

ASPECTS REGARDING THE MOTOR CAPACITY DEVELOPMENT IN CHILDREN WITH DIABETES

URZEALĂ CONSTANȚA^{1*}

ABSTRACT. This study is achieved and published under the aegis of the National University of Physical Education and Sports of Bucharest, as a partner in the program co-financed by the European Social Fund through the Sectoral Operational Programme for Human Resources Development 2007-2013, developed through the project Pluri- and interdisciplinary in doctoral and post-doctoral programmes, Project Code: POSDRU/159/1.5/S/141086, its main beneficiary being the Research Institute for Quality of Life, Romanian Academy. Our contribution to the project development is concretized in a research topic oriented towards the possibilities of interdisciplinary intervention on the body of persons suffering from diabetes. In this context, the objective of the present paper is to identify the motor potential of the child diagnosed with type 1 mellitus diabetes, as a landmark in dimensioning the physical exercise programmes developed simultaneously with nutritional, family and psychological counseling activities. The sample was made up of 11 diabetic children aged between 6 and 12 years. The assessment took place at the National University of Physical Education and Sports of Bucharest, in cooperation with the Medical Association “Support for Diabetes” and the Department of Pediatrics II within the “Marie S. Curie” Hospital. The motor tests were selected from the Eurofit test battery and were performed at the beginning of the first interdisciplinary intervention module, in October 2014. The results of this constative study have proved that the subjects participating in our research have a motor capacity development level encompassed within the limits corresponding to their current age stage.

Keywords: *diabetes, child, motor capacity*

REZUMAT. *Aspecte privind dezvoltarea capacității motrice a copilului cu diabet.* Acest studiu este elaborat și publicat sub egida Universității Naționale de Educație Fizică și Sport din București, ca partener în programul co-finanțat de Fondul Social European prin Programul Operațional Sectorial pentru

¹ UNEFS Bucharest

*Corresponding Author: ritmicuta@yahoo.com

Dezvoltarea Resurselor Umane 2007-2013, dezvoltat prin proiectul Pluri- și interdisciplinaritate în programe doctorale și postdoctorale Cod proiect: POSDRU/159/1.5/S/141086, al cărui principal beneficiar este Institutul de Cercetare a Calității Vieții, Academia Română. Contribuția noastră în derularea proiectului se concretizează într-o cercetare a cărei problematică este orientată spre posibilitățile de intervenție interdisciplinară asupra organismului persoanelor cu diabet. În acest context, obiectivul prezentei lucrări este de a identifica potențialul motric al copilului diagnosticat cu diabet zaharat tip I, ca reper în dimensionarea programelor de exerciții fizice, care se derulează simultan cu activități de consiliere nutrițională, familială și psihologică. Eșantionul a fost format din 11 copii cu diabet, cu vârste cuprinse între 6 și 12 ani. Evaluarea a avut loc în cadrul UNEFS București, în colaborare cu Asociația Medicală Sprijin pentru Diabet și cu secția Pediatrie II a Spitalului "Marie S. Curie". Probele motrice au fost selecționate din bateria de teste Eurofit și au fost susținute la începutul primului moduli de intervenție interdisciplinară, în octombrie 2014. Rezultatele acestui studiu constatativ au demonstrat faptul că subiecții participanți la cercetarea noastră au un nivel de dezvoltare a capacității motrice care se înscrie în limitele corespunzătoare etapei de vârstă la care se află.

Cuvinte cheie: diabet, copil, capacitate motrică

Introduction

This research is part of a more comprehensive scientific approach within the POSDRU/159/1.5/S/141086 project, through which we aim to render efficient the interdisciplinary intervention on persons with diabetes. Studies about the incidence of diabetes emphasize that in 2010, at global level, 6.4% of the adult population was diagnosed with this disorder. This percentage is estimated to reach 7.7% until 2030 (Dishman, Heath & Lee, 2013), the year when the World Health Organization prefigures that this disease will be the 7th cause of mortality in the world.

As to the incidence of diabetes in children, statistical data reveal that the number of cases differs depending on the race/ethnicity and the geographical area. The countries with the lowest degree of risk are thought to be Japan and Korea, while at the opposite pole, we find Finland and Sweden ("Familial insulin-dependent diabetes", 1991).

In Romania, the onset of diabetes mellitus between the ages of 0 and 14 records 3.48 cases/100,000 people/year (Moraru, Moraru, Oltean, Bozomitu, Bogdan & Stana, 2008).

Mellitus diabetes, popularly called “sugar disease”, represents a metabolic disorder affecting both the adults and the children, in the latter case being an autoimmune disease (Herrmann, Mutter, Rodl, Rose & Zaker, 2009).

There are two types of mellitus diabetes: type 1, a predominantly juvenile disorder that necessitates permanent insulin treatment and for which no prevention measures can be taken, and type 2, mainly affecting the overweight persons and which, in many cases, if identified in due time, can be kept under control through an appropriate diet (Dishman, Heath & Lee, 2013).

Regardless of the type of diabetes, if the disease is well-controlled and balanced, it doesn't represent a contraindication to motor activities. The type of physical exercises and, implicitly, the type of effort will be chosen in cooperation with the attendant physician, who will ensure that there are no side disorders that might restrict the practice of motor activities (Orgeret, 2008).

The treatment of diabetic children requires insulin administration, a proper diet and physical exercise. This emphasizes the existence of three factors the oscillations of which may lead to physiological imbalances (Bota & Teodorescu, 2007). Although many studies in the field prove the effect of physical exercises on the increase in glucose tolerance, in the case of type 2 diabetes, there is no conclusive evidence related to the glucose control improvement in the case of type 1 mellitus diabetes (“Sport – Eurofit for adults:”, 1995). However, the exercise intensity during the practice of motor activities will be correlated to the glucose values and the carbohydrate intake, pre-, intra- and post-effort.

In this context, any formative motor intervention on the child with type 1 mellitus diabetes relies on a good cooperation between family, teacher and diabetologist. We think that the physical exercise parameters are set after a minute analysis of the motor capacity development level, of the growth and development particularities, but also of the medical prescriptions.

Aims

This paper aims to identify the motor capacity development level in children with type 1 mellitus diabetes, as a landmark in dimensioning the physical exercise programmes applied in the context of an interdisciplinary intervention.

Methods and materials

As research methods, we used: bibliographical study, observation, testing and the Microsoft Excel software to calculate the statistical indicators.

The research was conducted at the National University of Physical Education and Sports of Bucharest, in October 2014, as part of a complex approach of educational intervention on both the diabetic child and his family, which required us to develop some modular programmes of motor activities and counseling. The initial motor assessment of the participants in this project was programmed at the beginning of the first module of activities, being followed by the prefiguration of the most efficient modalities of physical exercising. The sample was made up of 11 diabetic children from the Medical Association "Support for Diabetes" and the Department of Pediatrics II within the "Marie S. Curie" Hospital of Bucharest. The investigated insulin-dependent children were not medically exempt from the physical education and sports discipline imposed by the school syllabus. In order to identify the level of their motor capacity development, they had to perform many tests selected from the Eurofit battery, namely: sit-ups from dorsal decubitus with support (maximum number of repetitions within 30 sec.), trunk extension from ventral decubitus with support (maximum number of repetitions within 30 sec.), standing broad jump, sit-and-reach (for mobility), Flamingo balance test and tapping test. They were added tests for the coordination capacities, such as the Matorin test and a rhythm test, the latter for assessing the fidelity with which the subjects were able to reproduce a varied rhythmic sequence. With the support of volunteers from the UNEFS Student League and also of Graduates, we prepared the observation protocols and the individual assessment records, where we put down both the children's results and manifestations in relation to the glucose values registered before, during and after the end of the activity.

Results

The calculated statistical indicators allow us to have a global picture of the motor components that should be approached in the physical exercise programmes (table 1).

Table 1. Statistics for the motor capacity assessment

Test	Min.	Max.	Med.	Mean	St. dev.	Coeff. var.
Sit-ups from dorsal decubitus	12	27	12	17.54	4.48	25.54
Trunk extension from ventral decubitus	4	40	33	27.36	12.8	46.78
Standing broad jump	73	152	117	112.36	27.77	24.71
Sit-and-reach	-7	13	1	3	5.42	180.66
Turning jump to the right side	180	360	320	300.9	59.74	19.85
Turning jump to the left side	90	360	270	257.27	88.55	34.41
Flamingo	2	30	11	13.45	9.05	67.28
Tapping	13	32	18	19.27	5.04	26.15
Rhythm	6	10	8	8.27	1.1	13.3

Among the calculated statistical indicators, we insist on the coefficient of variability (Tudoş, 1993), which shows us that the group is non-homogeneous in the situation of the performed assessment, except for two tests, the rhythm and coordination ones. This is due to the age gap encompassing the research sample. That is why we tried as much as possible to take into account some clues considered to be standards for each age. Thus, to better assess the development level of the muscles strength, the results achieved by the investigated children were related to the minimal standard existing in the National School Assessment System for the physical education discipline (Filip, Scarlat, Dragomir, Mironescu & Predescu, 1999), corresponding to each grade.

In the sit-ups from dorsal decubitus, all the tested children managed to exceed the standard corresponding to mark 5 (with 12.9 repetitions on an average), respectively to the “sufficient” grade (fig. 1). The development level of the back muscle strength assessed through the number of trunk extensions from ventral decubitus emphasizes that 82% of the children have exceeded the minimal standard level, by recording an average equal to 27.36 repetitions, as compared to 10.81 repetitions. In the standing broad jump, the values achieved by the children are below the level specified in the minimal standards, the average being 112.36 cm, as compared to 122.72 cm (fig. 3). 36% of the subjects managed to reach/ exceed the length corresponding to their age.

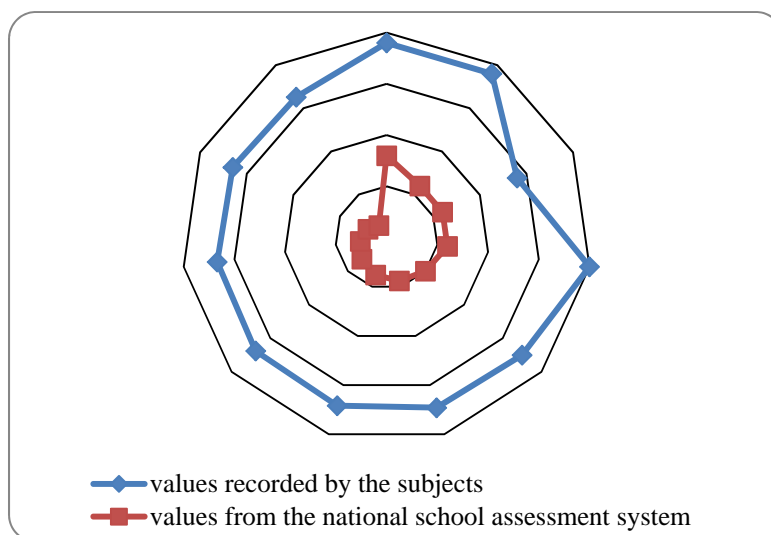


Fig. 1. Graph for the values recorded by subjects in the sit-ups from dorsal decubitus, in relation to the National School Assessment System

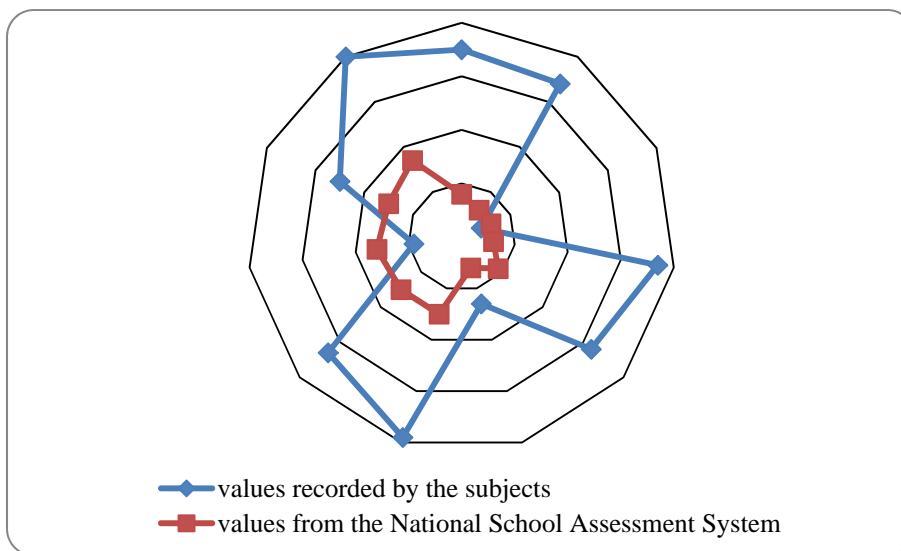


Fig. 2. Graph for the values recorded by subjects in the trunk extension from ventral decubitus, in relation to the National School Assessment System

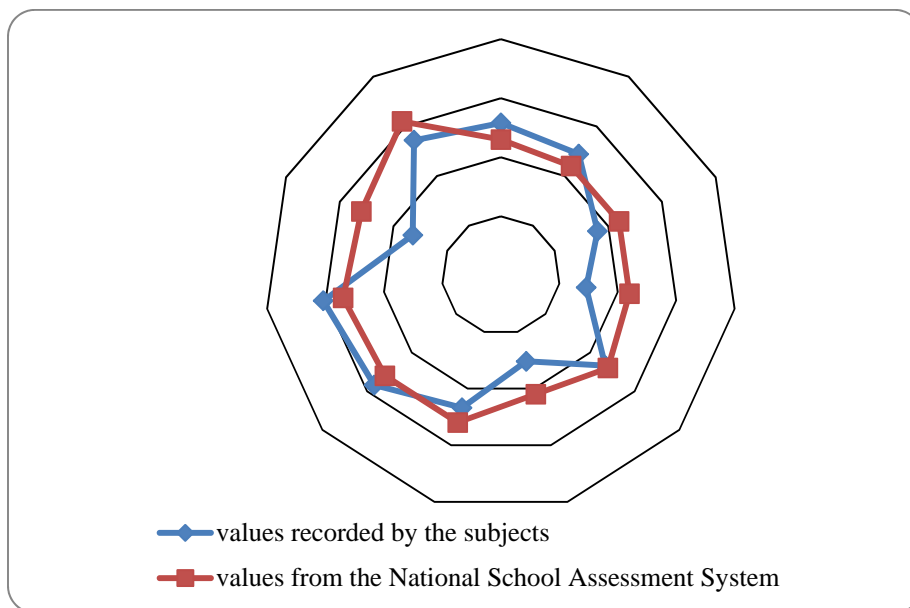


Fig. 3. Graph for the values recorded by subjects in the standing broad jump, in relation to the National School Assessment System

Mobility at the vertebral column and the coxofemoral joint levels was better in the case of the younger pupils compared to older pupils, the average being 4.16 cm versus 1.6 cm (fig. 4).

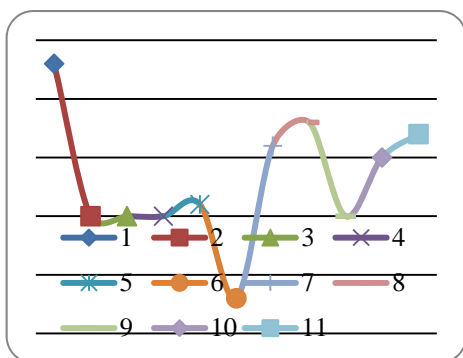


Fig. 4. Graph for the mobility values

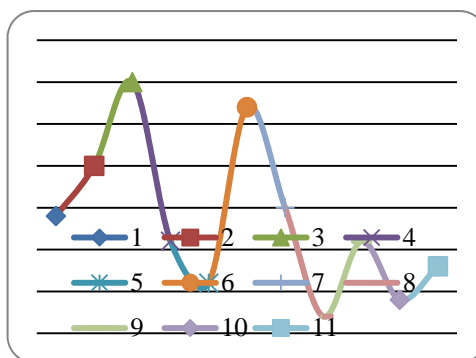


Fig. 5. Graph for the results in the balance test

The average obtained in the Flamingo test (13.45 balance losses/min) was influenced by the great amplitude of the data (fig. 5). General coordination investigated through the Matorin test indicated higher values in the case of the turning jump to the right side (300.9° compared to 257.27° to the left side), an aspect that could be explained by the fact that all the subjects were right-handed.

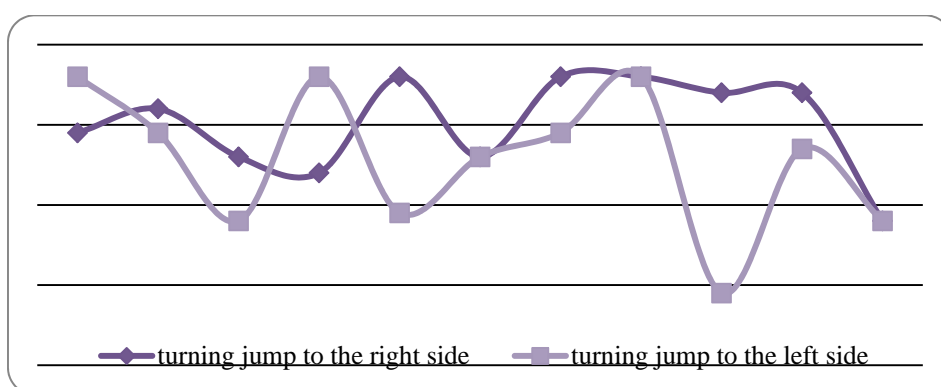


Fig. 6. Graph for the general coordination (the Matorin test)

The average for tapping was 19.27 sec., which proved a good repetition speed and coordination in the upper limbs. The average mark obtained by the children in the rhythm test (8.27) indicated a higher capacity of motor musicality and rhythmicity.

Discussions

The possibility to bring together, in a representative sample, children with type 1 diabetes is reduced, due to the number of recorded cases and to the parents' availability to get involved in this project, even if their participation doesn't require any expenses. The investigated children showed an increased interest in the proposed motor activities, they having a higher motivation even in the assessment lessons.

Conclusions

The study of specialty literature reveals that physical exercise represents the bio-antidote to hyperglycemia, while hypoglycemia is the most redoubtable enemy of the programmes of motor activities addressed to the child with type 1 mellitus diabetes.

The development of motor capacity components investigated through this scientific approach is situated at a level corresponding to the subjects' age, despite the existing metabolic diagnosis.

Knowing the initial level of the motor capacity development in children with type 1 diabetes represents a compulsory stage in dimensioning the physical exercise programmes, together with the permanent monitoring of the subjects' blood sugar, treatment and diet.

Acknowledgements

This study was achieved and published under the aegis of the National University of Physical Education and Sports of Bucharest, as a partner in the program co-financed by the European Social Fund through the Sectoral Operational Programme for Human Resources Development 2007-2013, developed through the project Pluri- and interdisciplinary in doctoral and post-doctoral programmes, Project Code: POSDRU/159/1.5/S/141086, its main beneficiary being the Research Institute for Quality of Life, Romanian Academy.

REFERENCES

- Familial insulin-dependent diabetes mellitus (IDDM) epidemiology: standardization of data for the DIAMOND Project. (1991). In *Bulletin of the World Health Organization*, nr. 69(6) (pp. 767-777). Retrieved from: <http://apps.who.int/iris/handle/10665/45646>
- Sport – Eurofit for adults: assessment of health-related fitness. (1995). Council of Europe Publishing (pp. 16-18). Retrieved from: http://books.google.ro/books?id=7k67209LK_EC&pg=PA9&lpg=PA9&dq=eurofit+manual&source=bl&ots=zljnhM8yFV&sig=X_TjIIDWp6InGwKI6iMc6zFQIgM&hl=en&sa=X&ei=h9lHVNSnAsTnywOQmYLQBA&ved=0CDwQ6AEwBQ#v=onepage&q=eurofit%20manual&f=false
- Bota, A. & Teodorescu S. (2007). *Exercițiul fizic în afecțiunile cronice* (pp. 67 – 69). București: EDP.
- Dishman, RK., Heath, G.W. & Lee, I.M. (2013). *Physical Activity Epidemiology* (pp. 244 – 248). Illinois: Human Kinetics.
- Filip, C. (coord.), Scarlat, E., Dragomir, P., Mironescu, I. & Predescu, S. (1999). *Sistemul Național Școlar de Evaluare la Disciplina Educație Fizică și Sport* (pp. 9, 16). Brașov: Imprimeriile Media Pro.
- Herrmann, A., Mutter, S., Rodl, M., Rose, T. & Zaker, C. (2009). 15 minute pe zi pentru sănătate (pp. 206 – 209). București: Reader's Digest.
- Moraru, D., Moraru, E., Oltean, C., Bozomitu, L., Bogdan, A. & Stana, B.A. (2008). Date actuale privind diabetul zaharat de tip 1 la copil. În *Revista română de pediatrie*, vol. LVII, nr. 3 (pp. 214 – 227). Retrieved from: http://www.medica.ro/reviste_med/download/pediatrie/2008.3/Pedia_Nr-3_2008_Art-8.pdf
- Orgeret, G. (2008). Le sport est un médicament bio. Trouver le sport adapté à son état de santé (pp. 59 – 62). Paris: Edition J. Lyon.
- Tudoș, Ș. (1993). *Elemente de statistică aplicată* (pp. 32 - 36). București.