

ADAPTED PHYSICAL ACTIVITY AND AQUA GYMNASTICS AS A MAJOR PREVENTION TOOL IN OBESE CHILDREN

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Abstract:

Obesity is one of the greatest socio-health problems of our time. The World Health Organization describes overweight and obesity as a global epidemic among children. It is the fastest growing age group according the obesity, in which special attention should be paid mainly to physical activity and sport. Lack of physical activity and malnutrition contribute to the increase in chronic non-infectious diseases through a common denominator such as overweight and obesity. Addressing the problem of obesity and civilization diseases is a priority for EU governments. Changing the current situation requires the development of strategic activities and the implementation of the EU Health Program 2020 EU Health Program. This builds on other European documents such as the European Charter on Counterfeiting Obesity and the EU Action Plan on Childhood Obesity 2014-2020. Obese children need to apply applied physical activities, both in school and out-of-school physical activities. The aim of this study was to increase physical activity and thereby reduce body weight in obese children using applied physical activity, specifically aqua gymnastics. 24 obese girls aged 11-12 years were divided into two groups. Experimental sample consists from 12 girls, adhering to the basics of healthy eating and increasing physical activity in the form of adapted physical activities and aqua gymnastics. Control sample consists from 12 girls, maintenance of diet and physical activity only in physical education lessons. It has been demonstrated that the social role of applied physical activity is indisputable. The systematic use of adapted physical activities and aqua gymnastics was the main factor in reducing the weight of the monitored girls.

Keywords:

Obesity, Girls in pubescence, Intervention program for weight reduce, Pedagogical experiment, Adapted physical activities, Aqua gymnastics

INTRODUCTION

Obesity is associated with high blood pressure, impaired metabolism of fats and sugars, increased blood clotting, atherosclerosis, is also a risk factor for the

most common malignant neoplasms (colon and rectum, breast, prostate, kidneys), for locomotor disorders, for chronic Lung disease, infertility, and a host of other conditions. The EU is facing an unfavourable position in obesity. At the

same time, it is also a sub-standard place in terms of comparison of expected life expectancy and life expectancy in health. In addition to genetic burden, social factors are the main determinants of the development of obesity. They co-create the living conditions and lifestyle of people. These include, in particular, lack of physical activity, incorrect nutrition with excessive energy intake, salt, animal and trans-fatty acids, sugars, along with insufficient fruit and vegetable intake (Bláha, 2015; Dimitrova 2014a). The development of obesity is also helped by insufficiently managed stress and socioeconomic inequalities. It has been shown that prevention by a suitable lifestyle is able to prevent obesity in most people. On the other hand, early comprehensive treatment of obesity can reverse already developed metabolic complications and thus prevent other chronic non-infectious diseases. At present, preventive measures are not being used to a sufficient extent, including social activities with the creation of a healthy environment and the health of people's protective behaviour. There is also a lack of use of the latest procedures in the treatment of obese patients in order to demonstrate significant savings in spending on health care and social security for patients with obesity and chronic non-infectious diseases.

Krejčí, Hošek (2016) declare, that in nowadays the movement insufficiency (hypo kinesis) can be observed in adults as in child age as well. Its psychic symptoms (so called "hypo kinetic syndrome") are impulsivity, irritation, dis-concentration, and lack of self-control, discomposure and aggressiveness. In children age is the

movement insufficiency an unphysiological phenomena, it is manipulated through the TV watching, computer and video games, video programs a mobile phones treatment Experience of adventure, in the past realized in different child games and playing, in nowadays is replaced by a virtual experience with minimizing of movement activity. Just the movement insufficiency (hypo kinesis) is the reason, because the motor learning is inhibited from childhood.

The movement insufficiency (hypo kinesis) is also one of the main reasons of increasing trend of overweight and obesity in children and in adults. Health complications of the overweight and obesity are numerous and influence negatively on the quality and duration of human life. According WHO documents 80% of obese children stay to be obese in adult age with all health risks.

Research of effective methods in overweight and obesity management is an important and actual science task on which solving many experts participate. Significantly all of them agree in importance of an individual movement regime. The aim of research work in our Institute is to specialize on an approach to overweight and obesity management in children and in adults, particularly on the base of 2 phases adequate movement regime, induced changes in self-control and in self-esteem, in first through the yoga training led in daily home practicing (3 months), and after through the coherent adequate movement activities (2 weekends, one week course) again led in daily leisure time, see Figure 1.

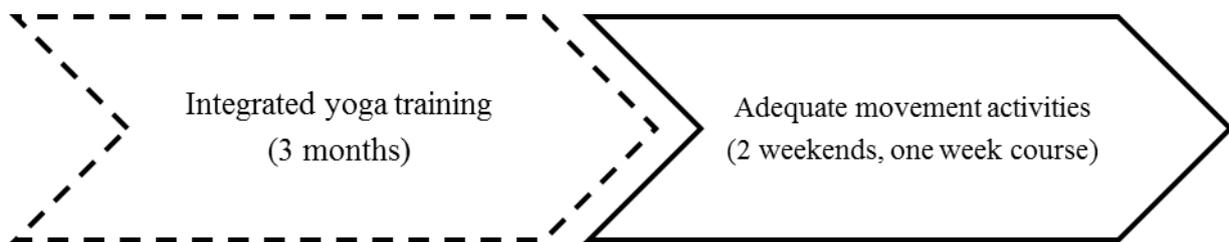


Figure 1 Scheme of algorithm of 2phases adequate movement regime

Krejčí, Hošek (2016) accent that adapted physical activities may be in closed connection with the adequate movement regime and the kinesis protection. Adequate means sufficient. To be adequate to the age, to the personal skills, to the individual needs etc. The base is created on the well-being, joy, play and creativity. – It means to move and in the same time experience well- being and joy. To move and play we can alone or with a partner. Different movement activities, adequate to the individual skills, inclinations and interests and suitable implemented in daily life, create the adequate movement regime. Its basic characteristics and principles are defined (in the line according the importance and the consequence) in the next points:

- **Coping** – in the sense of individual managing and mastering of movement. What for one is easy, for the second is difficult. The main role is playing: condition, age, health situation, impairments, etc. Coping is the base of progress in motor learning.
- **Spontaneity** – in the sense of freedom, facility, pleasure during the movement activity, eventually to experience „flow effect“. The spontaneity is the preposition for the saturation benefit.
- **Saturation** – in the sense of satisfaction, self-realization, self-determination during the movement activity and after it. The person has tendency to return to the movement activity again and again.
- **Repeatability** – in the sense of wish to return to the movement activity and to develop the performance as possible. Only in this step is real to begin with regular training with variable training load. The person accepts discomfort and even a pain.
- **Training** – in the sense of the variable dosage of the intensity according to the health situation, age, condition, body structure, sex, etc. During the training process can be developed a positive dependency on the movement activity. An obstacle can be availability of the movement activity every day.
- **Availability** – in the sense of regular, daily application of movement activity. It depends of nature conditions, time factors, solvency, laws, etc. Here usually begins combination of daily activity with season, temporal movement activities (for example yoga + alpine skiing + biking).

Adequate movement regime is created.

- **Safeness** – in the sense of the accident prevention, rescue during the movement activity realization. To keep principles of safeness. Only safe movement activity is adequate to the person. Again an important role plays: health situation, age, condition, body structure, sex, availability of equipment, etc.

On the base of adequate movement regime is possible to develop individual motoric skills. All, what is learned should be used in normal daily life and active life style according individual specifics and needs as for example to swim, aqua gymnastics, yoga, etc.

Kornatovská, Bláha, Hošek (2016) describe anthropometric characteristics of height and weight in Czech intact children population completed 6 times after the 2nd war in Czech Republic and on this base the Czech norms of children's weight, height and BMI were defined. The objectives of the study was to compare anthropometric characteristics of a group of mental disability children with the norms of intact population of children in Czech Republic, in second to analyse an intervention influence of physical activity on the monitored anthropometric parameters of height, weight and BMI in the experimental groups. Together 180 participants with disabilities (90 males, 90 females, in the age 8-15) divided in experimental and control groups participated in the experimental study, when 3 times in one year period of the intervention program duration, the named anthropometric characteristics were tested.

The investigation followed by data analyses (repeated measures ANOVA model consisting of Subject factor, between-subject factors Gender and Intervention and between-factor interactions). As expected, when evaluated the intact population data with the groups of children with disabilities, we have found significant differences. Based on the analysis of the results is guided discussion whether lack of physical stimulation has a negative impact on weight and height of children with disability. Further, it is discussed the question of kinesis protection, the level of burden in children with disability due to optimal physical development, as well as the question of sedatives and medicaments applied for children with disabilities due to symptoms of anxiety and maladaptive behaviour. Based on the Trans theoretical Model of Behaviour Change, a better understanding of the determinants of exercise behaviour is beginning to emerge.

Kornatovska (2009) found out that swimming has significant influence over psyche and moods changing in adapted physical activities in mental handicapped children. In the case of mental disability is necessary the swimming training creatively adapt and vary regarding to particular abilities of an individual. Swimming in salt water is easier than in fresh water. Salt water influences positively physical activity in water, it makes easier otherwise difficult skill of the back-floating position. Persons in salt water are more upheld than in fresh water, namely on the ground of higher density of water. Therefore swimming and physical movements in sea water are easier than in fresh water. By what the sea water is denser it makes easier swimming for everybody. Swimming skills

development in the process of motoric learning would be easier achieved in the sea (in case of calm sea cove) than during the motoric learning in swimming-pool training.

Through control physical activities training children with overweight or with obesity can experience inner feelings during the physical activity and to find individual dispositions. As it was mentioned in the beginning, it should be not discounted manifestations of fear, anxiety, as a subjectively observed state of threat in our “psychic philtre”. They are emotions, which inhibited the natural activity, including the movement activity as well.

OBJECTIVE, HYPOTHESES

The aim of this study is to increase physical activity and thus reduce body weight in obese females aged 11-12 through an interventional motion program using adapted physical activities and aqua-stimulating activity, i.e. aqua gymnastics.

Hypotheses H1: After the Intervention will be analysed significant reduce of weight in the experimental sample (ES) compare to the control sample (CS).

Hypotheses H2: After the Intervention will be analysed significant reduce in waist circumference in the experimental sample (ES) compare to the control sample (CS).

METHODOLOGY

Material and procedure

The material consists of 24 obese girls aged 11-12 years. The girls were divided into two samples on the base of random choose.

Experimental sample consists from 12 girls, adhering to the basics of healthy eating and increasing physical activity in the form of adapted physical activities and aqua gymnastics. Control sample consists from 12 girls, maintenance of diet and physical activity only in physical education lessons.

Methods

The following methods were used in the present study.

A. *Content analysis of literature* on the issue of physical activity in children with obesity and possibilities of weight reduction using applied physical activity.

B. *Pedagogical experiment:* For the purpose of this study, a special methodology was developed - an intervention program aimed at improving physical activity and reducing body weight in obese children. During the interventional exercise program, applied exercise and aqua-gymnastics were used. This experiment in the form of an interventional exercise program was performed for 9 months, three times a week for 60 minutes.

In the experimental group, a two-week aquarium and one applied exercise activity were included in the weekly schedule. Aqua-gymnastics in the experimental ensemble was performed twice a week in a 25 meter-long metropolitan swimming pool and 0.90 m - 1.60m deep, with a water temperature of 25-27° C. Interventional motion program using aqua-gymnastics included the following educational elements: Generally developing exercises in water, breathing exercises in water, aerobic exercise, exercises for muscle strength, endurance

exercises in water, stretching-stretching exercises (Nikolova, 2014). Applied physical activities were held in a gymnasium designed to teach physical education at the same school. The control group followed the basics of healthy eating and physical activity in physical education classes took place three times a week.

In both samples anthropometric examinations and motor tests to verify the effectiveness of the interventional movement program were performed before and after the experiment:

- Body height (cm) - Bláha (2017)
- Body weight (kg) - Bláha (2017)
- Waist circumference (cm) - Bláha (2017)

- Vital lung capacity (cm³) – Škeřík (2012)
- The strength of the back muscles - Dimitrova (2014b)
- Endurance force of the abdominal muscles - Dimitrova (2014b)
- Dynamic strength of the endurance of the lower limbs - Dimitrova (2014b)

C. *Statistics* In order to compare the accuracy of the difference between the

average values of the studied physical development and functional status indicators between the experimental group and the control group, statistical methods were used to compare the hypotheses t - student test (dependent and independent samples) with a significance level <0. 05.

RESULTS AND DISCUSSION

Physical evolution reflects changes in the morphological-functional properties of the human body in the process of ontogenetic development, that is, in individual life. It is primarily a natural biological process that is genetically conditioned, but depending on living conditions (natural and social). Under the influence of the above mentioned factors there are changes in selected anthropometric indicators of children: height, weight, waist circumference and others. Physical development is not only in the area of quantitative change but also changes in quality.

Table 1 and Table 2 show comparisons of the respective averages for the variables, experimental and control groups at the beginning and end of the study.

Table 1 Comparison of the mean value for variables - start and end of study in the experimental samplet of children (N = 12, females)

Tests / Indicators	Pre	Post	P	t cr.
Body height (cm)	140,77	142,41	0,00	1,51
Body weight (kg)	53,82	47,18	- 1,00	0,33
Waist circumference (cm)	75,9	73,1	1,00	1,83
Vital lung capacity (cm ³)	655	830	0,00	2,95
The strength of the back muscles	15,3	17,00	0,00	2,67
Endurance force of the abdominal muscles	16,3	19,1	- 1,42	2,86
Dynamic strength of the endurance of the lower limbs	11,06	14,7	1,21	3,00

Table 2 Comparison of the mean value for variables - start and end of study in the control sample of children (N = 12, females)

Tests / Indicators	Pre	Post	P	t cr.
Body height (cm)	139,2	140,5	0,00	1,50
Body weight (kg)	52,68	49,18	0,01	1,74
Waist circumference (cm)	77,8	75,6	0,01	1,95
Vital lung capacity (cm ³)	500	630	0,00	3,84
The strength of the back muscles	14,29	15,31	0,00	3,43
Endurance force of the abdominal muscles	13,28	16,12	0,42	2,41
Dynamic strength of the endurance of the lower limbs	11,14	16,7	0,07	2,03

The results of body height changes during the experiment

At the end of the study, there was a tendency to increase the height indicator, where average growth was achieved in both groups. The experimental group increased by 1.64 cm, the control group increased by 1.3 cm, see Figure 2. The analysis showed that in both groups there were statistically significant differences in the mean level of

height (cm) at the beginning and at the end of the study. For this reason, it is not possible to say with certainty that the adapted physical activity and aqua gymnastics used in the experimental sample affected the body height. Very likely, it is due to the biological development of adolescents and natural factors (such as nutrition, healthy lifestyle, physical activity, etc.) as well as obesity limiting physical development.

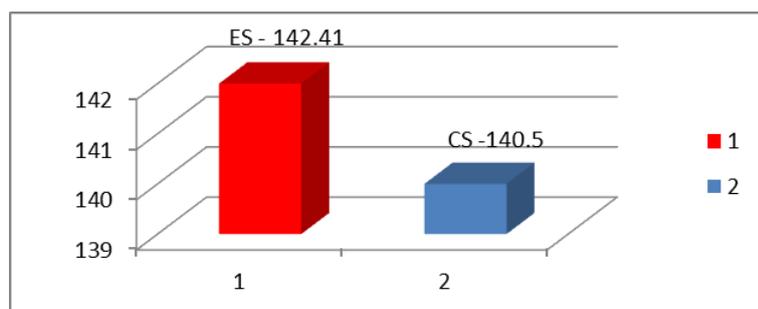


Figure 2 Body height (cm) in ES and CS children at the end of the experiment (N = 24, females)

The results of body weight changes during the experiment

At the end of the study, there was a tendency to decrease the mean value of the body weight indicator in both groups. In the experimental group, the value of 6.64 kg was reached, compared with the control group,

where the 3.5 kg decrease was seen (Figure 3). With the weight parameter, we can safely say that the methodology used in the interventional motion program using the applied exercise and aqua-gymnastics in the experimental group significantly affected the change in body weight (kg) in these children.

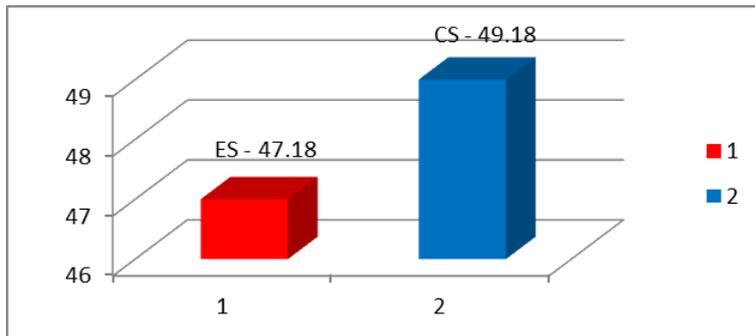


Figure 3 Body weight (kg) in ES and CS children at the end of the experiment (N = 24, females)

The results of vital lung capacity changes during the experiment

Vital capacity (cm^3) is the maximum volume of air that can be exhaled after a deep breath. It provides information of maximal lung ventilation in a child.

At the end of the study, there was a tendency to increase the maximum volume in both groups compared to the baseline. In

the experimental sample, the average lung ventilation diameter was increased by 45 cm^3 , compared to the control sample - see Figure 4. It can be assumed that the significant increase in average vital lung capacity in the experimental sample of children compared to the control sample was due to the inclusion of the interventional motion program in the experimental sample.

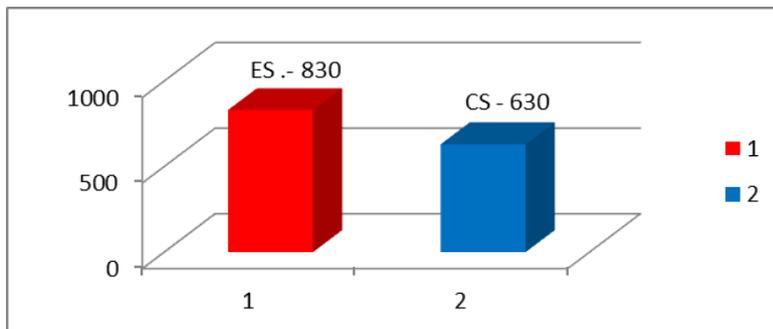


Figure 4 Vital lung capacity (cm^3) at end of experiment in ES and CS children (N = 24, females)

The results of waist circumference changes during the experiment

At the end of the study, there was a tendency for a slight reduction in waist circumference. The experimental group

decreased by 2.8 cm and the control group decreased by 2.2 cm - see Figure 5. Small changes in the waist circumference indicator (cm) at the end of the study in both groups can be physiologically justified by the presence of abdominal fat.

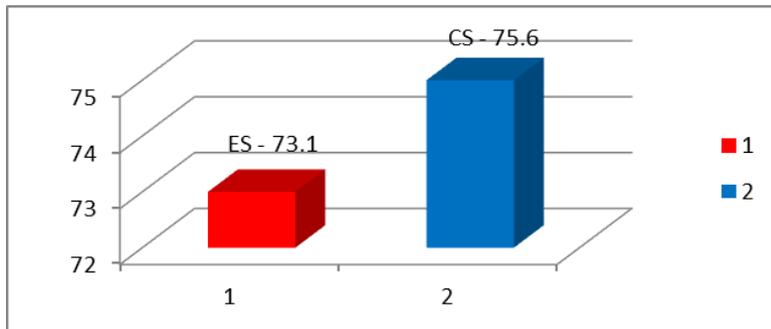


Figure 5 Waist circumference (cm) at end of experiment in ES and CS children (N = 24, females)

The strength of the back muscles changes during the experiment

At the end of the study, the two groups showed a tendency to increase the

mean values from baseline with a 1.7 s increase (experimental group) compared to the control 1.02 s (Figure 6).

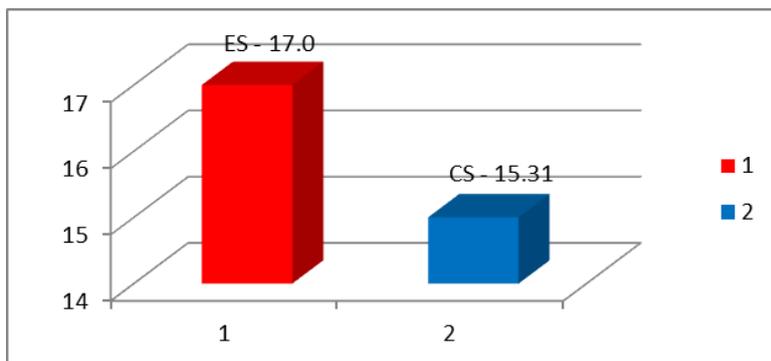


Figure 6 Strength of the back muscles at end of experiment in ES and CS children (N = 24, females)

The difference in the mean values between the two groups at the beginning of the study was 1.01 s, and at the end it changed to 1.61 s (in favor of the experimental group).

From the analysis it can be argued that there are one-way differences in the average level of strength of back muscles (s) in both groups at the beginning and at the end of the study, with significant changes in the mean values of the indicator

in each One of the study groups (in favor of the experimental group).

Consequently, we can not claim that the applied methodology of adapted physical education and aquimandism is the cause of the changes in the static strength of the back muscles (s) in the children from the experimental group.

The endurance force of the abdominal muscles changes during the experiment

At the end of the study, the two groups showed a tendency to increase the

mean values from baseline, with the increase in the experimental group within 2.9 s and in the control - 4.98 s (Figure 7).

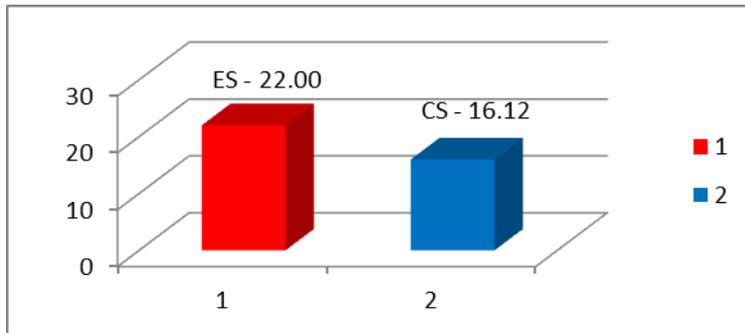


Figure 7 Endurance force of the abdominal muscles at end of experiment in ES and CS children (N = 24, females)

The analysis declare that in both samples there have been significant changes in the average values of the static power endurance of the abdominal muscle (s) at the end of study compared to baseline (in favour of the control sample). But since the two samples before the experiment, there are no significant differences in average score, and in the end such a difference exists, we can say that the developed methodology of adapted physical activities and aqua gymnastics cause positive changes in oxalic durability

of the abdominal muscle (s) in the individuals of the experimental group.

Dynamic strength of the endurance of the lower limbs changes during the experiment

At the end of the study, the two groups showed a tendency to increase the mean values from baseline, with the increase in the experimental group being within 5.7 and the control – 3.7 (see Figure 8).

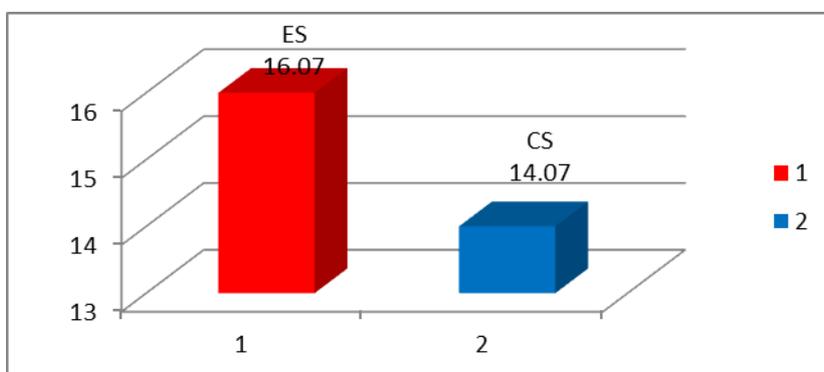


Figure 8 Dynamic strength of the endurance of the lower limbs at end of experiment in ES and CS children (N = 24, females)

Considering the significantly higher increase of the mean values of the indicator in the experimental group, it can be assumed that the reason for the change is the influence of the experimental methodology on adapted physical education and aqua gymnastics.

To solve the purpose and tasks of the study, the results of the tests conducted by each child on each of the observed signs

were evaluated on the basis of the whole set of levels. To reveal the individual peculiarities of each of the children in the experimental group, their results were evaluated using the sigmatical assessment method. The estimated T assessments of the children participating in the pedagogical experiment are presented in the Table 3.

Table 3 Individual assessments of the functional status of the surveyed children in ES (N=24, females)

Tests/ Indicators	Numbers of participants											
	N 1	N 2	N 3	N 4	N 5	N 6	N 7	N 8	N 9	N 10	N 11	N 12
Vital lung capacity	22.5	34.9	18.3	26.6	47.3	14.2	14.2	22.5	26.6	25.4	12.3	32.5
The strength of the back muscles	15.9	9.2	15.9	26.1	22.6	36.1	42.7	29.3	29.3	24.6	22.3	20.6
Endurance force of the abdominal muscles	9.8	28.8	28.8	16.1	9.8	35.1	22.4	28.8	35.1	25.1	15.2	31.1
Dynamic strength of the endurance of lower limbs	35.6	13.3	47.6	21.9	28.7	27.1	16.7	13.3	23.6	21.9	24.9	22.1
Summarized individual ratings	22.6	23.6	25.5	21.4	28.9	29.7	22.0	24.1	25.9	25.9	24.9	28.9

CONCLUSIONS

Planned aim of the study was fulfilled. Evaluation of the hypotheses is following:

Hypotheses H1: After the Intervention will be analysed significant reduce of weight in the experimental sample (ES) compare to the control sample (CS) was verified.

Hypotheses H2: After the Intervention will be analysed significant reduce in waist circumference in the experimental sample (ES) compare to the control sample (CS) was not verified.

The analysis of the results of the conducted study on of children with obesity and the generalized summaries allows formulating following conclusions and recommendations.

As a main result of the applied methodology of adapted physical activities and aqua gymnastics in obese children, there is generally a tendency to improve the physical signs and body weight reduction.

Following the methodology we have applied, the personal results of the surveyed persons and the average values of the group as a whole have improved. Unfortunately, for three of the indicators (body height, body weight, waist circumference), the differences are not statistically reliable, which is explained by the short period of the experiment and perhaps a need for correction of the methodology.

In the beginning and the end of the experiment, the coefficient of variation in the studied population is stable and relatively stable, which speaks of homogeneity and homogeneous homogeneity of the studied population in relation to the studied features.

The realized pedagogical experiment gives us reason to believe that the applied adapted methodology has a favourable effect on the physiometric indicators and the psycho-emotional status of the children who are happy to attend the courses of adapted physical education and aqua-gymnastics and show better self-esteem, which in turn supports their social integration.

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