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CASE REPORT

An individualized intermittent intensive physical therapy schedule for a child with spastic quadriparesis

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ABSTRACT

Current research literature supports the use of intensive physical therapy (PT) for children with cerebral palsy (CP) but lacks consensus on the selection of a specific therapy schedule. The purpose of this case report was to describe the use of an individualized intermittent intensive PT schedule for a child with CP who was otherwise seen following a traditional, two times per week, schedule. The patient was a 4.5-year-old girl with spastic quadriparesis, GMFCS level III. The new schedule was tried over a 3-month period. Each of the 3 months included a 2-week, five times per week intensive therapy phase, followed by a 2-week resting phase. Outcomes were assessed by using the GMFM-66 and by documenting the attainment of functional gross motor skills related to the patient's PT goals. Intervention included TAMO therapy and family instruction. The patient demonstrated a gradual increase in GMFM-66 scores throughout the 9-month period covered by this case report, with the greatest mean change score obtained when the intermittent intensive therapy schedule was used. Acquired skills were retained and even improved during the resting phases. The child's parents expressed their interest in using the new PT schedule in the future.

INTRODUCTION

Parents of children with cerebral palsy (CP) frequently look for alternative methods of therapy to address their child's progress in motor skills. These methods, including conductive education (Darrah, Watkins, Chen, and Bonin, 2003; Odman and Oberg, 2006; Reddihough, King, Coleman, and Catanese, 1998; Stiller, Marcoux, and Olson, 2003) and the use of the Adeli suit (Bar-Haim et al, 2006; Semenova, 1997), usually involve intensive therapy schedules, compared to one or two times per week physical therapy (PT) that these children traditionally receive. Recently published research demonstrated no significant difference in outcomes of intensive PT, compared to conductive education (Odman and Oberg, 2006; Stiller, Marcoux, and Olson, 2003), and intensive neurodevelopmental treatment, compared to an Adeli suit program (Bar-Haim et al, 2006). It appeared that the intensity of therapy might be the main variable responsible for the functional progress demonstrated by the study participants for all of the intervention approaches mentioned above (Bar-Haim et al, 2006; Odman and Oberg, 2006; Stiller, Marcoux, and Olson, 2003).

Bartlett and Palisano (2000) emphasized that it was important to identify factors contributing to change in basic motor abilities of children with CP. Those factors could then be manipulated and optimized to improve the long-term outcomes of intervention. The intensity of therapy may be one of those factors. Several research studies addressed the issue of the optimal frequency of therapy and demonstrated a trend toward greater improvement seen with intensive therapy schedules (Bower, McLellan, Arney, and Campbell, 1996; Bower et al, 2001; Trahan and Malouin, 2002). In a randomized controlled trial with 44 children with CP, aged 3–11 years, Bower, McLellan, Arney, and Campbell (1996) showed slightly greater benefits of 2-week intensive PT than a conventional PT schedule. They defined conventional PT as 1–3 hours of intervention provided over

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2 weeks, and intensive therapy as 6–10 hours of intervention provided over the same time period. Another randomized controlled trial (Bower et al, 2001) involved 56 children with CP, aged 3–12 years, classified at level III or below on Gross Motor Function Classification System (GMFCS) (Palisano et al, 1997). These children were followed for 18 months to compare the results of routine and intensive therapy as measured by the Gross Motor Function Measure (GMFM) (Russell, Rosenbaum, Avery, and Lane, 2002) and Gross Motor Performance Measure (GMPM) (Boyce et al, 1998). The investigators defined routine PT as 6 hours of intervention provided over 3 months, and intensive therapy as 44 hours of intervention provided over the same period of time (Bower et al, 2001). Overall, they found no significant difference in GMFM and GMPM scores between the groups with routine and intensive therapy schedules. Although there was a trend shown toward a statistically significant improvement in the groups receiving intensive therapy over a period of 6 months, this advantage was lost over the following 6-month period when the therapy schedule returned to routine. Receiving intensive therapy for 6 months proved to be very demanding for the study participants, their parents, and therapists (Bower et al, 2001).

Trahan and Malouin (2002) used a multiple-baseline design in a pilot study with five children with severe forms of CP. This study compared intensive PT provided four times per week for 4 weeks followed by an 8-week rest period over 6 months to conventional PT provided two times per week for 6 months. The researchers found statistically significant increases in GMFM scores during the intermittent intensive therapy phase in three of five subjects. All the subjects tolerated this therapy schedule well and retained their skills during the rest periods. These results indicated the need to reassess the PT schedule routinely provided to children with CP in clinical practice (Trahan and Malouin, 2002).

On the basis of research summarized above, it appears appropriate to further explore intensive PT schedules with children with CP. However, the following questions arise: 1) Which of the suggested intensive therapy schedules is the most beneficial for functional progress in a child with cerebral palsy? and 2) Is it appropriate to select the intensity of therapy based on individual characteristics of the patient and the family wishes while taking into account current research? These questions were asked by the parents of a child with spastic quadriparesis when they were considering alternative therapies for their daughter and in the process, became interested in selecting the most beneficial PT schedule for her. They wanted to know whether, as suggested by the literature (Bower, McLellan, Arney, and Campbell, 1996; Bower et al, 2001; Trahan and Malouin, 2002), she would demonstrate greater improvement in her gross motor skills if she underwent intensive PT compared to her regular schedule of two times per week. They were also interested in trying an intermittent intensive therapy schedule, because according to published research (Trahan and Malouin, 2002), it seemed to be more "family-friendly" than continuous intensive therapy over a long period of time that might be too demanding for the family (Bower et al, 2001). However, these parents were not comfortable with the 8-week breaks between high-frequency intervention periods as suggested by Trahan and Malouin (2002), because they were concerned that their daughter would not be able to retain her level of function for such a long period of time without therapy. Through the therapist's discussion with the parents, a consensus was reached, and a new PT schedule was tried for 3 months.

The purpose of this case report was to describe the use of an individualized intermittent intensive PT schedule for a child with CP, GMFCS Level III (Palisano et al, 1997). The new schedule was tried over a 3-month period of time preceded and followed by a traditional, two times per week, therapy schedule. The child's progress was assessed with the GMFM-66 (Russell, Rosenbaum, Avery, and Lane, 2002) and by documenting the attainment of functional gross motor skills related to her PT goals.

CASE DESCRIPTION

History

The patient was a 4.5-year-old girl with spastic quadriparesis functioning at GMFCS Level III. This child had been receiving home-based PT with the current therapist twice per week for approximately 2.5 years.

The patient was born at 26.5 weeks gestation with a birth weight of 820 g and hospitalized in the Neonatal Intensive Care Unit (NICU) for 2.5 months. She required mechanical ventilation for 3.5 weeks and oxygen supplementation for a total of 6 weeks. The infant was referred to the NICU Developmental Follow-up clinic at discharge from the hospital and was followed there until the age of 18 months. At that time she was diagnosed with spastic diplegia. An MRI showed bilateral ventricular dilation, on the left greater than on the right, with some white matter damage bilaterally. Later, her pediatrician diagnosed her with spastic quadriparesis. The patient started home-based Early Intervention services (physical

and occupational therapy) at 8 months of age and was referred to the current therapist at the age of 22 months. She was receiving PT at home two times per week until the new PT schedule was initiated. In addition, she attended a preschool where she received physical and occupational therapy one time per week that included 20 minutes of individual and 20 minutes of group therapy for each discipline. The project was approved by the Institutional Review Board at Midwestern University, Downers Grove, IL, after which the child's mother signed an informed consent document.

Examination and evaluation

At the beginning of the 9-month period of this case report, the patient was 4.5 years old. She was a very bright and curious little girl who was able to independently transition in and out of side-sitting and bench sitting from a quadruped position, independently reciprocally creep, crawl up a flight of stairs with minimal to stand-by assistance, and crawl down a flight of stairs with supervision. In addition, she was able to independently pull up to stand, cruise along furniture, maintain unsupported standing for up to 20–25 seconds, transition from standing into a squatting position with upper extremity support on the floor, and take up to 6–8 independent steps walking prior to the loss of balance. Her initial GMFM-66 score was 57.09, with a 95% confidence interval (CI) between 54.80 and 59.38 points (Table 1).

TABLE 1 GMFM-66 scores, change scores, and mean change scores across 9 months of varied PT schedule.

PT schedule	Testing session #	GMFM-66 score	GMFM-66 change score	Mean change score
2 x week	1	57.09	N/A	
	2	56.15	-0.94	0
	3	56.86	0.71	
	4	57.09	0.23	
5 x week	5	58.8	1.71	
	6	59.33	0.53	
	7	57.86	-1.47	0.5
	8	60.09	2.23	
	9	60.39	0.30	
	10	60.09	-0.30	
2 x week	11	59.33	-0.76	
	12	58.09	-1.24	0.13
	13	60.09	2.00	
	14	60.62	0.53	

The patient wore bilateral hinged ankle-foot orthoses (AFO) 6 hours per day and stood in a prone stander on average 7 hours per week. She did not use an assistive device for walking at home and moved around mostly by crawling on hands and knees. However, she worked on ambulation with a reversed wheeled walker during her PT sessions at preschool. Over the past 2 years, this child received Botulinum toxin injections into bilateral hip adductor, hamstring, and gastrocnemius muscles five times, with the last injections performed only into bilateral hip adductor and hamstring muscles.

Using the top-down approach to PT examination and evaluation (Effgen, 2005), the patient's PT goals were developed in collaboration with her parents. These goals were related to increasing her mobility by improving her ability to transition from supine into a ring sitting position in order to sit up in bed; learning to transition to and from standing without using furniture for support; increasing the number of independent steps she was able to take walking in her home; and improving her stair-climbing skills.

The patient's strengths that would assist her in achieving her PT goals and challenges that would potentially impede her progress (Effgen, 2005) were identified on the basis of the results of her observational movement analysis, GMFM-66 testing, passive range of motion measurements using a goniometer, and muscle tone assessment. The list of strengths included the child's abilities to move independently on even surfaces inside her home, transition in and out of side-sitting and supported standing, and initiate independent stepping without support. In addition, she functioned at a high cognitive level and had a very loving and supportive family who were very interested in helping her to progress toward her PT goals.

The challenges that would potentially impede the patient's progress were related to decreased static and dynamic sitting and standing balance; the inability to sit up in bed from a supine position; and her difficulty with independent upright ambulation due to spasticity in her hip adductor, quadriceps, hamstring, and gastrocnemius muscles, which negatively affected her active range of motion. Passively, she demonstrated hip abduction with hip and knee flexion to 75° and hip abduction with hip and knee extension to 40° bilaterally. The patient's popliteal angle passive range of motion was 13° on the right and 10° on the left, and her ankle dorsiflexion with knee extension was measured at 38° bilaterally. Despite sufficient passive range of motion available in her lower extremity joints, the patient displayed hip, knee, and ankle muscle weakness, which in combination with spasticity led to her inability to perform isolated movements. As the result, while walking

barefoot, she demonstrated hip adduction and medial rotation, mild crouching, and an equinovarus ankle alignment in the stance phase of gait with weight-bearing through the forefoot.

Physical therapist

The patient was seen at home by a licensed pediatric physical therapist with an advanced master's degree and Pediatric Clinical Specialist Certification who had more than 10 years of clinical experience. She was certified in Tscharnuter Akademie for Motor Organization (TAMO) therapy (Tscharnuter, 2002) and was consistently using this approach with the patient.

Outcome measure: GMFM-66

The GMFM is an assessment tool designed to measure change in gross motor functional skills in children with CP (Russell, Rosenbaum, Avery, and Lane, 2002). There are five dimensions of GMFM items: 1) Lying and Rolling; 2) Sitting; 3) Crawling and Kneeling; 4) Standing; and 5) Walking, Running, and Jumping. The original version of the GMFM contained 88 items. The newer and shorter version, the GMFM-66, developed by applying Rasch analysis (Linacre, 2006; Portney and Watkins, 2009) to the GMFM-88, contains 66 items scored on a four-point ordinal scale (from 0 to 3). A computer program (the Gross Motor Ability Estimator or GMAE) converts ordinal raw GMFM scores into Rasch scores on an interval scale (Russell, Rosenbaum, Avery, and Lane, 2002).

The authors of the GMFM-66 (Russell, Rosenbaum, Avery, and Lane, 2002) used data from a reliability study conducted for the GMFM-88 to calculate reliability estimates for the GMFM-66. They reported a high level of stability of this instrument over time (ICC = 0.9932), high reliability of item difficulties over time (ICC = 0.966; $p < 0.001$), and high reliability of child ability scores using different items (ICC = 0.975; $p < 0.001$). The original study of reliability conducted for the GMFM-88 yielded ICC ranging from 0.92 to 0.99 for intrarater reliability; from 0.87 to 0.99 for interrater reliability; and from 0.83 to 0.98 for reliability of judgment of change (Russell, Rosenbaum, Avery, and Lane, 2002).

GMFM-66 administration and scoring

To become proficient in using the GMFM-66, the therapist completed self-instructional training offered on a CD-ROM (Lane and Russel, 2003) and routinely used this outcome measure with the patient monthly to evaluate her PT progress over a 6-month period. In the 3 months preceding the trial of an intermittent intensive therapy schedule, the GMFM-66 was administered at the beginning and at the end of the first month and at the end of each subsequent month, for a total of four outcome scores. During the intermittent intensive therapy period, measurements were taken after the 2-week intensive therapy phase and again at the end of each resting phase, for the total of six outcome scores. After the return to the traditional therapy schedule, the GMFM-66 was administered four times, at the end of each of subsequent 4 months.

Intervention

In the first 3 months preceding the trial of a new schedule, the patient received PT two times per week for 60 minutes. In the next 3 months, the new therapy schedule was implemented. The child received PT five times per week for 60 minutes for 2 weeks and then rested until the end of each month. After the conclusion of the intensive therapy phase, PT schedule returned to two times per week.

PT sessions

The therapist conducted all PT sessions in the child's home and used TAMO therapy with her throughout the report period. As described by Tscharnuter (2002), TAMO therapy is a motor organization approach that was developed on the basis of dynamic theories of motor control. The therapist does not move the patient through space but provides task-specific, gentle loading to the child's body to change the force distribution, with the emphasis on the adaptation to gravity and to the supporting surface. This challenges the patient to adapt to a new situation. Spontaneous exploration of the child's environment is encouraged to develop the variability of movement that may be applied in different situations (Rahlin, 2005; Tscharnuter, 2002). As the child moves through the environment set up by the therapist, she attempts a variety of movement transitions suggested by the task at hand while the therapist's handling provides her with information about her current and possible future support surface contact (Rahlin, 2005; Tscharnuter, 2002). In addition, when necessary, the therapist provides the child with a graded amount of dynamic support encouraging her to "actively explore new possibilities for postural control introduced through dynamic loading" (Rahlin, 2005).

The patient's PT sessions were structured to challenge her dynamic balance by encouraging movement transitions (to and from sitting and to and from standing), object manipulation, and ball activities in a variety of sitting and standing positions. Dynamic balance was also encouraged with upright locomotion, including knee walking, cruising along furniture, independent ambulation, and stair climbing. Both barefoot walking and use of orthoses (hinged AFOs) were incorporated into the therapy sessions.

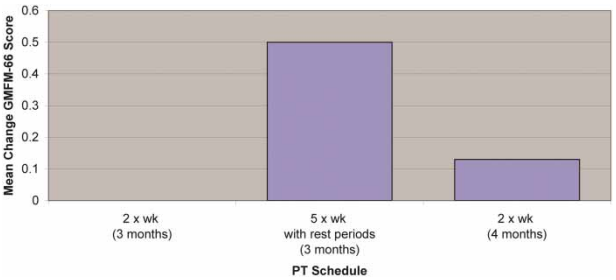

FIGURE 1 Mean change GMFM-66 scores across three project periods with varied PT schedule.

Family instruction

The patient's parents were active participants in her therapy and consistently followed through with her home program activities. These included 1) working on the transition from supine to a ring sitting position, both on the floor and in the child's bed; 2) climbing onto and down from the couch in the living room; 3) encouraging the use of upright locomotion instead of creeping around the house; 4) walking in a "parallel ropes" device similar to parallel bars but with two ropes stretched between the poles on both sides of the child to provide her with dynamic support and challenge her dynamic balance during gait; and 5) performing ball activities, such as catching, throwing, and kicking in unsupported standing with appropriate guarding for safety.

The parents incorporated the home program into the patient's daily routine and performed it with her regardless of the therapy schedule she had at each point in time. Varying the selection of specific activities from day to day helped to maintain the child's interest in participating.

Outcomes

Table 1 contains the GMFM-66 scores as well the GMFM-66 change scores and mean change scores calculated for three periods when the PT schedule varied. Change scores indicate the difference between consecutive GMFM-66 scores obtained at 14 testing sessions. The mean change scores were calculated for each of the three project periods with varied PT schedule by averaging the GMFM-66 change scores within each period. The greatest mean change score was recorded during the intermittent intensive therapy (Table 1; Figure 1). In addition, the patient displayed an increase in GMFM-66 scores after two of three resting phases during the 3-month intermittent intensive therapy period (Table 1).

Information about the child's functional gross motor abilities documented across 9 months of the varied PT schedule is summarized in Table 2. This information was derived from the PT daily progress notes and progress reports included into the patient's medical record, and from the GMFM-66 score sheets and item maps reflecting her performance at the GMFM testing sessions conducted at the end of each PT schedule period. The patient achieved a higher level of performance for most of the skills listed in Table 2 during the intermittent intensive therapy and maintained these gains after returning to two times per week schedule without a considerable further improvement.

After observing their child's performance during this trial of a new intermittent intensive PT schedule and after looking at her GMFM-66 scores, the patient's parents expressed their interest in having her participate in intermittent intensive therapy again in the future.

DISCUSSION

The outcomes of this case report support the research findings reported by Trahan and Malouin (2002), who used a similar therapy schedule and found that all study participants retained their skills during the periods of rest. However, they did not report an increase in GMFM scores following the resting phase. This may be due to the significantly longer rest periods Trahan and Malouin (2002) used in their research compared to this plan of care. Other reasons for this difference may be related to history and to the individual characteristics of the patient described in this case report as summarized below.

As stated earlier, when the patient was receiving intermittent intensive therapy, GMFM-66 was administered every 2 weeks to account for her ability to retain the skills acquired during the therapy phase. As shown in Table 1, the patient displayed an increase in GMFM-66 scores after two of three resting phases in the 3 months of intermittent intensive therapy. As was documented in her medical record, by the

TABLE 2 Functional gross motor skills documented across 9 months of varied PT schedule.

Functional gross motor skills	2 x week PT (3 months)	5 x week PT (3 months)	2 x week PT (4 months)
Transition to ring sitting from supine on one folded blanket under the trunk using hands	Inconsistent performance	Able to complete independently most of the time	Able to complete independently
Transition from the floor to sitting on a large bench*	Able to partially attain sitting	Attains W-sitting with SBA for safety	Attains W-sitting with SBA for safety
Crawling up* and down stairs	With verbal cues and supervision	With supervision	With supervision
Number of steps taken walking in tall kneeling*	7–10 (inconsistently)	10–14 (inconsistently)	10–30 (inconsistently)
Greatest # of steps taken walking independently	10–13	22	17–25
Average # of steps taken walking independently*	7–8	10–12	10–12
Kicking a stationary ball in unsupported standing*	Unable to initiate	Able to complete without LOB	Able to complete without LOB
Walking up 4 steps on stairs using one rail*	Not attempted	With min. assistance	With min. assistance

LOB: loss of balance; SBA: standby assistance.
*GMFM-66 item.

end of each of the first two intensive therapy phases, she showed some signs of fatigue, including reluctance to participate in therapeutic activities, frustration, and low motivation. At the end of the second intensive therapy phase, her fatigue might have also been accentuated by a cold. However, she was able to recuperate during the resting phases and apparently continued practicing earlier achieved skills spontaneously, which led to an improved performance after the break. At the end of the third intensive therapy phase, there were no signs of increased fatigue noted in the patient's chart, and her performance after the resting phase remained stable.

It is important to note that during intermittent intensive therapy period of this project, the patient received Botulinum toxin injections in bilateral hip adductor and hamstring muscles. This occurred 1 week after the second GMFM testing session, following a 2-week, five times per week, intensive therapy phase and a resting phase (between GMFM-66 tests 6 and 7) (Table 1). Nine days after the injections, as documented in her chart, she displayed significant hip adductor muscle weakness that negatively affected her static and dynamic balance in tall kneeling. The patient was not able to maintain adequate hip adduction to shift her weight over one lower extremity and take a step forward with the other. Prior to the injections, she had been able to take up to 10 independent steps walking in tall kneeling. In addition, this experience appeared to have a negative psychological effect on the child, undermining her confidence in her ability to walk and balance on her knees. She started demonstrating avoidance behaviors when these activities were initiated during PT sessions and at the GMFM-66 testing session 7. In addition, during that time, she had a cold, which, combined with increased weakness in her hip adductor muscles, might be responsible for the "dip" in GMFM-66 scores recorded at the testing session 7 (Table 1). The increase in score obtained after the resting phase at testing session 8 (Table 1) might be partially reflective of the child's recovery from both problems mentioned above; however, this score was higher than the ones recorded at testing sessions 5 and 6, which also indicated a further improvement in gross motor functional skills.

It is possible that the Botulinum toxin injections affected the child's progress during intermittent intensive therapy as reflected in the "dip" in GMFM-66 score described above. However, it is also possible that after the initial negative effects of the injections, the decrease in spasticity and increase in hip abduction in combination with intensive therapy helped improve the patient's gross motor functional skills as noted in her score at GMFM testing session 8 (Table 1).

Clinical implications and suggestions for future research

Based on the positive outcomes of this case related to both the patient's progress and her parents' perception of her progress, a positive answer can be given to the second question stated in the introduction: Is it appropriate to select the intensity of therapy based on individual characteristics of the patient and the family wishes while taking into account current research? However, this answer can be given only specifically for this patient. While the outcomes are important to this child and her family, a cause-and-effect relationship between the child's progress and the therapy schedule cannot be established by a case report (McEwen, 2001; Romeiser Logan, Hickman, Harris, and Heriza, 2008). In addition, as discussed above, besides the change in therapy schedule, the Botulinum toxin injections may have also played a role in the case outcomes. To address the issue of generalizability of results, it appears warranted to conduct a multiple baseline design study (Portney and Watkins, 2009) with children with CP using the same therapy schedule as described in this case report. Besides assessing the participants' gross motor progress using the GMFM-66, each child's behavioral responses to the changes in schedule need to be thoroughly documented.

The first question asked in the introduction to this article (Which of the intensive therapy schedules suggested in research literature is the most beneficial for functional progress in a child with CP?) could not be answered by this case report. Therefore, a randomized controlled trial comparing the therapy schedule reported by Trahan and Malouin (2002) to the schedule used in the current research is proposed. Because the Botulinum toxin injections received by the patient may have affected her progress demonstrated during intermittent intensive therapy, it may be beneficial to conduct an experimental study comparing the effects of Botulinum toxin injections, an intermittent intensive therapy schedule, and Botulinum toxin injections combined with intermittent intensive therapy on gross motor function in children with spastic CP.

Other questions related to this case report that come to mind are 1) Would a child with CP benefit from consistent use of intermittent intensive therapy, or should it be used only at a specific time while working on specific functional goals? and 2) Does it matter what method of intervention is used for intensive therapy? For example, in a hypothetical situation, when the child and her family are very interested in mastering a skill such as independent ambulation,

and the results of the PT reassessment suggest that the child is ready for the challenge, would it be helpful to initiate an intermittent intensive therapy schedule? Again, which therapeutic approach would be the most effective in that case? TAMO therapy was used as the main intervention in this case report, but as discussed in the introduction to this article, previous research had shown that many different therapeutic approaches may be effective, as long as the intensity requirement is met (Bar-Haim et al, 2006; Darrah, Watkins, Chen, and Bonin, 2003; Odman and Oberg, 2006; Reddihough, King, Coleman, and Catanese, 1998; Stiller, Marcoux, and Olson, 2003). It appears important to explore the answers to these questions by designing and conducting future research.

Finally, as I have observed in my clinical practice, despite the support for intensive therapy provided by current literature (Bower, McLellan, Arney, and Campbell, 1996; Bower et al, 2001; Trahan and Malouin, 2002), physical therapists still frequently use one or two times per week PT schedules for children with cerebral palsy. It may be of great interest and benefit for pediatric PT practice to explore possible reasons for the persistence of conventional schedules and the barriers to flexibility in use of intensive therapy. One of the reasons may be the insufficient use of evidence in pediatric PT practice (Schreiber, Stern, Marchetti, and Provident, 2009). Other possible barriers that seem to be worth researching include difficulties with obtaining medical insurance coverage for intensive therapy, as well as such organizational challenges as appropriate staffing and creativity in scheduling in a traditional health care environment. Conducting and publishing research in this area of practice and reporting successful implementation of intensive therapy schedules in a clinical setting may assist pediatric therapists, clinic administrators, and insurance executives in modifying their approach to this issue.

CONCLUSIONS

This case report described the selection and successful application of a new intermittent intensive therapy schedule with a child with CP based on available research evidence and the patient's family preferences. The patient demonstrated a gradual increase in GMFM-66 scores throughout the 9-month period covered by this case report, with the greatest mean change score obtained when the intermittent intensive therapy schedule was used. The acquired skills were retained and even improved during the resting phases. The child's parents expressed their interest in using the new PT schedule in the future. It is possible that the individual characteristics of the patient and the Botulinum toxin injections she received during intermittent intensive therapy affected her progress. Further research is needed to address the generalizability of results.

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