

YOUNG RESEARCHERS Scientific criticism, controversy**Bojan Bjelica¹, Radomir Pržulj¹**¹Faculty of Physical Education and Sport, University in East Sarajevo

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**IMPACT OF COMPLEX MOTOR EXERCISE
TO CEREBRAL PALSY PATIENTS****Summary**

Cerebral palsy (CP) is permanent disorder affecting body posture and movement in various areas of children's health status. Four original scientific papers have been the subject of research in this paper. All the above mentioned papers have answered the requirements concerning the subject matter and the aim of this paper. Aim of this paper is to establish impact of programming to CP patients. Method used was the selection of papers issued from 2003 to 2011. We drew the conclusion that physical activities of CP patients are at very low level due to the specific nature of the medical condition itself. Regular, professionally guided and persistent programmed agents and procedures with CP patients result in significant improvements. Various issues, especially in the adolescent age, may be addressed if problems uprising from the condition are addressed at early stage, in early childhood. Improvement can be expected in higher motivation, better functioning, greater physical stability, balance, coordination and other significant factors.

Key words: *cerebral palsy, physical activity, motor disorder, lesion*

1. INTRODUCTION

Cerebral palsy (CP) is a term which explains a group of syndromes of motor disorder of non-progressive nature which are a consequence of lesion or brain anomaly in early stages of development (Dormans et al., 2000). The condition is primarily connected to changes in posture and movement but it is also followed by additional numerous secondary issues which greatly affect health status and quality of life (Koman et al., 2004). There are certain components of CP patients' health status which can be positively affected by physical activity (Heimer & Duraković, 1999).

Research has shown that people with CP must maintain higher level of physical preparedness than healthy population in order to postpone deterioration of functional ability of organism connected to aging and consequences of primary damage to the organism (Rimmer, 2001). Planned physical activity aimed at increasing functional ability at early age lead to increase in oxygen intake and therefore improvement in stamina of the CP patients (Shinohara, Suzuki, Oba, Kawasumi, et al., 2002). Programmed exercise aimed at strengthening the

muscles of lower extremities result in extraordinary improvement in CP patients' condition and achieved results are lasting a long time (Blundell, Shepherd, Dean, et al., 2003). Such and similar programmes, using extra weight over specific time intervals lead to gaining better strength of lower extremities of CP patients (Unger, Faure, Frieg, 2006) as well as the increase of muscle tonus which provides better mobility of children with CP and which might have positive impact to leg muscles (Lee & Chon, 2013). Advantages for people who maintain their physical functions a higher level and who fight the problems caused by CP are numerous CP (Rimmer, 2007).

Proportion of improvement which can be achieved by people who perform certain forms of self-guided programmes for strength development and muscle engagement, compared to people who spend time in regular daily activities, is evident in fact that it is possible to achieve inhibited results in six weeks with CP patients. Such effects remain positive after strength trainings in the future (Dodd, Taylor, Graham, 2004).

Recent developments in the field of technology and methods for aiding, especially CP patients, are using games of 'virtual reality' which has the aim to engage as many body parts as possible into movement and lead to strengthening specific muscles and amplitude of movement which is desirable in such condition (Li, 2007).

Regular, team planned and programmed physical activity can have significant impact to changes of morphological, muscle, motor and cardio-vascular functions of healthy fitness of children with CP (Klajić et al., 2007). For better understanding, we provided classification and main causes of the disease in Table 1.

Table 1. Classification and main causes

Motoric syndrome	Neuropathology	Main causes
Spastic diplegia	Perventricular leucolamacia	Prematurity ischemia infection endocrine/metabolic causes
Spastic tetraplegia	PVL multicystic encefalopathy	Ischemia infection endocrine/metabolic causes. genetic
Hemiplegia	Brain infarction	coagulation disorder infection genetic
Extrapyramidal (aletoid/dyskinetic)	Basal ganglia Putamen Kernicterus Talamus	Asphyxiation mitochondrial disorder genetic

2. METHOD

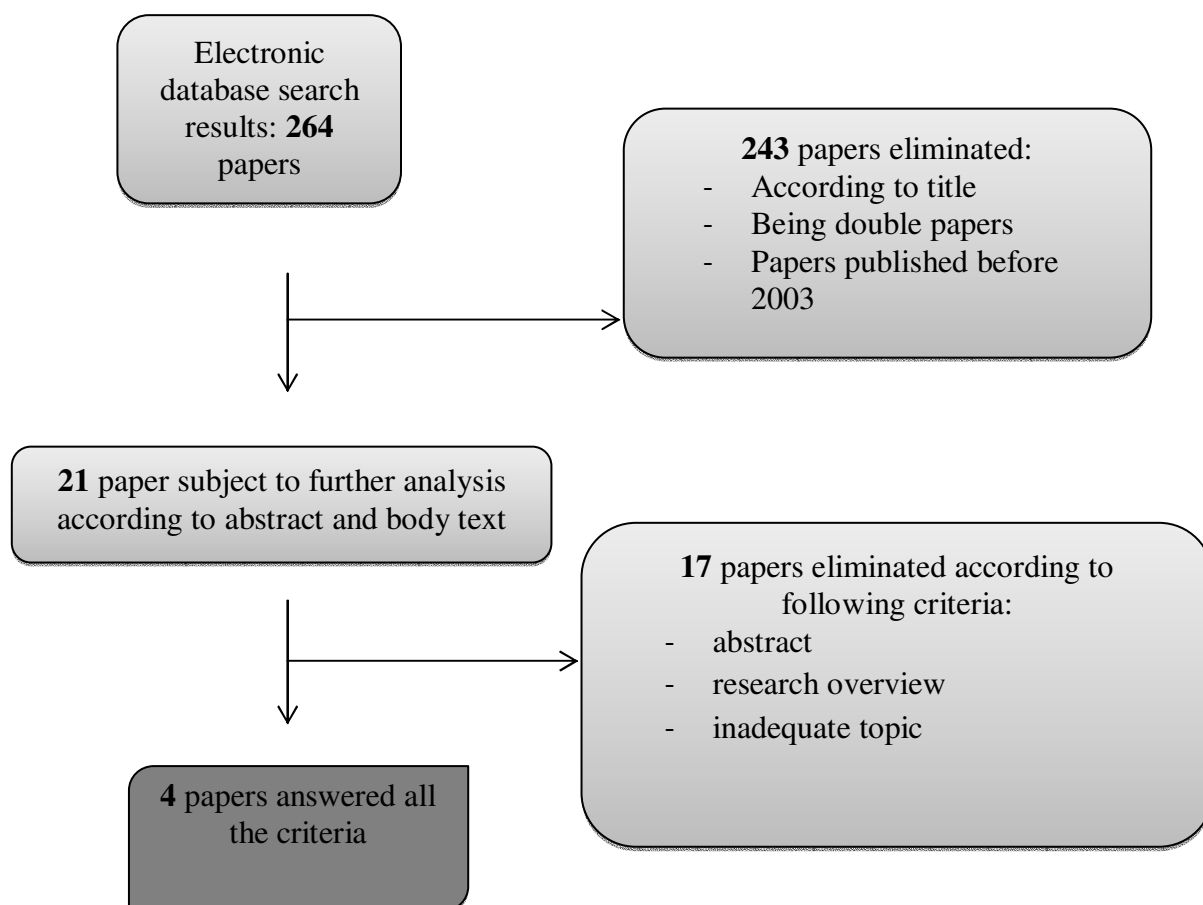
Research data for the purpose of this research was collected via electronic databases PubMed, Scholar Google and DOAJ. Search of publications was limited to period from 2003 to 2011. In database search key words used were: cerebral palsy, physical activity, motor

disorders, and lesions. Research titles, abstracts and entire papers found were then read and analyzed. In order to accept any of the found research for further analysis it had to answer two criteria, firstly that it is dealing with CP and secondly that it was performed in the above mentioned time frame. All the research which answered the criteria was then analyzed and presented according to following parameters: reference (first letter of the author and year, year the paper was published), sample with age and number of participants, programme of physical exercise, programme duration and research results.

3. RESEARCH RESULTS

Procedure of collecting, analysis and elimination of obtained papers is presented in Table 2. There were 264 papers identified according to key words. Number of research which was eliminated immediately according to title, doubling and issuing date (before 2003) was 243 and 21 was subject to further analysis. In the further analysis of the remaining 21 papers 17 were eliminated according to multiple criteria: abstract, because they were systematic research, non-existence of control group in the research. Remaining four papers answered the criteria which are publications from 2003 to 2011 and participants who are CP patients.

Table 2. Procedure of collection, analysis and elimination of obtained papers



In Table 2 is presented the protocol for obtaining papers which answer the criteria.

Table 3. Overview of papers

Reference	Population	Group	Treatment	Protocol	Results
Andersson et al. (2003)	People with SD. Part of population with aids, part in wheel chair.	EG (n=10 m/f, age 23-44), CG (n=7 m/f, age 25-47).	EG – programme of progressive strength training (speed of walking, speed of standing up, OMSUC), CG-SDA	EG – twice a week in 10 weeks, CG-SDA	Improvement in all the variables, impact on MS and ability to walk.
Unger et al. (2006)	School age children who are spastic CP patients	EG (n=21 d/d1, age 13-21), CG (n=10 d/d1, age 13-21).	EG – individually designed programmes, 8-12 exercises in 28 stations (3D analysis of walking, questionnaire) CG-SDA	EG – once or twice a week, 8 weeks, 40-60 minutes. CG-SDA	EG-significantly different from KG. speed, rhythm, length of steps not significantly changed.
Eek et al. (2008)	Children with bilateral spastic CP.	n=55, age 5-15, middle age 10,7 years.	Ratio of muscle strength and walking (eight muscle groups in legs by myometer)	Measuring standing, walking, running, jumping.	Differences in muscle strength and MS. Muscle weakness influences the walk.
Sandlundab et al. (2011)	Children with CP.	n=14, age 6-16.	MA and movement according to test mABC-2, test of motor knowledge BO, test of one minute walking and according to ETPS2.	Treatment at home lasting 4 weeks	Motivation and PI improved. Motor movement improved. Useful method for rehabilitation.

SD-spastic dysplegia; EG-experimental group; CG-control group; n-number of pšarticipants; SDA-standard daily activity; OMSUC-evaluation of overall motor ability; CP-cerebral palsy; 3D-Three dimensional; BO-Bruininks-Oseretsky test; ETPS2-EyeToy for PlayStation 2;d/d1-boys and girls; m/f-male and female; MA-motor activities; MS-muscle strength; MS-motor ability; PI-practical interpretation извођење.

4. DISCUSSION

Table 3 presents the overview of papers dealing with programmes of exercise for people with cerebral palsy. In the table are results of application of specific exercise programme as well as the methods used in work with the patients. Analysis of the data shows that various exercise programmes have mostly positive results in rehabilitation of patients with CP.

In the first row is data about the research conducted on the sample of 17 participants, 10 participants in the experimental group were aged 23-44 and 7 participants in the control group were aged 25-47 and they had spastic dysplegia. A number of participants was using walking aids whereas a part of group was using wheel chair for a prolonged period of time. Experimental group was under influence of programmed progressive strength training and under treatment twice a week for 10 weeks. They have improved walking speed, speed of getting up and overall motor abilities. Improvement and increase of muscle strength results in significant improvement in walking abilities for CP patients.

The second row presents research results of the research conducted on the sample of 31 school age children with spastic CP. Experimental group consisted of 21 participant and control group consisted of 10 participants. They were all aged 13-21. Program lasted for 8 weeks, twice a week lasting 40-60 minutes and it was designed individually for each participant who performed eight to twelve exercises on 28 pages offered stations of circular exercise method. Effects were measured by 3D overview of child's walk before and after experiment and a questionnaire. Effects compared to control group were positive, both in experimental results and the questionnaire where perception was significantly increased. Speed, rhythm and length of steps were not significantly changed.

The third row of the table presents research data for the sample of 55 participants aged 5-15 with bilateral spastic CP.

Ratio of muscle strength and walk was measured according to eight groups of leg muscles tested by manual myometer. Segments taken into consideration were: standing, walking, running, jumping. It was determined that muscular weakness influences walking.

Final, fourth row of the table presents research data on 14 participants with CP, aged 6-16. Aim was to research the possibilities of interactive game use as a motor activity for children with CP. Treatment lasted for four weeks. Children's motor abilities were significantly improved as well as the motivation due to the use of such contemporary manner of rehabilitation. Interactive game has proven to be a great choice. Specific motor effects have to be additionally subjected to research.

Total number of participants in this systematic overview was 117. Fourth row in the table had the smallest number of participants, 14, whereas the third had the largest, 55.

Rehabilitation programmes are mainly focused on establishing body functioning starting with muscle tonus and their strength, controlled energy consumption and other relevant issues we have mentioned in this research. Programme of progressive strength training which lasted for 10 weeks with training frequency twice a week had the best results in this research.

Paper presented in the third row dealt only with the ratio of strength and walking ability estimate for children with CP, whereas the paper in the first row had the longest programme duration-10 weeks.

5. CONCLUSION

CP is permanent disorder of posture and movement which reflects on many aspects of child's health status. Rehabilitation programmes are mainly focused on the body functioning starting with muscle tonus, controlled energy consumption, strength and other relevant issues mentioned in the research. Regular, professionally guided and persistent programme activities with the patients with CP give good results.

It is evident that treatments for strength development of the extremities are not sufficiently used and therefore we need to draw more attention to introduction of new and innovative concepts in that area. Only with the cooperation with the parents, CP patients and experts in creation of programmes for rehabilitation of CP patients shall we come to more positive and useful results which certainly present positive direction for the rest of their lives.

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