. They are connected to coordination and are difficult for children in the research, therefore, session plans should include more exercises of this kind.

It can be concluded that the suggested adaptive physical education sessions motivated children with Down Syndrome to perform various physical activities, as well as improved their physical development and psycho-emotional conditions.

Compliance with Ethical Standards

Conflict of Interest. The authors declare that there is no conflict of interest that could be perceived as interfering with publication of the article.
Competing Interests. The authors declare that they have no competing interests.

Ethical Approval. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.
Informed Consent. Informed consent was obtained from all individual participants included in the study. All subjects of the institutional survey gave consent for anonymized data to be used for publication purposes.
Funding sources. This study has not received any financial support from any government, community or commercial organization.

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