

Innovative extension of the educational system for physiotherapy students regarding functional improvement of infants and young children with central nervous system damage

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Abstract

Considering insufficient methodology for optimal mastering of daily activities by a child with cerebral palsy (CP), the key assumptions were presented that should facilitate the achievement of a set goal. They included: subordination of motor improvement to functional requirements (motor development directed at a specific goal), functional balance and appropriate motivation.

Pre-school children with CP require high-intensity functional exercises, as further focusing on motor development significantly limits the way of mastering everyday abilities and functioning in a school setting. This is important, because the effectiveness of improving motor skills decreases with age despite the intensification of exercises, and their continuation does not affect the learning of daily activities.

Key words: cerebral palsy, functional improvement, education of physiotherapy students

Extension of the physiotherapy curriculum regarding functional improvement of infants and young children with central nervous system (CNS) damage- introduction and justification.

Firstly, the concept of “functional improvement” should be defined. Functional improvement, understood as improved physical activity in its various aspects, should be differentiated from functional improvement regarding daily living activities, which is the issue dealt with in the present paper. Functional improvement of infants and young children with cerebral palsy (CP) is to develop and improve their mental, emotional and motor skills for mastering daily activities in future. According to numerous reports available in literature, such an understanding of functional improvements the main goal of rehabilitation of children with CNS damage. The authors of functional improvement

methods recognize the importance of independent (unaided) functioning of children with CNS damage; however, no consensus has been reached on the methods of teaching, such skills from the earliest period of development. Another factor delaying the development of functional improvement is a strict demarcation of the activities provided by a physiotherapist, speech therapist, sensory integration therapist and special pedagogue, hence the difficulty in combining all the management elements to focus on the development of independence in activities of daily living (ADL). Infants and young children with perinatal CNS damage should be prepared for ADL, taking into account their motor, emotional and mental development; therefore, there is a need for a new, eclectic method of functional improvement of these children.

Functional improvement of infants and young children with CNS damage in the selected physiotherapy methods

The Petö method

It is worth emphasising that Andras Petö [1] made an innovative attempt to reduce various dysfunctions in children with CNS damage. In his method group of children is guided by one professional, who combines the roles of various therapists [2]; the development of gross and fine motor skills is connected with the development of speech [3]. As a child grows up, the rehabilitation program is expanded to include the child's preparation for unaided functioning and development of daily living skills [4]. Moreover, the child is prepared to initiate school education. Such an approach was also presented by Milani Comparetii [5]. The Petö method is widely used in preschool children with CNS damage. The method is characterized by different forms of management, which other methods lack [6]. Petö emphasized that an infant should be motivated and prepared to interact with the therapist and parents by being emotionally involved. However, improvement of infants in a group creates organizational and methodological problems.

Karel and Berta Bobath method

The main objective of this concept [7-13] is to treat CNS damage in children as early as possible to gain normal sensorimotor experiences. Gaining proper sensorimotor experience during the first months of life creates optimal conditions for further motor development. Otherwise, the abnormal patterns become more persistent and infant uses them to maintain the basic positions and movements. After many years of work, the Bobath's came to the conclusion that, focusing on improving gross motor skills does not lead to the development of independent daily functioning

[14]. The Bobath's stressed the importance of functional improvement for future development and functioning in the community. Therefore, new motor skills should be used to integrate and develop sensory, motor and visual skills. This approach creates the basis for the development of manual dexterity.

The Vojta method

The main objective of this method [15] is to restore basic motor patterns for further optimal motor development. The method mainly develops big motor skills, neglecting the aspects essential for future independent functioning. The pattern of reflex rotation consists of four phases, which are also observed in proper development.

The Doman method

The Doman method [16], aimed at improving the development of children with severe CNS damage, raises reasonable controversies. The value of forced CNS oxygenation by temporarily increasing carbon dioxide in the inhaled air has been questioned. Moreover, there are certain doubts as to the efficiency of long-lasting passive exercises in the home setting with several individuals involved. Furthermore, the method does not provide any information or instructions regarding the development of independence in activities of daily living.

The importance of child's conscious participation in the rehabilitation process

Lack of understanding of the importance of emotional involvement and conscious participation of children in the rehabilitation process reduces the possibility of achieving optimal progress in their functional development. This aspect has been strongly stressed by Zofia Kułakowska [17-22]. "Physiotherapy based solely on the stimulation of reflexes from the lower movement control centres,

affects only an extremely small part of the patient's potential (e. g, the Doman, Vojta method). The child's sphere of activities - conscious action - remains beyond the scope of planned therapeutic methods, despite the importance of feedback [17].

Innovative assumptions of the physiotherapy program regarding functional improvement of infants and young children with CNS damage

The presented outline of the methodology of functional improvement of infants and young children with CNS damage was primarily based on the experience gained during twenty years of work of the Functional Adaptation Outpatient Clinic in Department of Neurological Rehabilitation at the Children's Health Centre in Warsaw. The elements of the Petö and Bobath method were used during rehabilitation of children. The group improvement program (infants were managed individually) was focused on:

- overcoming pathological postures and pathological movement patterns,
- functional improvement,
- development of functional balance combined with improvement of sensory integration,
- subordination of motor improvement to achieving goals,
- preparation for school education.

Noteworthy, all classes were organized in the form of cyclic two-week stays conducted by the same team. Based on the initial assessment, a specific program was designed enabling one person to conduct classes adjusted to motor skills, functional and mental development of children. Parents were always involved; thus, the therapeutic team could discuss all the issues with them and help them to understand the methodology used. This was essential for organising 3-month trainings in the home setting. The progress of children was videotaped and assessed during successive stays in the Centre

Selected aspects of the functional improvement program for infants and young children with CNS damage

The principles of the program were as follows:

- Motivation to motor activity.
- Subordination of motor activity to functional requirements, developing goal-oriented movements [18]
- Stages of development of gross and fine motor skills following one another and mutually interpenetrating.
- Functional balance in the sitting position on a chair, without rails, with the feet flat on the floor.
- Parallel development of emotional, mental, motor skills (language and social development).
 - The therapist should be able to use the instructions provided by special educators, speech therapists and psychologists.
- Cooperation of parents.

Anticipated effects of teaching students about functional improvement of infants and young children with CNS damage

The goal of extending the physiotherapy curriculum related to functional improvement of infants and young children with CNS damage is to change the proportion between motor and functional improvement, with an increased focus on functional improvement. These assumptions are in line with the concept of Bobath - "The last stage of the development of our treatment was the recognition of the fact that the treatment was not carried over into activities of daily life, as we had expected it would be" [14]. There is no evidence that any type of physical therapy can have a beneficial, lasting effect on motor functions, except for the therapy provided during early to middle childhood. Older children undoubtedly benefit more from the development of communication, cognitive, and recreational skills (involving family and society resources) instead of

endless therapy sessions.

Implementation of the innovative educational system for physiotherapy students aimed at improving the functional improvement of infants and young children with CNS damage

The opinions presented above confirm our approach to functional improvement of infants and young children with CNS damage and justify the presentation of assumptions important for functional improvement:

Functional balance

Functional balance is an ability to maintain balance while performing certain activities, e.g. reaching for an object outside the hand's reach (leaning).



Fig. 1. A ten-month-old boy with mild CP. Development of functional balance (photo by K. Metera)



Fig. 2. A nine-month-old girl with mild CP.

Development of functional balance
(photo by K. Metera)

A delay in functional development causes severe, abnormal motor reactions, including the fixation of abnormal posture and movement patterns, hindering functional transformation of motor skills.



Fig. 3. A four-year-old boy. Functional weight transfer and learning how to get on the step (photo by K. Gołębiewska)

Factors affecting functional balance improvement while sitting in the chair

The ability to sit in a chair is particularly important for further development. This position allows the child:

- to develop functional balance on a stable surface
 - as under natural conditions; in contrast to commonly used exercises on a moving surface
 - on rollers or balls. Such exercises develop balance, but not functional balance.
- to improve eye-hand coordination important for gross motor skills.
- to attempt standing up and walking.
- to develop the independence in activities of daily living.



Fig. 4. A boy with bilateral hemiplegia. Functional improvement (photo by K. Metera)



Fig. 5. B. Children with cerebral palsy. Development of functional balance (photo by A. Łańcucka)

The importance of sitting in a chair for integration of eye-hand coordination of gross motor activity:

Most of the functional actions (activities daily living - ADL) are based on the integration of eye-hand coordination with coordination of gross motor skills, which allows an infant and a small child to permanently control the appropriate mechanism. – using gross and fine motor skills in order to achieve functional purposes.

The role of a sitting position in the chair for the development of motivated standing up and walking is the result of:

- infant's desire to achieve a goal,
- shifting the increasing weight to the feet,
- multiple, motivated attempts to get up.



Fig. 5. A. Children with cerebral palsy. Development of functional balance (photo by A. Łańcucka)

This innovative system of teaching physiotherapy students will allow them to introduce more effective solutions to “functional improvement” of infants and small children with CNS damage

Conclusions

Based on the experience gained while managing infants and young children with cerebral palsy, the following conclusions were formulated

1. Despite the overall concept, movement improvement is not the main goal of functional improvement; but is one of the factors affecting its performance.
2. Functional improvement of infants and young children with damage to the central nervous system should combine goal-oriented motor activities with mental and emotional development to master daily activities.
3. Functional improvement is enhanced by the development of functional balance. The results of functional improvement are determined by the practical involvement of parents in this process.
5. Physiotherapists should be aware of and consider the above-mentioned issues to overcome some stereotypes associated with management of infants and children with cerebral palsy.

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