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PREVENTION OF OBESITY AND BALANCE PROBLEMS THROUGH ADAPTED PHYSICAL EXERCISES IN PERSONS WITH DOWN SYNDROME

Синдром Дауна є захворюванням, викликаним наявністю додаткової хромосоми в генетичній конструкції людини. Це захворювання супроводжується серцево-судинними недугами, легневими розладами, порушення функції щитоподібної залози, дисфункцією кишечника, судом, ожирінням, схильністю до інфекцій, імунodefіцитними станами, лейкемією та розладами центральної нервової системи. Мета. Виявити вплив кінезітерапевтичних засобів і методів на покращення стану здоров'я пацієнтів з синдромом Дауна. У дослідженні взяли участь вісім пацієнтів одного віку та статі у яких було діагностовано синдром Дауна та пов'язані з ним стани. Місцем проведення дослідження був зал гімнастики факультету фізичного виховання і спорту Іасі. Процедури проводилися з 15.01. по 15.06.2018 р. з частотою 3 рази протягом тижня. Під час дослідження використовували таке обладнання: подограф, сантиметровастрічка, медична вага, мати, дзеркала, гімнастичний кулі та кола. При виконанні вправ застосовували ігровий метод, що підвищувало ефективність реалізації завдань і полегшувало перебіг адаптаційних процесів до фізичних навантажень. Результати. Одним із проявів ефективності застосованих засобів і методів кінезітерапії було зменшення індексу ваги тіла. Водночас вірогідно, порівняно з вихідним станом, покращилися функціональні показники серцево-судинної системи, а також зростає величина екскурсії грудної клітки.

Ключові слова: синдром Дауна, ожиріння, серцево-судинна система, кінезітерапія.

Down syndrome is a medical condition caused by the presence of an additional chromosome in the genetic (genome) construction of the affected. Down syndromes are cardiovascular diseases, pulmonary disorders, thyroid disorders, intestinal dysfunction, seizures, obesity, susceptibility to infections, immune system diseases, leukemia, and central nervous system disorders. The underlying hypothesis was to verify whether the proposed recovery programs are tolerated by the subjects, improving the symptomatology and to what extent kinetherapeutic methods and techniques have made progress in their health condition. In the research, eight subjects of age and gender, all diagnosed with Down's syndrome and associated conditions, took part in the research. The place of the action is represented by the gymnastics hall of the Faculty of Physical Education and Sport Iasi, between 15.01.2018 – 15.06.2018 with a frequency 3 times x week. Materials used in the research were: podograph, metric band, scales, mattresses, mirrors, gymnastics bank, balls and circles. We involved the use of application trails and exercises in the form of games, which included the performance of various tasks and the adaptation to new conditions. The calculation of the final body mass index reveals an improvement in obesity symptoms by decreasing the number of kilograms. We can also see the contribution of physiotherapy to this progression by weight loss gradually, avoiding over-training, a harmful phenomenon for people with Down's syndrome and heart disease. As a result of the interpretation of the data obtained about the chest perimeter in the inspiration, there was a slight increase in the values, indicating an improvement of the respiratory act and a slight adaptation to the effort.

Key words: Down Syndrome, obesity, cardiovascular system, kinesitherapy.

Introduction. Down syndrome is a medical condition caused by the presence of an additional chromosome in the genetic (genome) construction of the affected. On average, it was estimated that one in every 800-900 children was born with this condition, making it the most common known genetic anomaly (Mureșan M. D., 2011).

Pathologies associated with Down's syndrome are cardiac disorders, pulmonary disorders, thyroid disorders, intestinal dysfunction, seizures, susceptibility to infections, immune system diseases, leukemia, and central nervous system disorders.

Children and adolescent with DS have a higher risk for obesity. The recognition of physiological and behavioral factors that can increase this risk are crucial for developing personalized plans to approach each individual in order to avoid the gain of excess weight (Murray, J., Ryan-Krause, P., 2010).

Balance reaction is additionally problematic due to inadequate co-contraction caused by muscle weakness, mental retardation, dysfunction in sensory integration processes, cartilage hypoplasia, and improper bone density (Russell DJ, Rosenbaum P, Avery L., 2002).

Physical inactivity is a major public health problem, and there is irrefutable scientific evidence showing that lack of regular physical activity is a major risk factor in many chronic conditions (Marcu V., Dan, M., 2007).

Psychomotricity is the result integrating education and maturation of motor and mental functions, and, regarding the movements, it refers to their determination: will, affection, needs, and impulses (Abalașei, 2012). (Abalașei, B., 2012).

Psychomotor disorders are a real problem for these children that make it impossible adapting to normal social situations, establishing a fear of movement. At the same time, there is the opposite of these problems, where motor and psychomotor skills are well developed, leaving them a voluminous motorcycle baggage, with which they can perfectly cope with daily challenges (Robănescu N., 2001).

Many children with Down Syndrome are late to reach the early motor milestones such as grasping, rolling, sitting, standing and walking. That is why it may be important to start adapted physical activities early (Sacks & Buckley, 2003).

Lack of physical activity is another major contributor to overweight and obesity. In only 1 study did most (60%) adults with DS who were surveyed report that they "exercised" daily, but other studies reported that those with DS were more sedentary than those without DS (Jobling A, Cuskelly M., 2006).

Despite all the limitations, it is advisable to practice physical exercise adapted to the individual capacities of each SD patient. Here are recommendations that demonstrate the need for these individuals to develop strength, muscular endurance and cardiorespiratory endurance, in order to provide: strengthening of the joints, reduction of the risk of respiratory infections and reduction of muscle hypotonia (Cooper-Brown L, Copeland S, Dailey S, Downey D, Petersen MC, et al., 2008).

The underlying **hypothesis** was to verify whether the proposed recovery programs are tolerated by the subjects, improving the symptomatology and to what extent kinetherapeutic methods and techniques have made progress in their health condition.

Material and method. In the research were included eight subjects of all age and gender, all diagnosed with Down's syndrome and associated conditions. The place of the action was at the Faculty of Physical Education and Sport Iasi, between 15.01.2018 – 15.06.2018 with a frequency 3 times x week. Materials used in the research were: podograph, metric band, scales, mattresses, mirrors, gymnastics bank, balls and circles.

The program used involved the application and exercise exercises in the form of games, which involved performing different tasks and adapting to new conditions such as using the right leg to jump into circles (helping to develop laterality), walked through obstacles in orthostatism and quadrupedy (to develop oculo-motor coordination and spatio-temporal orientation), to perform movements in front of the mirror (to shape body shape). The exercises complex exemplified above is designed to help and support the day-to-day activities of people with psycho-motor impairment.

Results and discussions. Subjects (tabl. 1) were tested for height, weight, resting thoracic perimeter, inspiration thoracic perimeter, thorax expiratory perimeter, resting abdominal perimeter (in orthostatism), abdominal perimeter in inspiration, abdominal perimeter in expiration, abdominal resting perimeter in the decubitus), the abdominal perimeter in the decubitus, the abdominal perimeter exits in the decubitus, the distance between the internal malleoles, the Romberg test and the “fingers-to-ground” test (orthostatism with open eyes and closed eyes) (tabl. 2)

Table 1

No.	Name	Genre	Age	Diagnosis
1	P.T.	F	17	Down Syndrome
2	L.O.	F	32	Down Syndrome
3	P.M.	F	23	Down Syndrome
4	L.I.	M	29	Down Syndrome
5	T.D.	F	21	Down Syndrome
6	T.T.	M	27	Down Syndrome
7	A.G.	M	24	Down Syndrome
8	P.A.	M	30	Down Syndrome

The calculation of the final body mass index reveals an improvement in obesity symptoms by decreasing the number of kilograms. We can also see the contribution of physiotherapy to this progression by weight loss gradually, avoiding over-training, a harmful phenomenon for people with Down’s syndrome and heart disease.

The comparative results of the two tests show a weight loss during physical therapy programs, going towards the direction of normal weight (tabl. 3).

To make the Romberg test, the patient is asked to stand straight with his hands in the extension of the body and with the peaks and sticks glued. The test follows two steps: 1. The patient is in the straight-open position. If the balance is maintained in this position, it goes to the second stage. 2. The patient is asked to close his eyes so that maintaining orthostatism will require the integrity of both superficial and profound sensitivity.

Subjects managed to maintain the equilibrium position for the time specified in the previous table, then exhibited steady-state disturbances manifested by instability with the tendency of grasping a support point and immediate opening of the eyes (figure 1).

Table 2

	INITIAL TESTING								FINAL TESTING							
	P.M.	L.O.	P.T.	P.A.	A.G.	T.T.	T.D.	L.I.	P.M.	L.O.	P.T.	P.A.	A.G.	T.T.	T.D.	L.I.
Height (cm)	140	153	151	159	156	173	140	157	140	153	151	159	156	173	140	157
Weight (kg)	47,5	94	74	77	63	64	71	56	46	93	72	75	61	62	69	54
Resting thoracic perimeter	89	124	98	100	90	94	88	90	89	124	98	100	90	94	88	90
Inspiration thoracic perimeter	89	125	99	102	92	92	92	90	90	125	99	103	93	92	92	91
Expiration thoracic perimeter	88	122	98	98	89	94,5	91	89	88	122	98	98	89	94,5	91	89
Resting abdominal perimeter (orthostatism)	79	110	90	90	85	91	93	84	78	109	89	88	83	91	92	84
Inspiration abdominal perimeter (orthostatism)	76	108	87	89	84	91	92	83	76	108	86	89	84	89	92	83

Expiration abdominal perimeter (orthostatism)	75	112	88	86	82	88	94	82	75	112	88	86	82	88	94	82
Resting abdominal perimeter (decubitus)	80	109	89	89	86	84	93	78	80	109	89	89	83	82	93	76
Inspiration abdominal perimeter (decubitus)	82	107	88	91	81	83	93	79	82	107	88	91	81	83	93	79
Expiration abdominal perimeter (decubitus)	81	110	89	88	79	20	92	73	81	110	89	85	79	20	92	73
Distance between the internal maleoles (cm)	3	4	0	3,5	2	5	5	0	3	4	0	3,5	2	5	5	0

As a result of the final measurements of the Romberg balance test, improvements in time were seen in some subjects, unlike other subjects who have stagnated. All these data can be seen in the table and figure below.

Table 3

Comparison between initial weight and final weight

Name	Initial BMI	Final BMI
L.I.	22,7	21,9
T.D.	36,2	35,2
T.T.	21,4	20,7
A.G.	25,9	25,1
P.A.	30,5	29,7
P.T.	32,5	31,6
L.O.	39,7	39,6
P.M.	24	23,5

“The fingers-ground test evaluates both the degree of mobility of the spine through the torsion flexion movement as well as the mobility of the coxofemoral joints and the suppleness of the sciatic and gastrocnemius muscles. The distance between the soil and the peak of the medius (dactilion) is measured; the normal value is zero. The excess or excess mobility is marked with either minus or plus” (Cordun, 2009) (tabl. 4).

Pacient	Initial testing, s	Final testing, s
P.A.	15	14
T.D.	3	4
A.G.	6	6
T.T.	4	7
L.I.	5	10
L.O.	5	7
P.M.	2	4
P.T.	1	1

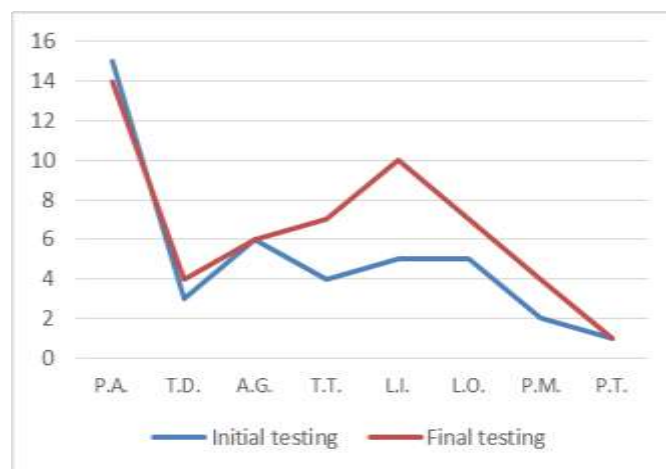


Figure 1. Initial and final measurements of the Romberg test.

As a result of the interpretation of the data obtained about the chest perimeter in the inspiration, there was a slight increase in the values, indicating an improvement of the respiratory act and a slight adaptation to the effort.

Tabel 4

The results of the initial “finger-ground” test

Pacient	Initial testing	Final testing
P.A.	0	+1
T.D.	0	+1.5
A.G.	+ 1	+1.5
T.T.	+ 7	+7
L.I.	- 3	-2
L.O.	+ 2	+2,5
P.T.	- 1	-0,5
P.M.	- 2	-1

As a result of the final measurements, there was an improvement of the measured parameters due to the physiotherapy programs used during the working period, this being highlighted in the tables and graphs above.

Conclusions. The efficient combination of physiotherapeutic means is achieved by the obvious improvement of the symptomatology during the rehabilitation program. This can be noticed primarily by lowering the weight of the subconscious.

Secondly, spatial-temporal orientation and coordination have been improved, proven by the implementation of application paths without difficulty and without orientation errors.

There has also been an increase in the quality of the respiratory act, materialized by increasing the chest perimeter in the inspiration, accompanied by increased effort adaptation during the sessions, as observed by reducing pauses between the effort.

From the point of view of the psychomotoric behavior, a progress of the balance, by the success at the end of the sessions, of all the subjects, is highlighted by the application of numerous trails of equilibrium exercises. For example, the patient L.O. at the beginning of the sessions he was afraid and opposed to climbing and walking without support on the gym, and at the end he managed to go without support and in perfect balance.

Inability to jump on both legs through circles of patient T.D. has been resolved during physiotherapy sessions by adapting exercise that stimulates the jump, starting by jumping with a ball held at the knee, then succeeding without any help or ancillary material.

The conclusions that we have made following the research and the confirmation of the hypothesis from which we started are an example that once again demonstrates the place of kinetotherapy in the complex recovery process of children with Down syndrome.

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ОСОБЛИВОСТІ ВИКОРИСТАННЯ СТУДЕНТАМИ ПРОГРАМИ GYM BOOM ПІД ЧАС САМОСТІЙНИХ ЗАНЯТЬ ФІЗИЧНИМИ ВПРАВАМИ

Стаття присвячена проблемі організації самостійних занять фізичними вправами з використанням мобільного додатку ГутВуот серед студентської молоді. Мета роботи – аналіз, узагальнення та систематизація даних щодо сучасних підходів до використання студентами програми ГутВуот під час самостійних занять фізичними вправами. Методи дослідження: теоретичний аналіз і узагальнення літературних джерел, опитування, педагогічні спостереження. Встановлено, що 29,49% студентів володіють фітнес-трекером, причому найбільш поширеними типами є прикладні програми телефону (46,2% респондентів) та фітнес-браслети (44,7% студентів). Отримані результати свідчать, що використання фітнес-додатків з оздоровчою метою є ефективною моделлю для поліпшення фітнес навичок студентів, персоналізації навантаження і заохочення до різних видів фізичної активності.

Ключові слова: студенти, фізичні вправи, самостійні заняття, мобільний додаток ГутВуот.

Resume. The article is devoted to the problem of organizing independent exercises with physical exercises using the GymBoom mobile application among student youth. The purpose of the work is to analyze, summarize and systematize data on modern approaches to the use by GymBoom students during self-employment exercises. Methods of research: theoretical analysis and generalization of literary sources, surveys, pedagogical observations. It was found that 29.49% of students have a fitness tracery, with the most common types being telephone applications (46.2% of respondents) and fitness bracelets (44.7% of students). Students used supplements to increase physical activity, nutrition and optimal weight, with 29.37% of the participants noted that they had achieved their goal and helped them to supplement it. About 16.78% of participants reported negative feelings (guilty, shame, feelings of tension) when using applications. The effectiveness of the use of GymBoom by students during self-study exercises is largely determined by the maturity of self-awareness and the positive reflectiveness of the individual and adherence to the basic principles of physical education. The results indicate that using health fitness programs is an effective model for improving student fitness skills, personalizing workload and encouraging different types of physical activity.

Key words: students, physical exercises, independent exercises, mobile GymBoom application.