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Assessing the Efficacy of Intermittent Intensive Physical Therapy in Pediatric Cerebral Palsy

Rekha Chitrada*, Kamalakannan M., Senthilkumar Natarajan, Varsha Anbu, Akshaya Venkat, Shathurshini B. S., Sai Nikesh M., Sri Kanth V.

Saveetha College of Physiotherapy, Saveetha Institute of Medical and Technical Sciences, Chennai, Tamil Nadu, India.

***Email:** drchitradarekha@gmail.com

Abstract

Background: Cerebral palsy (CP) is a prevalent neurological disorder affecting children worldwide, particularly boys, with spastic CP being the most common form. Despite its prevalence, effective rehabilitation strategies for severely disabled children with CP remain limited.
Objective: This study aimed to evaluate the feasibility and effectiveness of a 6-month rehabilitation program for severely disabled children with CP, utilizing alternating intense therapy sessions and rest periods, to enhance gross motor function.
Methods: Employing a multiple-baseline design, the study assessed changes in motor performance using the Gross Motor Function Measure (GMFM). Visual and statistical analyses, including descriptive statistics and paired t-tests, were conducted to evaluate outcomes. Results: Participants received an average of 60 treatments over the 20-week trial, exceeding expectations. Seven out of ten children exhibited significant increases in GMFM scores, with a mean improvement of 9.2% (range 3 to 15%; $p < 0.05$). Importantly, all participants maintained motor function during rest periods, with a high compliance rate of 93.1% during intense therapy.
Conclusion: The study highlights the potential of the proposed rehabilitation program to improve gross motor function in severely disabled children with CP. These findings provide valuable insights for developing more effective and sustainable rehabilitation strategies for this population.

Keywords

Intermittent Intensive Therapy, Cerebral Palsy, Gross Motor Functional Classification System.

Introduction

Cerebral palsy is a broad term encompassing a range of disorders characterized by motor impairment resulting from non-progressive brain injury during infancy. It is a lifelong condition that affects individuals in various age groups. Understanding the distribution of cerebral palsy across different age ranges is crucial for providing appropriate interventions and support throughout the lifespan (AbdElmagid et al., 2021).

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The prevalence of cerebral palsy varies across age groups, with certain age ranges being more commonly affected than others. Among infants and toddlers, which include the age groups of 0-2 years and 3-5 years respectively, cerebral palsy is relatively common (Upadhyay et al., 2020). The incidence tends to decrease as children enter the age range of 6-13 years and remains stable during the teenage years of 14-18. However, the occurrence of cerebral palsy in adults (41-60 years) and seniors (60+) is relatively rare compared to the earlier age groups. Gender differences play a significant role in cerebral palsy, as more boys are affected by this condition than girls (Clutterbuck et al., 2019). The exact reasons for this disparity are not yet fully understood, but research suggests that biological and genetic factors may contribute to the higher prevalence among males.

The study by (Janssen-Potten et al., 2023) in children with severe impairment (GMFCS levels IV-V) underscores the significance of this research. Understanding the impact of intermittent intensive physical therapy on this population is crucial for optimizing cerebral palsy rehabilitation. This study aims to assess the feasibility of a 6-month program incorporating alternating intense therapy sessions and rest intervals, providing insights into practicality and tolerability. Tracking changes in gross motor function during therapy and rest periods allows for assessing immediate effects and retention of gains.

Methodology

Study Design

This study employed a multiple baseline design in Saveetha Hospital to systematically evaluate the intervention's impact on gross motor function in children with cerebral palsy. The design allowed for both within-patient control, through the experimental phase (Phase B), and between-patient control, through the staggered duration of the baseline phase (Phase A).

Participants

Inclusion criteria- confirmed cerebral palsy diagnosis, no surgical interventions or additional issues impacting rehabilitation. Ethical approval obtained. Ten participants enrolled (6 males, 4 females) aged 12-36 months. Males: 4 right hemiparesis, 2 left hemiparesis, 2 delayed milestones; GMFCS Level III. Females: 3 delayed milestones; GMFCS Level IV. Participants selected based on diagnosis and GMFCS level.

Intervention

During Phase A of the study, participants underwent therapy sessions twice a week for a duration of four weeks. This phase served as the baseline assessment, where participants received standard care practices. These traditional physical therapy sessions were administered at a lower frequency, typically one to two sessions per week. The therapy sessions during Phase A focused on fundamental aspects such as stretching, strengthening, and functional activities.

In Phase B, the intervention phase of the study, participants followed a more intensive

rehabilitation program. This comprehensive rehabilitation program aimed to address various aspects of motor function and was administered four times per week for a duration of 12 weeks, denoted as Phase Bt (treatment phase). The therapy sessions during Phase Bt included a range of interventions such as stretching exercises, strengthening exercises, balance training, gait training, and functional activities. These sessions were designed to improve muscle flexibility, strength, balance, walking abilities, and overall motor function. Each therapy session lasted approximately 60 minutes with rest period of 5 minutes for every 30 minutes.

Following the 12-week treatment period (Phase Bt), participants entered an 8-week rest period denoted as Phase Br. During Phase Br, participants did not receive any therapy sessions, allowing for recovery and observation of the sustainability of motor gains achieved during Phase Bt. This alternating pattern of treatment (Bt) and rest (Br) was repeated twice over the 20-week experimental period.

The purpose of this design was to assess the effectiveness of the intensive rehabilitation program compared to standard care practices. By comparing motor function changes during the treatment (Bt) and rest (Br) periods in Phase B, researchers aimed to evaluate the immediate effects of therapy as well as the retention of motor gains during rest intervals. This comprehensive approach provided valuable insights into the impact of therapy intensity on motor function outcomes in children with cerebral palsy.

Outcome Measures

Gross Motor Function Classification System (GMFCS) assessed at baseline, end of baseline, and before/after each treatment period, with dimension scores collected.

Data Analysis Procedure

Descriptive statistics summarized participant characteristics and outcomes, with inferential statistics (ANOVA) analyzing changes in GMFCS scores ($p < 0.05$). Qualitative analysis explored participant experiences.

Results

Baseline Phase: Table 1 shows treatment numbers during baseline phase A. Motor performance in children aged 1-7 remained stable, with slight improvements. No significant changes were seen in children aged 8-10. Experimental Phase: Table 1 displays sessions during the trial phase. All children improved their overall GMF scores, notably seven aged 1-7. Three showed minimal progress. No decline in motor performance was noted. After initial therapy, scores improved in seven aged 1-7, but remained unchanged in three aged 8-10 and Figure 1 shows the results.

Discussions

The research landscape on treatment intensity's impact on early intervention effectiveness is nuanced. While some scholars like (Sorsdahl et al. 2020; Lee, 2017) advocate for exploring higher treatment frequency, contrasting perspectives exist. Studies by (Lee et al. 2017) suggest more

frequent sessions yield better outcomes, yet (Labaf et al. 2015; Paul et al. 2022) didn't strongly support this notion. (Brandao et al. 2018; Ghorbanpour et al. 2019) even found increased therapy didn't necessarily improve upper-limb function, echoing concerns about understanding unique benefits and methodological challenges.

Recent research Tezcan et al. (2022) underscores that therapeutic frequency doesn't consistently enhance outcomes, and escalating intensity might have downsides. In this context, our study's approach of alternating between intense therapy and rest intervals offers a nuanced perspective. By acknowledging the limitations of continuous high-frequency therapy and considering the needs of individuals with severe disabilities, we suggest a more tailored treatment approach. This strategy aligns with emerging evidence and provides a potential solution to the complexities surrounding treatment intensity in early intervention.

Table 1. Number of sessions received during Phase A and Phase B

Participants	Duration(wk)	Received/ 28(days)	Duration(wk)	Bt¹ Received/ 42(Days)	Bt² Received/ 42(Days)	Before Treatment GMFM Scores %
1	4	25	12	38	32	45.2
2	4	22	12	35	34	57.1
3	4	20	12	34	36	53.2
4	4	26	12	37	40	43.2
5	4	24	12	39	36	51.4
6	4	25	12	35	36	54
7	4	27	12	38	36	58.7
8	4	22	12	30	36	47.5
9	4	21	12	38	33	40.2
10	4	25	12	23	20	45.2

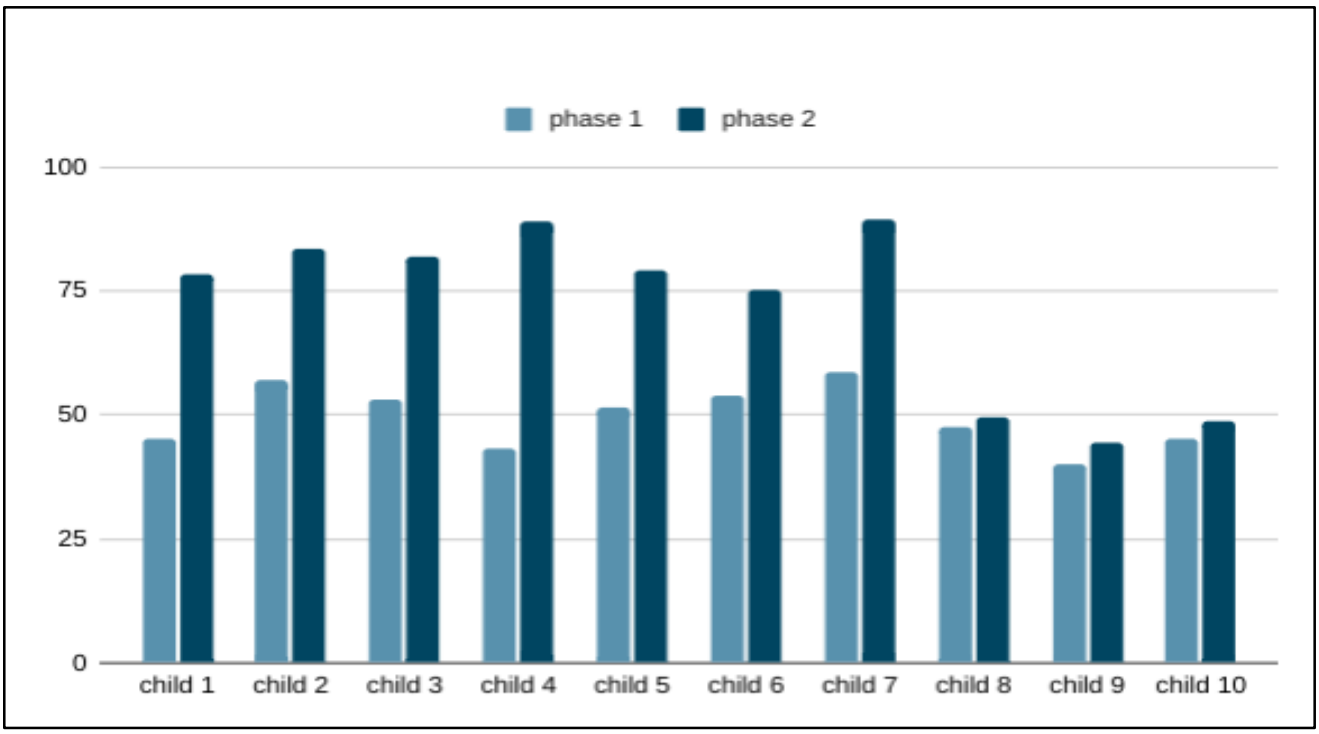

Figure 1. Results of Phase A and Phase B (Phase 1=Phase A , Phase 2=Phase B)

Conclusion

The study's findings suggest that alternating high-frequency therapy with rest intervals can improve motor function in children with hemiparesis. This balanced approach optimizes effectiveness while preventing exhaustion, indicating promising avenues for enhancing treatment outcomes and promoting the well-being of young patients with motor deficits.

Study Contribution and Importance

This study evaluates intermittent intensive physical therapy in pediatric cerebral palsy, offering practical insights to optimize rehabilitation strategies. It addresses research gaps in specific rehabilitation methods for pediatric cerebral palsy, aiming to improve patient outcomes and enhance the quality of care.

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