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ACTIVITIES OF DAILY LIVING IN CHILDREN: THEORETICAL PERSPECTIVES IN OCCUPATIONAL THERAPY

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Background: Cerebral palsy (CP) is a leading cause of childhood disability, affecting 1 in 500 newborns globally. Hemiparesis, a common form of CP, limits upper limb function and impacts activities of daily living (ADL). Constraint-induced movement therapy (CIMT) is a proven intervention for improving motor function, promoting greater independence. This study evaluates the effectiveness of modified CIMT (mCIMT) in enhancing hand function and ADL performance in children with unilateral CP.

Methods: A systematic review was conducted to analyze mCIMT protocols, focusing on therapy duration, immobilization methods, and age-related outcomes. Key indicators assessed included motor improvements, ADL proficiency, and quality of life.

Results: mCIMT significantly improves ADL performance, enhancing self-care skills, grasping function, and bimanual coordination. Recent studies (e.g., Tanabe et al., 2025; Reidy et al., 2023) show notable gains in PDMS-2, PEDI, and PMAL scores ($p < 0.01$) in children 6–8 years old, with a threefold increase in affected hand use. Hybrid and home-based CIMT models demonstrate comparable efficacy to clinic-based interventions, improving therapy accessibility.

Discussion: Research suggests that mCIMT, especially when combined with bimanual training, leads to superior outcomes. Higher therapy doses and shaping techniques are particularly beneficial for older children. Task-oriented and engaging rehabilitation strategies enhance participation and motivation, maximizing treatment benefits.

Conclusion: mCIMT is a highly effective rehabilitation method, improving ADL, upper limb function, and independence in children with CP. Further research is needed to standardize intervention protocols and explore long-term effects, ensuring sustained improvements and broader therapy accessibility.

Key words: *rehabilitation, occupational therapy, school environment, occupational therapy services, quality of life, recovery, independence, self-care, occupational participation, activities of daily living.*

Маргарита Виноградова, Олександра Калінкіна. Активність повсякденного життя дітей: теоретичні аспекти в ерготерапії

Вступ. Церебральний параліч (ЦП) є однією з основних причин інвалідизації дітей, уражаючи 1 із 500 новонароджених у світі. Геміпарез, як найпоширеніша форма ЦП, обмежує функцію верхньої кінцівки та впливає на активності повсякденного життя (ADL). Індукована обмеженням рухова терапія (CIMT) є доказовим методом покращення моторних функцій та сприяє збільшенню рівня незалежності. Це дослідження оцінює ефективність модифікованої CIMT (mCIMT) у покращенні функцій руки та виконання ADL у дітей з унілатеральним ЦП.

Методи. Проведено систематичний огляд для аналізу протоколів mCIMT, з акцентом на тривалість терапії, методи іммобілізації та вікові особливості. Основними критеріями оцінки були покращення моторних функцій, рівень виконання ADL та якість життя.

Результати: mCIMT значно покращує виконання ADL, включно із самообслуговуванням, функцією хапання та двосторонньою координацією. Останні дослідження (Tanabe et al., 2025; Reidy et al., 2023) показують суттєві покращення в PDMS-2, PEDI та PMAL ($p < 0.01$) у дітей віком 6–8 років, а також триразове збільшення використання ураженої руки. Гібридні та домашні моделі CIMT демонструють аналогічну ефективність порівняно з клінічними втручаннями, що покращує доступність терапії.

Обговорення. Дослідження свідчать, що mCIMT, особливо в поєднанні з бімануальним тренуванням, дає кращі результати. Вищі дози терапії та методи поступового ускладнення (shaping) є особливо ефективними для старших дітей. Використання цілеспрямованих завдань та мотиваційних підходів збільшує залученість дітей, сприяючи максимальній ефективності терапії.

Висновок. mCIMT є ефективним методом реабілітації, який покращує ADL, функцію верхньої кінцівки та рівень незалежності в дітей із ЦП. Подальші дослідження необхідні для стандартизації протоколів втручання та оцінки довгострокових ефектів, що забезпечить стабільні результати й ширший доступ до терапії.

Ключові слова: *реабілітація, ерготерапія, шкільне середовище, ерготерапевтичні послуги, якість життя, відновлення, незалежність, самообслуговування, заняттєва активність, активність повсякденного життя.*

Introduction. Cerebral palsy (CP) is the most common cause of childhood disability worldwide, with a prevalence of 1 in 500 newborns and an estimated 17 million individuals affected globally [1; 2]. Hemiparesis, as one of the primary clinical manifestations of CP, occurs in 17 % of preterm children and 56 % of full-term children diagnosed with CP [3; 4].

Occupational therapy is a key component of rehabilitation aimed at enhancing independence and quality of life for individuals with functional limitations. Its primary goal is to facilitate the development, recovery, or maintenance of essential skills required for performing daily activities. Constraint-induced movement therapy (CIMT) is one of the effective occupational therapy interventions widely used in the rehabilitation of children with hemiparesis [1; 2].

Recent studies indicate that the application of CIMT in children with CP not only enhances upper limb motor function but also has a positive impact on overall balance, movement coordination, and social participation. This evidence suggests that occupational therapy combined with CIMT can significantly improve the activity levels and functional independence of children in their daily lives [5; 6].

The goal of this study is to analyze the effectiveness of modified constraint-induced movement therapy in children with cerebral palsy, with a particular focus on the duration of intervention, type of limb immobilization, and the age of participants.

Materials and Methods. This study presents a review of recent scientific research exploring the practical application of mCIMT as a primary occupational therapy intervention for children with hemiparesis. The analysis includes variations in therapy duration, immobilization techniques, age-specific outcomes, and different organizational approaches to intervention programs.

Results. Children with hemiparetic CP experience limitations that affect multiple aspects of daily life, including independence in self-care tasks, participation in play and group activities, and proper motor development. These restrictions can hinder their ability to engage in social interactions and delay functional progress.

The lack of rehabilitation increases the risk of secondary complications, such as joint stiffness, muscle atrophy, spasms, pressure sores, contractures, and arthropathy, which significantly reduce quality of life and limit the ability to perform daily activities. The use of non-affected limb restriction is justified by its high effectiveness in restoring the function of the paretic limb, which in turn positively impacts performance in activities of daily living (ADL) and instrumental activities of daily living (IADL), ultimately improving children's quality of life and functional independence.

Current scientific research supports the effectiveness of CIMT and its modified version (mCIMT) in restoring upper limb function in children with hemiparetic CP [1; 2; 5–8]. Additionally, studies confirm that CIMT significantly enhances the ability of children to perform essential ADL tasks, fostering greater autonomy and participation in everyday life [9–14].

The study by Tanabe et al. (2025) evaluated the effectiveness of modified pediatric constraint-induced movement therapy (P-CIMT) conducted in home-based settings with remote consultations. The study included 10 children aged 6–8 years (6 boys, 4 girls) diagnosed with unilateral cerebral palsy (UCP) and classified at MACS levels II–III. The 15-day intervention consisted of daily training sessions using special gloves instead of traditional immobilization devices. Instead of completely restricting movement in the non-affected hand, soft immobilization methods were used to enhance safety and reduce the risk of falls [9].

The results demonstrated significant improvements in ADL performance, particularly in self-care skills, object grasping, and visuomotor integration. PDMS-2, PEDI, and PMAL scores showed substantial increases after the intervention ($p = 0.01$), with the frequency of affected hand use tripling. The therapeutic effect remained stable three months post-intervention, although some decline was noted in self-care task performance. The study confirmed that P-CIMT is an effective approach for enhancing motor function and independent ADL performance, and that home-based therapy can serve as a safe and accessible alternative to traditional clinical rehabilitation settings [9].

The study by Reidy et al. (2023) analyzed the effectiveness of a hybrid tele-rehabilitation model for delivering P-CIMT compared to a traditional in-clinic approach. Conducted at the Kennedy Krieger Institute in the United States during the COVID-19 pandemic, the study explored telehealth as a crucial tool for providing rehabilitation to children with hemiparesis. The researchers examined two cases where children with UCP initially underwent hybrid tele-rehabilitation P-CIMT, followed by clinic-based therapy. The hybrid model combined online parent instructions, remote supervision, and periodic in-person visits to the clinic [10].

The results indicated significant upper limb function improvements, assessed through the Assisting Hand Assessment (AHA) and Quality of Upper

Extremity Skills Test (QUEST). The progress achieved through hybrid P-CIMT was comparable to traditional in-clinic therapy, confirming the sustainability of treatment effects. Notably, children who began therapy in the hybrid format retained their progress before transitioning to in-person intervention, reinforcing the effectiveness of tele-rehabilitation. Additionally, parents felt more confident in supporting their children, highlighting the value of coaching-based rehabilitation approaches. The study concluded that tele-rehabilitation could serve as an effective alternative for families with limited access to specialized clinics, while the hybrid model could reduce financial and time-related burdens associated with traditional in-person therapy [10].

The study by Christmas et al. (2018) evaluated the effectiveness of two P-CIMT methods in improving upper limb function in preschool-aged children with hemiparetic CP. Conducted as a randomized controlled trial (CATCH TRIAL) across 16 pediatric therapy centers in the United Kingdom, the study included 62 children who were divided into two groups. One group received prolonged immobilization of the affected hand using a specialized splint, while the other underwent intermittent manual constraint applied during therapy sessions [11].

The primary outcome measures included the AHA, the QUEST, and the Pediatric Quality of Life Inventory (PedsQL) [11]. The study aimed to determine the effectiveness of these two different CIMT approaches in enhancing motor function, bimanual coordination, and quality of life in young children with unilateral CP.

The results of the study demonstrated that after 10 weeks, both groups showed improvements in the use of the affected hand during ADL. However, the prolonged immobilization group achieved a higher increase in AHA scores (9.0 points vs. 5.3 points in the intermittent manual constraint group, $p < 0.001$). Additionally, this group received more active therapy time (60 minutes per day vs. 30 minutes) [11].

After 24 weeks, the difference between the groups diminished, suggesting the need for further research on the long-term effects of CIMT. Researchers highlighted that prolonged immobilization provides more intensive hand training, leading to better short-term outcomes. However, both CIMT strategies were effective in improving ADL performance in children with hemiparesis, reinforcing the overall benefits of CIMT-based interventions [11].

The study by Bansal & Diwan (2021) compared the effectiveness of mCIMT and hand-arm bimanual intensive therapy (HABIT) in children with spastic hemiplegic CP. The focus was on qualitative improvements in upper limb motor function and enhanced performance in ADL [13].

The study included 26 children aged 2–10 years, randomly assigned to two groups: one received mCIMT (wearing a constraint sleeve for 6 hours daily and performing unimanual tasks for 2 hours per day for 10 days), while the other underwent HABIT (bilateral intensive training for 6 hours per day for 10 days). Functional improvements were assessed using the QUEST and the Canadian Occupational Performance Measure (COPM) [13].

Both groups exhibited statistically significant improvements, which remained stable one month post-intervention. While mCIMT and HABIT were equally effective in improving upper limb motor function ($p < 0.001$), mCIMT had a greater impact on ADL performance, particularly in independent dressing, utensil use, hygiene routines, and fine motor skills. Parents reported a higher satisfaction level following therapy, confirming functional improvements in real-life situations. These findings suggest that mCIMT is particularly effective for enhancing daily independence, reinforcing its role in occupational therapy interventions for children with CP.

The researchers concluded that both methods are effective in improving upper limb function in children with CP. However, mCIMT had a significantly greater impact on ADL, which may contribute to greater independence in everyday life [13].

The narrative review by Dihidar et al. (2024) analyzes the effectiveness of CIMT in improving hand function in children with CP. The authors highlight that upper limb impairment is one of the primary barriers to independence for children with hemiparetic CP, significantly affecting their ability to perform ADL. The review includes 30 scientific studies, of which 21 confirmed the effectiveness of CIMT in enhancing upper limb motor function [12].

Findings from the reviewed studies indicate that CIMT significantly improves ADL performance in children with hemiparesis, particularly in self-care tasks, bimanual activities, and fine motor skills. Several studies emphasize that therapy intensity is a key factor, and that mCIMT — which incorporates bimanual training elements and functional task integration — may be more effective than traditional CIMT. Additionally, the authors stress that therapy duration, the use of motivational play-based approaches, and family involvement are critical for enhancing intervention outcomes.

This study underscores the importance of CIMT in improving motor skills and fostering independ-

ence in children with CP while also highlighting the need for further research to determine the long-term effects of therapy [12].

The study by Roberts et al. (2022) evaluated the effectiveness of repeated doses of group-based hybrid P-CIMT in children with UCP. The primary focus was on enhancing hand function, improving bimanual coordination, and assessing the long-term retention of acquired skills after multiple therapy sessions [14].

The study included 15 children aged 5–15 years (9 boys, 6 girls) who participated in two intensive therapy camp sessions. Each session consisted of 50 hours of constraint-based therapy and 10 hours of bimanual tasks, incorporating 30-minute daily training with the Hocoma Armeo®Spring robotic system. Hand function was assessed using the AHA scale before and after each therapy course [14].

The study demonstrated significant improvements in affected hand function and bimanual skills after each therapy course. The initial mean AHA score was 55.93 ± 12.78, increasing to 63.07 ± 12.85 after the first course. Following the second course, the mean AHA score further improved from 58.13 ± 14.83 to 66.53 ± 12.82. These findings highlight the positive impact of repeated doses of P-CIMT on hand functionality, which plays a crucial role in enhancing ADL. Children demonstrated greater ability to use both hands in daily tasks such as dressing, using utensils, washing hands, and buttoning clothes [14].

One of the key conclusions of the study is that therapy effects gradually diminish between courses, but repeated P-CIMT sessions help restore and improve motor skills. This underscores the importance of regular therapy cycles to maintain long-term benefits and enhance ADL performance in children with UCP [14].

The study by Andrew M. Gordon et al. analyzed the effectiveness of CIMT and HABIT in children with UCP. Based on research involving over 100 participants since 1997, the study emphasized that high-intensity therapy is the key factor for success, regardless of the specific method used [15].

Findings indicate that 90 hours of therapy yield better outcomes than 60 hours, particularly for older children, who may require higher session frequency and the shaping method to reinforce motor learning. HABIT was found to be effective in improving coordination and functional skills, which transferred to unpracticed tasks. However, HABIT required a higher therapy dosage than CIMT to achieve similar improvements. The authors also highlighted that combined CIMT+HABIT approaches could be promising but require sufficient intensity to be effective.

The key takeaway from the study is that proper dosing (duration and frequency of therapy) is more critical than the specific therapy method, making it an essential consideration for long-term rehabilitation planning [15].

Given the available research, mCIMT is an effective method for children with hemiparetic CP, but further investigation is required to determine the optimal intervention duration, immobilization type, and potential combination approaches. Meta-analyses suggest that researchers are working toward defining the best therapy parameters, but a standardized protocol has yet to be established.

Oskoui et al. [2] emphasize the importance of early intervention, as children who began therapy between the ages of 2–4 years demonstrated better adaptation and skill retention even one year after completing therapy. Similarly, Mamotenko et al. (2023) [16] highlight the psychological aspects of therapy, noting that comfortable immobilization devices and parental involvement positively influence children's motivation, making them more engaged in the rehabilitation process.

Conclusion. The results of this study confirm the effectiveness of mCIMT in improving upper limb function in children with hemiparetic CP. The therapy has shown a significant impact on enhancing children's ability to independently perform ADL, including dressing, utensil use, hygiene routines, and fine motor skills. Research also confirms that longer and more intensive therapy yields better outcomes, especially for older children, who require additional time for adaptation and skill retention.

Scientific data suggest that combining mCIMT with bimanual training and cognitive-motor tasks can enhance therapy effects and contribute to longer-lasting functional improvements. Other key factors include motivational play-based methods, parental involvement, and flexible immobilization approaches, which reduce discomfort and increase child participation. Despite significant advancements, further research is needed to determine the optimal therapy duration, frequency, and immobilization methods, as well as to evaluate the long-term effects of mCIMT in children with CP.

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