

Mikołajewska Emilia, Komendziński Tomasz, Dreszer Joanna, Bałaj Bibianna, Mikołajewski Dariusz. Role of toys in the development and rehabilitation of children with developmental disorders. *Journal of Education, Health and Sport*. 2015;5(4):224-228. ISSN 2391-8306. DOI: [10.5281/zenodo.16864](https://doi.org/10.5281/zenodo.16864)  
<http://ojs.ukw.edu.pl/index.php/johs/article/view/2015%3B5%284%29%3A224-228>  
<https://pbn.nauka.gov.pl/works/554863>  
<http://dx.doi.org/10.5281/zenodo.16864>  
Formerly *Journal of Health Sciences*. ISSN 1429-9623 / 2300-665X. Archives 2011 – 2014  
<http://journal.rsw.edu.pl/index.php/JHS/issue/archive>

Deklaracja.

Specyfika i zawartość merytoryczna czasopisma nie ulega zmianie.  
Zgodnie z informacją MNiSW z dnia 2 czerwca 2014 r., że w roku 2014 nie będzie przeprowadzana ocena czasopism naukowych; czasopismo o zmienionym tytule otrzymuje tyle samo punktów co na wykazie czasopism naukowych z dnia 31 grudnia 2014 r.

The journal has had 5 points in Ministry of Science and Higher Education of Poland parametric evaluation. Part B item 1089. (31.12.2014).

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Received: 15.02.2015. Revised 27.03.2015. Accepted: 10.04.2015.

## Role of toys in the development and rehabilitation of children with developmental disorders

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**Keywords:** rehabilitation; physiotherapy; developmental disorders; toy use; parent–child interaction; patient–therapist relationship.

### Abstract

Developmental disorders (called also developmental disabilities) are disorders beginning before age 18 and characterized by delay of developmental skills expected to achieve in particular age or developmental stage. Every effort toward new ways of intervention is precious, and achievement of the therapeutical success still constitutes true challenge. This study aims at assessment how toys can be incorporated into principles of the eclectic approach toward therapy of children with developmental disabilities.

### Introduction

Developmental disorders (called also developmental disabilities) are disorders beginning before age 18 and characterized by delay of developmental skills expected to achieve in particular age or developmental stage. Severity of aforementioned disorders vary

from mild to most severe. Unfortunately current recovery is limited. Its influence to health-related quality of life in infants and children may completely change their functional and cognitive abilities (and further: life attitude). Thus every effort toward new ways of intervention is precious, and achievement of the therapeutical success still constitutes true challenge.

Despite toys are commonly used in the treatment of children with developmental disabilities, research and scientific publications concerning this issue, especially in infants, are still rare. Toys are usually available, low-cost, fun, and functional ways to increase treatment possibilities. Novel technical solutions are well accepted by infants and children since rehabilitation robots and other therapeutic devices supported by virtual reality (VR) systems are popular way of neurorehabilitation.

This study aims at assessment how toys can be incorporated into principles of the eclectic approach toward therapy of children with developmental disabilities.

### **Toys in the therapy of infants**

Therapy of infants should be shaped as toy play, promoting requested child behaviors, including more advanced toy play [1]. Toy use can be early diagnostic tool for children with autism spectrum disorder (ASD). Modified Checklist for Autism in Toddlers (M-CHAT) as far as CHT-23 used with high sensitivity and specificity in 18-19-month old infants incorporate bringing objects to show parents [2]. Throwing a toy block indicates impulsivity in 18-months-old infants and can be predictor of attention-deficit hyperactivity disorder (ADHD) [3]. Ride-on toy car proved its effectiveness to explore their physical and social environment (including peers) in the case study of 21-month-old child with cerebral palsy [4]. Favourite results of developmental music groups on social behavior in premature and full-term infants under 24 months were showed in the research by Walworth [5]. Music toys can influence positively to responsiveness during toy play.

Toys for children with motor deficits support therapy and make easier child-therapist interaction. They can play crucial role in infants, where motivation and stimulation of the young patient is hard to achieve. The same toy can play important role in exercises performed with infant by parents/caregivers – such model of therapist-parent co-operation is often applied, allowing for provide almost 24/7 therapy

### **Toys in the therapy of older children**

Spontaneous game play with mobile toy robot allow for assessment interaction in autistic children, taking into consideration eye contact, touch, manipulation, and posture [6]. Also reduced playfulness in children with developmental disabilities may be treated using robot supporting play in impaired children [7]. Toy/object exploration was also observed in play of children with Down syndrome [8].

Intelligent multifunctional toys are the next step toward increased use of toys in the therapy of older children with developmental disorders. Simultaneous monitoring and stimulation of particular skills should aim at achievement of the best level of development accessible for each particular patients.

We are aware that for some children with developmental disorders level of full independence will be out-of-reach. Thus user-friendly supporting devices will be constant element of the environment of such patient.

## **Eclectic/mixed approach to intervention in infants with developmental disorders**

Key issue in children is quick achievement of the best outcomes available in the current health status of the patient, including both motor, cognitive, and social skills. Every week of delay can make a significant difference. Effectivity of rehabilitation is closely connected with the applied methods, techniques, and tools. Kind of exercises, way of stimulation and motivation, numbers of repetition, and level of the load and support (in motor impairments) plays an important role in recovery. But paying attention to one delayed skill is not reasonable. Balanced simultaneous development of all skills (motor, cognitive, social) can play a crucial role for quicker achievement of subsequent developmental milestones.

Despite advances in treatment NDT-Bobath method remains the most popular method of rehabilitation in children with developmental disorders (both infants and older children), but none of them is predominant. Various modifications provided within the core concept of Bobaths move the focus point toward eclectic approach to intervention. Use of toys as monitors and sources of stimulation may shape new mixed intervention strategies based on NDT-Bobath approach. But huge variety of possible developmental disorders, small patient characteristics, and associated medical, psychological, social, and economical factors makes aforementioned intervention difficult and individual. Combined methods, techniques and tools (even: assistive technology [9], toys, elements of environment, etc.) used within one therapeutic approach are often called eclectic/mixed approach.

We should be aware selected methods, techniques and tools may be contradictory or incompatible, which make joining them impossible. Thus creating patient-tailored approach need for deep knowledge and long experience.

## **Discussion and conclusions**

Application of detailed schemes describing use of toy in the therapy of infants with developmental disorders is difficult. There is a lot of unknown or uncharted applications of toys in such therapy. Toy library was used so far to enable expression of children with cancer [10], but this concept can be used also in children with developmental disorders.

Robots and artificial animals can be sources of social interaction in children with such problems. This way understanding of interaction and associated (indirect) social information can be easier. Artificial animals can play the same role as living animals, but its level of control is enormously huge. Thus stimuli can be more precise and pre-planned, and amount and time span of stimulation can be individually shaped. Computational intelligence techniques and advance in robotics and material science can make behaviour of such “artificial friend” as close to the original as possible.

Potential of VR and computer games in pediatric neurorehabilitation is still underscored. Many commercial devices pretend to play role of rehabilitation tools, but all there need for additional research, especially randomized controlled trials. The same problem is regarded as key in biofeedback-based devices. Despite many solutions there is lack of VR or similar solutions designed for infants.

Severe threats include ingestions [11] and toy-related injuries [12]. Understanding the epidemiology of injuries in children with developmental disabilities allow to reduce toy-related risks [13]. Consciousness concerning safe mobility, seating, transfers, in children with developmental disabilities plays the same important role as child's cognitive and behavioral level, developmental quotient or intelligence quotient.

There is still threat of so called brain enhancement, of course. But such risks are taken into consideration both by clinicians and engineers, and appropriate ethical rules are close to incorporation.

Few research makes necessary further search and selection based on evidence-based medicine (EBM) approach. It seems aforementioned work will never be finished. Novel developmental syndromes will require novel approaches. Development of novel approaches will be stimulated by new technologies applied in the area of diagnosis, intervention and care. Patients with more complicated disorders will require patient-tailored methods, techniques, or tools, supported by re-design and evaluation of studies of their efficacy. Compartmental studies and associated methodologies are necessary to compare two difficult approaches to the same syndrome.

We hope our vision of toys application in the development and rehabilitation of children with developmental disorders showed directions for further research. Aforementioned issue, despite still at the beginning of its development, seems be important area of pediatric research in 21<sup>st</sup> century.

### **Acknowledgement**

This work was conducted as a part of work within a project “NeuroPerCog: development of phonematic hearing and working memory in infants and children”, head: prof. Włodzisław Duch. The project is funded by the Polish National Science Centre (DEC-2013/08/W/HS6/00333).

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