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EVALUATION OF PHYSIOLOGICAL PARAMETERS OF CHILDREN WITH PSYCHOMOTRICAL DISABILITIES UNDER THE INFLUENCE OF WATER EXERCISING

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ABSTRACT. Adapted sports activity is a major benefit for the life of children with disabilities, but unfortunately there are so few institutions that manage to take care of this matter. We are glad to make aquiantance to "EU POT" a non-governmental organization, that succeeded in calling up and developing physical exercises through adapted swimming for this category of children. The physical effort from the adapted swimming lessons determine variations of the physiological constants of the organism. The organization "EU POT" together with the Humanistic Sciences Department of Valahia University has developed an adapted swimming programme for the children with psyco motric disabilities of the Special Arts and Crafts School from Targoviste. Since this is pioneering work, we have followed and evaluated the physiological parameters of the children that participated in this programme. We consider that this evaluation offers us a clear perspective of their values, that modify under effort influence and even under the emotions generated by medical devices. We have developed measurements of these physiological parameters before and after effort and we have interpreted the obtained results. The results have presented really interesting changes, some values have increased after effort, but some have diminished after physical exercising in aquatic environment. The obtained results are extremely various and are personally interpreted for each individual, due to the different conditions that the children are suffering of.

Key Words: physiological parameters, children with disabilities, adapted physical exercise

REZUMAT. ***Evaluarea parametrilor fiziologici la copiii cu dizabilităţi psiho-motrice, sub influenţa exerciţiului fizic adaptat.*** Activitatea sportivă adaptată este un beneficiu major în viaţa copiilor cu dizabilităţi, dar din păcate sunt puţine instituţiile care se ocupă de aceştia. Avem bucuria de a cunoaşte o organizaţie „EU POT", care a reuşit să se mobilizeze şi să desfăşoare exerciţii fizice de înot adaptat cu acesti copii. Efortul fizic din lecţiile de inot adaptat determină variaţii ale constantelor fiziologice ale organismului. Organizaţia „Eu

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Pot" împreună cu Departamentul de Ştiinţe Umaniste al Universităţii „Valahia" din Târgovişte a desfăşurat un stagiu de înot adaptat cu copiii cu dizabilităţi psiho-motrice ai şcolii Speciale de Arte şi Meserii, Târgovişte. Deoarece este o activitate de pionierat am urmărit şi am evaluat parametrii fiziologici ai copiilor participanţi la activitatea sportivă. Considerăm că evaluarea parametrilor fiziologici la copiii cu dizabilităţi ne oferă o imagine clară a valorilor acestora, care se modifică sub influenţa efortului sau chiar a emoţiilor generate de aparatura medicală. S-au desfăşurat măsurători ale parametrilor fiziologici înainte şi după efort şi s-au realizat interpretări ale rezultatelor obţinute. Valorile au prezentat modificări foarte interesant, unele valori au crescut după efort, dar alte valori au scăzut după desfăşurarea efortului în apă. Rezultatele obţinute sunt extrem de variate şi sunt intepretate în mod personalizat, pentru fiecare copil în parte, existând diferite afecţiuni în grupul copiilor de lucru.

Cuvinte cheie: parametrii fiziologici, copii cu dizabilităţi, exerciţiu fizic adaptat.

Introduction

Children are part of a very special category of human race, special beings in our lives, who mark our personalities, beliefs, feelings and they make us choose new paths in life. Children with disabilities should have equal chances as normal children do, but unfortunately not all of us have the same perspective. The modern and ultra performance society brought us the speed of light in communication, offered exceptional technologies but at the same time brought also genetic mistakes. Not all things can be only positive, that is why we must take responsibility for every negative effect that may come from a positive reaction, somewhere in the Universe.

Children with disabilities are the ones who have Down syndrome, autism, paresis, hemi paresis and mental retard. The Down syndrome is not a disease, but a genetic disorder caused by a plus presence of 21 chromosome, also called 21st trisomy. It has been reported about children who suffer of Down syndrome that they develop less motor abilities than the children who suffer of mental disorders.

Autism is a complex disorder, which appears in the first 3 years of life and it's caused by a neurological dysfunction that makes social interaction very difficult, along with communication abilities. Children who suffer of autism have difficulties in verbal and non-verbal communication, social interaction and even relaxing activities. Some studies reveal the fact that autism can be genetically influenced. Many researchers have focused on discovering the gene that causes autism, whereas some have associated it with a compromised immune system.

Hemiparesis consists of a reduction of the muscular force in one half of the body, due to damage of the central motor neuron.

Paresis represents the decrease of muscular force and it's characterized by: ataxia, abolition of reflexes and deep sensibility impaired. Along with these neurological signs comes a dimorphic syndrome, usually represented by a sharper carving of the planetary bolt and rarely by a kyphoscoliosis.

Mental retardation is characterized by a substantial limitation of the cognitive functions that show a significantly lower level of intellect and the coexistence of at least two limited application skills (communication, self-care, social abilities, rest and work).

The purpose of this activity was to monitor, evaluate and compare during this adapted swimming activity the evolution of the following physiological parameters: heart rate, peripheral blood oxygen saturation and blood pressure.

Physiological parameters

Heart Rate represents the number of heart beats per minute. The measurement is done either directly by compression of the radial artery on bone structure or indirectly by compressing the artery with cuff blood pressure monitor and displaying electronic pulse along with heart rate.

Peripheral Blood Oxygen Saturation. Pulse oximetry is a noninvasive technique that is performed routinely to monitor SO2. For evaluation we used a transducer placed on the distal phalanx, which monitored oxygen saturation of arterial blood.

Blood Pressure (TA) is the pressure exerted by the blood on the vessel wall during the contraction and relaxation of the heart rhythm, which consists of two components:

- Systolic pressure - the pressure exerted on artery walls when the heart contracts - with normal values between 100 and 130 mm Hg
- Diastolic pressure - the blood presses against the walls of the artery when the heart relaxes between two contractions (in diastole) - with normal values below 85 mmHg.

Objectives of the activity

- Observing the behavior manifestations of children when entering into the pool
- Evaluation of rest and exercise parameters at the beginning and end of activity
- Correlation of results with the children's affections
- Analysis and interpretation of results

Hypothesis. We believe that the evaluation of physiological parameters of children with disabilities gives us a clear picture of their values, which change under the influence of effort or emotions generated by medical devices.

Conduct activities. Lot studied consists of 7 children with psycho-motor disabilities, who have been monitored during 6 months, June to November 2012, changes in cardiovascular parameters.

Permanently he had a teacher and a doctor to oversee the lessons and to intervene in emergency medical cases.

Material

During the activities we had a pulse oximeter and an electronic tensiometer with which we measured cardiac biological constants values, meaning peripheral blood oxygen saturation and blood pressure**.**

Research Methods

Table no. 1.

Anthropomorphic Measurements

No.	Name and Surname	Diagnosis	Age (years)	Height (cm)	Weight (kg)
1	L C	Down Syndrome	17	140	43
2	B G	Down Syndrome	17	144	53
3	D P	Down Syndrome	15	145	57
4	E U	Reduced IQ	17	164	70
5	D A	Autism	12	160	61
6	D S	Tetraparesis	15	160	35
7	D T	Epilepsy, Hemiparesis	15	155	76

Medical Testing

Table no. 2.

Cardiovascular Parameters – June 2012

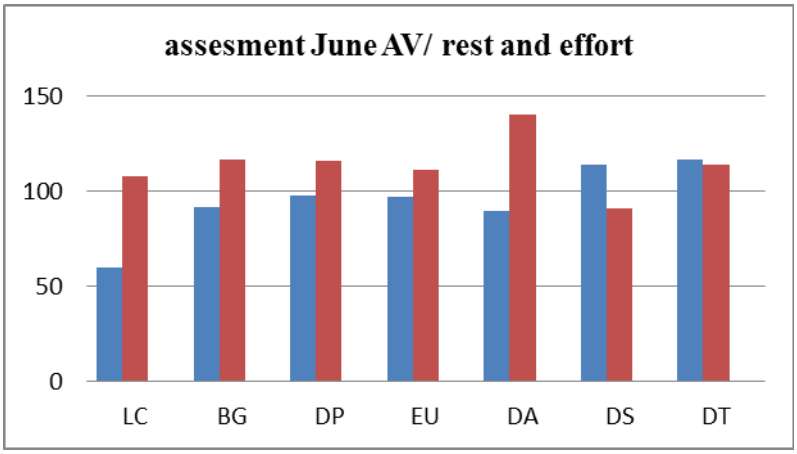
No.	Name and Surname	Age (years)	Rest			Effort		
			AV (min)	SaO2 (%)	TA (mm Hg)	AV (min)	SaO2 (%)	TA (mm Hg)
1	L C	17	60	84	138/77	108	99	140/82
2	B G	17	92	97	128/89	117	95	136/85
3	D P	15	98	79	142/90	116	99	145/90
4	E U	17	97	98	132/67	111	99	142/77
5	D A	12	90	96	132/72	140	99	140/70
6	D S	15	114	99	138/85	91	99	142/90
7	D T	15	117	97	125/70	114	96	130/82

Table no. 3.

Cardiovascular Parameters – November 2012

No	Name and Surname	Age (years)	Rest			Effort		
			AV (min)	SaO2 (%)	TA (mm Hg)	AV (min)	SaO2 (%)	AV (min)
1	L C	17	78	99	121/78	99	90	127/83
2	B G	17	87	95	124/88	91	62	133/81
3	D P	15	104	98	132/92	102	96	131/88
4	E U	17	93	95	130/71	130	95	138/72
5	D A	12	83	96	129/82	89	99	120/61
6	D S	15	110	99	125/93	109	94	133/85
7	D T	15	117	97	115/62	90	88	128/74

Medical Interpretation of the results



Graph no. 1. Cardiovascular Parameters – June 2012

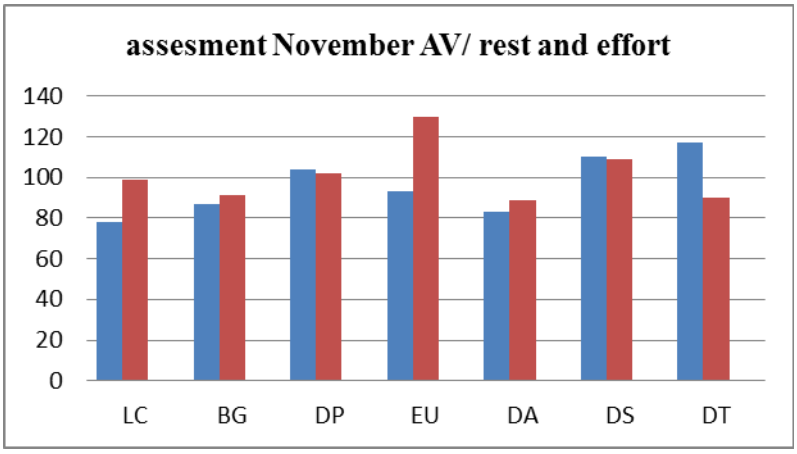
We can observe in the graphic above that we have extremely various AV evolution. The first three who have Down syndrome start with a medium value of rest, but we can't say that this is the standard value. It is possible that the bigger value of rest of DP can be present due to the presence of specialized equipment. After effort it can be observed a pozitive response, increasing AV, normal reaction when exercising and relatively close.

For the EU athlete we can observe a slight evolution from rest to effort, because he has good physical condition and more active motric activity, effort deployed being quite easy for the specificities of this child.

For DA, AV values are pretty high, but we must take into consideration autism also. This is reflected very well in evaluation after effort, the child being at his first swimming lessons, contact with strangers, which makes it very difficult for autism challaged children, who are agitated and reacting to the presence of the device in water.

For DS and DT we have a very interesting evolution. At first, the values are high, probably due to the presence of medical healthcare and devices. Later on, the values have decreased, because children have accomodated and relaxed. Children with

For children presenting serious conditions, water helps to relax and perform certain movements easier, which for those with paralysis, are very difficult to perform even on land.



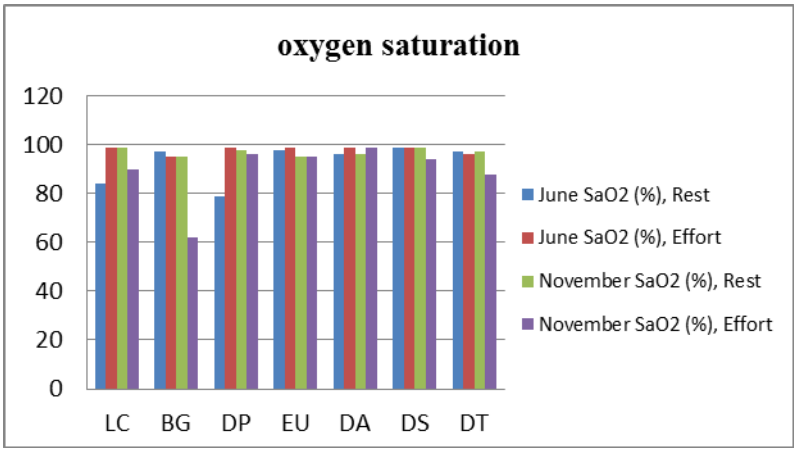
Graph no. 2. Cardiovascular Parameters – November 2012

In the evaluation carried out in November we have observed changes in the parameters evaluated. Thus the first three athletes with Down syndrome have a high enough AV value, because these children are eager to exercise in water and a little nervous when entering into the pool. On the other hand, it is very well observed that the value when doing effort, increases very little, even decreases at DP, who is a child with a quieter temperament. Because children feel extremely well in water, they are no longer nervous, nor frightened and they have adapted very well to the sporting activity, the difference between effort and rest is not very high.

For EU, rest values are approximately the same as they were when starting the activity, but the effort value is much higher, because this child swims very well, one full length of the pool without stopping, only with the assistance of volunteers, thus leading to a great effort for him.

For DA autist, the values are limited, a fact that demonstrates a complex adaptation to many factors: to effort during water exercising, to water pressure against organism and also to the external factors. This child presents a listless behavior, exercising in water being carried out at a slower pace, which reflects in reduced heart rate effort.

For DS and DT we consider that effort has firstly a relaxing effect. On the other hand, DS starts effort with a very high AV, mainly due to emotions, but maintains a high AV value because he succeeded swimming alone, supported only on aqua-tube. However, for DT water is an excellent environment for developing and doing certain movements. Due to the existing conditions, movements have reduced amplitude and very low realisation speed, being permanently helped by two volunteers.



Graph no. 3. Rating oxygen saturation at rest and during exercise, May and November

LC and DP have a starting value of SaO_2 less for June, when we started work. As a result of developed effort, a larger quantity of oxygen has mobilized, reaching 100%. Because children didn't make higher intensity exercises, the SaO_2 evolution is normal. After approximately 7 months activity, the concentration of oxygen has increased as weekly exercise is carried out, by mobilizing more often oxygen supplies. Values decreased after exercise because the body has adapted to the exercise conducted.

For BG we have the highest indicator of rest value, observing that after effort, the oxygen saturation decreases, in May as in November, due to the intense effort. It seems like the effort while participating in a contest is so intensely that consumes much of the body's oxygen reserves.

For EU, DA, DS and DT, children with severely affections, effort deployed by them is more peaceful. Thus, the exercise intensity being lighter, the development of the oxygen saturation is less fluctuating.

Table no. 4.

Blood pressure assessment, November / rest and exercise

No	Name and Surname	Rest	Effort
		TA (mmHg)	TA (mmHg)
1	L C	121/78	127/83
2	B G	124/88	133/81
3	D P	132/92	131/88
4	E U	130/71	138/72
5	D A	129/82	120/61
6	D S	125/93	133/85
7	D T	115/62	128/74

The evolution of blood pressure is presented under various aspects, according to each children particularities:

For LC, a child with physical integrity, swimming exercises have had a growing trend, but not with high or very high intensity. The effort that he can deploy is a moderate one, thus the blood pressure presents a slightly upward curve.

For BG, who develops higher intensity exercises with a higher oxygen consumption, the blood pressure evolution presents an upward curve, thus correlating with all values of the evaluated indicators, reflecting the fact that this athlete has a more energetic character.

DP was very emotional during blood pressure assesment, fact that led to obtaining a very high value. Then, doing a similar effort as participating in a competition, the value decreased, being actually the efective value of practical exercise.

EP is an athlete that performs adapted swiming without help, the physical effort that he deploys being much higher than the one of other athlets.

DA has autism and therefore an increased excitability, which makes the initial assessment of the blood pressure to be higher than after performing their exercise in water, that produce physical and mental relaxation of these children.

For DS and DT, children with tetraparesis and hemiparesis, every new thing that hey encounter leds to high excitability and fear, that could be very well observed when assesing blood pressure at rest. After conducting the physical activity, which they already know and have been practicing for 7 months, they have lower blood pressure, water having a benefic calming effect.

Conclusions

Children's contact with external elements has reflected in high values of physiological parameters, demonstrating that the influence of exogen and unknown factors is very high, especially for children with psychomotrical disabilities.

In June, after conducting new exercises, effort parameters have presented higher values for the ones who could perform moderate intensity effort and lower values for the children that relaxed and felt good in the pool (this applies to children with paresis and tetraparesis).

After 7 months of preparation with moderate workouts, the rest values have decreased, presenting a complex adaptation to environmental factors, to surrounding people, to effort deployed, not being influenced anymore by the external factors.

On the other hand, effort values have normally increased, as the ones of physical effort, or have decreased, as a moment of relaxation and recreation for children with paresis and tetraparesis.

The evolution of these values demostrates the natural and functional adaptation that the body does, through repeated training, to external stimulents.

Also, it is very important the fact that children with physical and mental disabilities have adapted so well to the aquatic environment that they relaxed during the swimming lessons and this caused a physical relaxation, evaluated by us through various indicators .

Conducting training with children with special needs has to be done with customized programmes and individual observation for each child and each condition separately.

Observing the physical parameters of children with disabilities has demonstrated that they too can develop adaptation to exercising, showing a positive track of the followed indicators.

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