

**MINISTRY OF EDUCATION, RESEARCH, YOUTH AND SPORT
NATIONAL UNIVERSITY OF PHYSICAL EDUCATION AND SPORT**

PHD THESIS ABSTRACT

SCIENTIFIC SUPERVISOR: Professor University MARINESCU GHEORGHE

PHD STUDENT: DUMANGIU MIHAIL ALEXANDRU

**THESIS TITLE: EDUCATION OF BALANCE AND GAIT IN CHILDREN
WITH CENTRAL MOTOR DISABILITIES BY MEANS OF PHYSICAL
EDUCATION AND PHYSIOTHERAPY**

KEYWORDS: cerebral palsy, balance, gait, kinetic program.

The theme presented is a case study that is treating the fundamental problem of the motricity in patients with cerebral palsy and that is walking learning under stable equilibrium conditions.

The thesis has three parts, consisting of 13 chapters which run over 248 pages. After content is presented the synoptic table which contains a significant number of figures, tables, graphs and pictures, and it ends with a consistent bibliography.

The first part of theory, titled „Theoretical Foundations of the Central type Motor Disability in Literature" includes six chapters with well documented information about the disease that is the subject of this paper.

In Chapter One, entitled „The Theme of Research“ it is argued the choice of the topic of this paper by the problems of the central type motor disability, which develops a barrier in the life of affected patients, but which we are trying to help them to overcome it.

Observing, analyzing and deciphering both the signs and clinical manifestations of spastic diplegia allow us, after many years of practice, to develop a complex technique to stimulate the education of both balance and walking, which can help the affected children to overcome the threshold between dependence and independence.

Here is presented both the knowledge of this condition in the literature, and also the fact that cerebral palsy is an open question of the research and of discovery of a more effective treatment options.

Chapters Two and Three present the central type motor disability, beginning from the definition given by one of those who founded the medical recovery in children. The information is richer, revealing the vastness of the clinical picture of cerebral palsy, that can affect hearing, vision, and which can lead to impaired phonation, and swallowing, to sensitivity and comitilality, being among the most costly diseases.

Muscle spasticity, muscle contracture and retracture, are both discussed briefly, those consequences of brain damage being the factors that are making the recovery being a matter of time, sometimes endless.

Chapter Four, entitled “Balance in Standing and Walking” presents the fundamental problem of this thesis, addressing balance and walking from a theoretical point of view.

Practical and theoretical information acquired over many years, allow us the issuing of a parallel between the balance and walking of a normal child and those of the child with brain injury.

Chapter Five, entitled “Kinetic Treatment“ passes through the stages which are leading up to an individualized recovery program, and is clearly establishing the possible changes in cerebral palsy, both the risk factors and elements that can contribute to 'manage' the best possible way the condition. It is very important to note that both deviations from normal, and deviations and deformities can be found dominantly in some joints, some of which having an iatrogenic cause.

In this section are also briefly summarized both stimulation methods and techniques that were the basis of the first stimulation programs, and that continue to be found as important items in a treatment program.

Chapter Six can be considered the standard of the neuromotor development of the normal children. This is the way which is traveling every child with a normal development.

As a conclusion to the first six chapters which are forming the first part of the thesis, it can be said that it was methodically pursued the creation of a precise and real image of what a central type motor disability represents.

Te Second Part of the thesis, called “Preliminary Study on the Influence of Plantar Support in Balance and Gait Education in Children with Central Type Motor Disability "is a preamble decryption of both balance and gait.

At the beginning of the preliminary study, we felt the need to devote the first two chapters, to the “foot as an organ of support”, highlighting in this way the importance that is invested in that body part. There are shortly summarized leg and foot anatomy, but also their biomechanics in standing and while walking. Both the

ankle joint and leg allowed movements, and the axes and planes of movement, are the subject for a fine analysis, which has a dominant role in the preliminary study.

Chapter Nine deals with the preliminary study itself. The premise that gives meaning to the issues of the second part is the normally involved leg which is participating in the body support with the largest area available. We believe that the need to conduct this preliminary study “is mandatory, beginning from the finding that in normal conditions, the best stability is those of the bodies which have a larger support base.”

Changes which occur in the central type motor disability at the foot level, differences in muscle tone, deviations from its normal longitudinal axis, are to decrease the effectiveness of plantar support. All this are generating the preliminary study objectives, which are oriented to correct and restore the role of organ of support that it has the leg.

Since this condition has several forms of spastic foot, the goal proves to be the revealing of the most effective forms of spastic foot from the dominant: equine foot, equinovarus foot or equinovalgus flat foot.

The hypothesis of the preliminary study is found in the idea that the support surface can have the dominant role in maintaining of static and dynamic balance. We consider that changes in the legs alignment (flexion of the knees, coxofemoral flexion or asymmetrical attitude of the body) may have a less negative influence in standing.

The choice of cases was made between children diagnosed with central motor type disability at the “Neuropsihomotor Recovery National Center for Children, Dr. Nicolae Robănescu” showing various forms of spastic foot. The research lot is composed of 15 patients, who frequently participate in recovery programs in our Center. Before using this information to create the preliminary study, efforts were made in a research which was completed by attending the International Congress of Rehabilitation Medicine and Balneology in Bucharest in 2007, titled, ” *Plantar Support in Orthostatic Posture and Equilibrium in Cerebral Palsy* , the motor level of these children being the main factor in their inclusion in our research group.

In preliminary research can be found several methods of investigation, including those related to muscle testing, joint amplitude measurement, posture evaluation, that are contained also in the research thesis. Specific for this part of the thesis are both podograma and podograph analysis and interpretation and interpretation of the degree of spasticity by Ashworth scale.

Test results of the applied tests, can be found well detailed in the presented tables and charts

Conclusions of the Second Part of the thesis are fluent, as a result of the systematization and of the implemented management.

As a consequence of the implemented quality management at the end of Second Part of the thesis can be drawn easily the following conclusions:

- Preliminary study shows an appropriate structure for a prior research, which aims to sustain the final part;
- As a result of the specific tests application for the plantar support, it can be said that the hypothesis of the preliminary study was confirmed;
- This study makes a transition to a more complex discussion of the distal low extremities and allows the integration of the results in the process of final conclusions.

The third part of the thesis is titled, "Personal Contributions, Data Analysis and Interpretation of Balance and Gait Education in Children with Central Type Motor Disability" and runs over four chapters.

Chapter Ten presents diachronically the stages made by the author, to achieve the final experiment.

Final research goals are related to the disorders caused by brain injury and have a specific and general character. Especially is the fact that among the general goals we found the idea of the relationship of trust between the therapist and the patient who can contribute to the improving of the final result.

The formulated goal, is "to test a variant to stimulate the body" which makes us think to a presentation of further personal contributions that can be tailored to the rehabilitation program of treatment of children and adults.

The research hypothesis proposes to us to rise the efficiency of the balance and gait education and by **the development of the control leg flexion movements in standing, by the increasing the range of motion of the knee extension in sitting and by rising the hip extension in standing** using the adapted kinetic stimulation programs. A problem you also want being resolved in the gait education is the speed of execution.

The research methods used are:

- The direct and indirect observation;
- The literature study;
- Experimental method;
- Assessment method by testing;
- Statistical and mathematical method of data processing;
- Graphic method.

From the statistical and mathematical methods we include:

- The arithmetic mean, a measure of central tendency
- The Friedman test, a nonparametric test for ordinal data
- The Kendall test, a correlation coefficient for ordinal data –a non-parametric test. It provides information about the correlation between variables included in the research hypothesis.

- The Linear Regression test, all these tests are found in the mathematic statistical program SPSS IBM Statistics Version 19 for Windows.

In section 10.8.5 we present the arsenal used in testing patients:

1. Goniometry measurements in order to appreciate the passive and active range motion of hip, knee and ankle joints, bilaterally;
2. Classical Romberg test, assessment test for the established static equilibrium;
3. Pushing test (“thrust test”);
4. Unipodal test support;
5. Flamingo balance test, the Eurofit battery of tests. Also applied for the assessing of the dynamic balance;
6. Platform balance test;
7. Berg Scale;
8. Tinetti scale;
9. Measuring of the speed of execution of the previous step.

These are subject to a laborious work, known as being the difficulty to persuade the children to participate in testing.

A major importance has, “the contents of the intervention” by its major linking with the value and results of therapy. Stimulation technique is presented effectively to achieve the ultimate goal, through educating of the standing and learning of walking upright, so through the independence of these children.

In Chapter Eleven there are presented the results of research. The Applied Statistical Analysis provides an image on paper of the practical results.

By comparison of the designed models we can see the superior value of model number 1, which is the content of the research hypothesis, this one having the highest value and being statistically significant.

These results allow us to support the statement found in Chapter Twelve, that the research hypothesis is confirmed, which enables us to conclude that the program of stimulation was valuable.

We note that the confidence that this program of stimulation can be both adapted and applied to persons who are older.

The proposals and suggestions made make us believe that the version of stimulation presented can help us to improve the living conditions of people who have special needs.