Cerebral Palsy: Steps to Independence vs. Traditional Therapy

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Dedication

This report is dedicated to Jason Laughlin and his family for allowing the release and review of his records and progress. It is my hope that this article will reach medical professionals and enhance awareness and education on cerebral palsy and the most advanced therapies available. Best wishes to Jason in the coming year of Steps to Independence.
Acknowledgements

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Introduction

With a prevalence of 2.3 per 1000 children, cerebral palsy is the number one cause of movement disorders in children. “Cerebral palsy describes a group of disorders of the development of movement and posture, causing activity limitations that are attributed to non-progressive disturbances that occurred in the developing fetal or infant brain. The motor disorders of cerebral palsy are often accompanied by disturbances of sensation, cognition, communication, perception, and/or behavior, and/or by a seizure disorder.” (Tilton, 2006).

Cerebral palsy is caused by a permanent static lesion of the cerebral motor cortex that can occur during pregnancy, at birth, or within the first two years of life. Depending on where this lesion is located, the extent and type of central nervous system damage, and the ability of the central nervous system to make up for the damage, different clinical manifestations can present. Classifications are based on deformity or abnormality (spasticity, rigidity, hypotonia, dystonia, or mixed); anatomical distribution of the deformity or abnormality (hemiplegia: involvement of the ipsilateral arm and leg; monoplegia: single limb involvement; diplegia: significant leg involvement with little effect on the arms; quadriplegia: involvement of all four limbs; double hemiplegia: bilateral involvement characterized by greater involvement of the arms than the legs); or location of the central nervous system injury (periventricular, brainstem, cortical, pyramidal, or extrapyramidal) (Koman, Smith, & Shilt, 2004). Only once the type and location of tone abnormality is identified, the extent of its attribution to the disability is determined, and goals are established, can it be decided which treatment will be the most beneficial. Although cerebral palsy in not a progressive disease, the effects on the body can get worse with age; thus early identification and treatment is necessary to reach the child’s highest level of functioning (Delgado & Combes, 1999).
Due to the multiple manifestations of cerebral palsy, a wide spectrum of management options is available and often used in combination. Current therapies include: physical therapy, occupational and speech therapy, orthotics, device-assisted modalities, pharmacological intervention, and orthopaedic and neurosurgical procedures. Of these, physical therapy, bracing, and orthopaedic musculoskeletal surgery are most commonly used to treat symptoms of cerebral palsy (Koman et al., 2004)

Physical therapy aims to develop strength and coordination and maintain range of motion in order to prevent contracture. Children with cerebral palsy often experience decreased muscle strength, flexibility, balance, and cardiovascular endurance levels. Physical therapy sessions may encompass exercise programs, hydrotherapy, horseback riding, heat/cold application, stretching, biofeedback, and electrical stimulation (Tilton, 2006). Not many studies have been done on hydrotherapy or biofeedback to prove or disprove its effectiveness. Studies have been done to support the positive outcomes of electrical stimulation (Liptak, 2005). Both uncontrolled and controlled trials support the use of horseback riding (Liptak, 2005). It is beneficial for enhancing posture and balance control (Kuczynski & Slonka, 1999). Exercise, in addition to standard care, had significant positive effects on child function and quality of life (Verschuren et al., 2007). According to the guidelines in table 1, moderate exercise can improve the strength, flexibility, and endurance of children with cerebral palsy (Groff, Lawrence, & Grivna, 2006). Weakness shows a stronger relationship with motor functioning than spasticity or contractures. Strength and passive motion can be improved through strength training. Much of the therapy aimed at strength training for cerebral palsy uses natural body weight. Increases in strength are not due to muscle hypertrophy alone. Children develop strength through improved motor skills coordination, increased motor unit activation, and other neurological adaptations. In addition,
strengthening exercises reduce coactivation of other muscles. This allows the child to achieve movement patterns with reduced energy expenditure, better movement control, and reduced spasticity. After four weeks of training, the body does begin to increase strength by increasing muscular size (Koscielny, 2004). Strength training causes adaptive changes in the nervous system and in the muscular morphology. The increase in motor neuronal output due to strength training may involve increased firing rates, increased motor neuron excitability, and decreased presynaptic inhibition, downregulation of inhibitory neural pathways, and increased levels of central descending motor drive (Aagaard, 2003). Passive stretching can increase range of motion in children with cerebral palsy, as well as reduce spasticity. Sustained stretching is more effective than manual stretching for increasing range of motion and reducing spasticity in targeted joints and muscles (Pin, Dyke, & Chan, 2006). However, clinical trials suggest that it is not the type of therapy that produces significant change, but rather it is the motivation, type and degree of impairment, therapist-patient relationship, intensity and duration of therapy, and even the environment within which the therapy takes place (Goldstein, 2004). The type of therapy chosen depends on the age of the patient, the severity of the problem, the stage of recovery, how long the patient has been in rehabilitation, and environmental situations (American Physical Therapy Association, 1997). Before an intervention is implemented, a physical therapist develops a plan of care. This plan of care includes goals and outcomes, the interventions being used, the frequency of visits, and the estimated amount of time to reach the goals and outcomes, and criteria for discharge (American Physical Therapy Association). Upon discharge, parents are often given the information needed to continue home therapy for the child. Parents are often encouraged to participate in therapy to add support, increase the child’s comfort level, and to allow for parent education on the intervention being used.
Orthotics are often used to manage and treat cerebral palsy as they provide stabilization during standing and ambulation, help to maintain muscle length, decrease the risk of contracture, and maintain range of motion. Splinting is used to increase muscle length, and serial casting helps to increase musculotendinous length. Orthopaedic surgery is utilized to lengthen contractures, balance joints, fuse unstable joints, correct skeletal deformity, reduce joint subluxation and dislocation, reduce spasticity, and to stabilize spinal deformity. The techniques used include neurectomy, tenotomy, orthodesis, osteotomy, ostectomy, tendon transfer, tendon lengthening, fractional myotendinous lengthening, multi-segmental spinal fusions or a combination of these (Koman et al., 2004). These procedures are recommended after the child has a mature gait, usually between the ages of 6 and 10. All procedures are done at once to reduce recovery time. Physical therapy would then be initiated to strengthen and enhance range of motion in the corrected limbs (Tilton, 2004).

The most common neurosurgical procedure used is selective dorsal rhizotomy (Tilton, 2006). This surgery can reduce spasticity by transecting the overactive dorsal nerve rootlets. The surgery reduces lower limb spasticity via interrupting the muscle stretch arch reflex. Although only the rootlets from L1/L2 to S1/S2 were selected, patients showed improvement in upper arm spasticity as well. Postoperatively, the majority of patients experienced hypotonia, but overcame it within 2-3 months of physical therapy (Dong-Seok, Joong-Uhn, Kook-Hee, & Chang-II, 2001). This surgery works best on the limited age range of 3-7 year olds, with spastic diplegia, good trunk control, good leg strength, and isolated leg movements (Tilton).

Occupational therapy aims to enable the patient to perform activities of daily living. Assistive devices are often used to allow the patient to have better upper extremity use, which makes activities of daily living easier to complete. Different approaches used include
neurodevelopmental treatment and sensory integration (Steultjens et al., 2004).

Neurodevelopmental treatment (NDT) is a neurophysiologic therapy that aims to increase the child’s motor abilities by changing the motor responses of the central nervous system (Butler & Darrah, 2002) and to decrease contractures (Tsorlakis, Evaggelinou, Grouios, & Tsorbatzoudis, 2004). This therapy is founded on the idea that the movement disorder with cerebral palsy is in the sustained “primitive reflexes” that affect posture and movement. NDT aims to inhibit these abnormal reflexes (Delgado & Combes, 1999). Studies do support the effectiveness of NDT, especially in a more intense application (Tsorlakis et al., 2004). Sensory integration is used for children who have difficulty processing sensory information, and thus, have trouble completing activities of daily living. The goal of sensory integration therapy is to help the child to process and integrate sensory information through repeated stimuli and touch. These repeated interactions will retrain the brain. Once the brain learns to integrate the information, the child can then begin to learn new movements and tasks (Schaaf & Miller, 2005).

Pharmacotherapy agents are often used in conjunction with the aforementioned therapies for patients with spasticity. Oral agents include baclofen, tizanidine, diazepam, and dantrolene sodium. These medications work as a muscle relaxant, but can have the side effects of drowsiness, increased drooling, and behavioral problems (Delgado & Combes, 1999). Injection therapy is used to treat focal spasticity by acting as a neuromuscular blockade, and these drugs include botulinum toxin (Botox), phenol, and alcohol. Botox blocks the nerve signal to the muscle and induces muscle weakness. However, the nerve will reconnect to the muscle in two to six months, and thus, the treatment must be repeated. Children, with cerebral palsy, under six years of age, who have abnormal tone and do not have fixed joint contractures, are felt to respond best to Botox injection therapy. For generalized increased tone, oral medications and
the Baclofen pump are more appropriate (Delgado & Combes, 1999). Device-assisted modalities include theraband suits and Adeli suits that function to support and stretch muscle groups and to teach the brain to recognize correct muscle movements. By eliminating the force of gravity by suspending the patient’s limbs, the child can better perform tasks and is able to increase strength and range of motion. However, this form of treatment involves intense therapy duration (Turner, 2006).

Conductive Education is another type of therapy, just recently making its way into the United States. It was first begun in the 1940’s in Hungary by Dr. Andreas Peto. This therapy is based on education rather than the medical model of intervention. Education and rehabilitation goals are brought together in an effort to teach the child to be independent in school and society. The therapy sessions are run by conductors and are taught to a group of children, allowing the children to encourage each other. Tasks are broken down into steps. Tasks are started within the child’s ability level and then progress in functional requirement, until the child attains a functional independent goal. The elements required in all conductive education include: “1. group work using a highly structured framework; 2. the use of task series; 3. the use of rhythmical intention; and 4. the use of specific equipment.” (Darrah, Watkins, Chen, & Bonin, 2003).

Steps to Independence is a unique conductive therapy that was started in Cleveland, Ohio at United Cerebral Palsy. It is an intensive therapy for children with motor disorders. It helps to enhance children’s level of functioning by increasing muscle strength, improving body mechanics, and increasing motivation for goal achievement. The key to this program is that it uses the mainstay of the traditional conductive education in that it breaks down tasks into step series. What makes it even more effective is that it involves a two-on-one approach. Each child
works with a team of physical and occupational therapists to achieve muscle strength and fine and gross motor coordination. This program uses device-assisted modalities which include: 1. The Universal Exercise Unit- can be used as a Pulley System or the Spider System, and 2. The Therasuit. The Pulley System is a system of pulleys, straps, and splints used to improve strength, active range of motion, and muscle flexibility. By taking away gravitational forces, the patient is able to initiate movement. With this system, the therapist is able to isolate and target specific muscles or muscle groups. The goals include: counteracting or preventing muscle atrophy, increasing muscle strength, increasing active and passive range of motion, improving muscle flexibility, and preventing joint contractures. The Spider Cage utilizes a belt and bungee cords that supports the child at the waist and suspends the patient in the middle of the cage. This gives enough support to allow the patient to perform movements and functional skills with confidence. Performing these movements helps to improve sensory integration. The goals include: increasing strength, increasing range of motion, isolating desired muscle or muscle groups and strengthening them to enable function, eliminating gravitational forces acting on the body to facilitate weak muscle groups and active movement, obtaining measurable gains in muscle strength and flexibility, improving balance, improving coordination, focusing on a particular functional skill, promoting developmental milestones, facilitating upright position in any position, improving partial or full weight bearing, promoting motor learning and motor planning, providing a variety of sensory-integration techniques, developing a sense of security and success, loading or unloading the exercised joints, and promoting independence and overall improved self confidence. The TheraSuit consists of a cap, vest, shorts, knee pads, and shoe attachments, all of which are connected by a system of elastic bands. The goals are to improve and change proprioception, reduce pathological reflexes, restore physiological muscle synergies, and load
the entire body with weight. These goals aim to normalize vestibulo-proprioceptive input. The vestibulo-proprioceptive system regulates balance and tells the body where it is in space. By correcting the proprioception from the joints, ligaments, muscles, tendons, and joint capsules, the body alignment is also corrected. The benefits of the TheraSuit include: re-training of the central nervous system, restoring ontogenic development, providing external stabilization, normalizing muscle tone, aligning the body to as close to normal as possible, providing dynamic correction, normalizing gait pattern, providing tactile stimulation, influencing the vestibular system, improving balance, decreasing uncontrolled movements in ataxia and athetosis, improving body and spatial awareness, supporting weak muscles, providing resistance to strong muscles to further enhance strengthening, promoting development of both fine and gross motor skills, improving bone density, helping to decrease contractures, helping to improve hip alignment through vertical loading over the hip joint, and improving coordination (United Cerebral Palsy, personal communication, August, 2008). An automated saddle is used for horseback riding simulation to improve pelvic girdle mobility, balance, and posture. Supplemental techniques are used to improve function throughout all modalities. Taping is used for additional support and to induce gleno-humeral alignment, scapular adduction, and thoracic extension to improve the child’s ability of isolated supination. Other taping techniques are used for wrist extension and keeping the fingers extended and for dorsi flexion of the foot. The Lite Gait Treadmill is incorporated to improve gait. The focus is to improve toe-off and weight shift with stability to enhance the child’s stride extension before swing through. Occupational therapy modalities are incorporated by using a wedge on a seat for sitting and a spoon adapted to promote supination (Boenig, 2007).
The therapy team involved incorporates warm-up activities, using hot packs and stretching into every session. The Universal Exercise Unit and Therasuit and other equipment are used in the child’s training program. Parent involvement is always encouraged during the sessions. Home programs are provided to the parents to maintain the child’s progress. United Cerebral Palsy found that most children achieved more goals in Steps to Independence, which consists of a three to four week period of three to five sessions a week for 2-3 hours per session, than they did through their longer duration of traditional therapy (United Cerebral Palsy, personal communication, November, 2007). (See comparison chart in Table B.)

It has been shown that short, intensive therapy periods optimizes the effects of motor training (Boenig, 2007). After working through Steps to Independence, children may have the functional advances necessary to qualify for other modes of treatment such as orthopedic and neurosurgery to reach an even higher level of functioning. In addition, caring for child with cerebral palsy can be demanding and time-consuming, so choosing a therapy that incorporates the most functional therapies in the least amount of time is optimal for the family.

The purpose of this case study was to describe how a new approach to the management of cerebral palsy, Steps to Independence, helps children to reach their therapy goals. This case study focuses on a single patient who participated in both traditional physical and occupational therapy and Steps to Independence. Details regarding the patient evaluation, assessment, plan, and outcome are described as well implications for Steps to Independence in the current medical practice. Because the study involved one patient, it was determined by the IRB that this case study did not meet the criteria for research and did not require IRB review and approval.
Subject Description

Patient Diagnosis

Jason is a male child, born on 11/11/01 without any pregnancy or delivery complications. He was born at 37 weeks gestation. He began showing developmental delays at an early age. The child is known to have microcephaly. On 6/4/02, at 7 months of age, a routine extended EEG was performed. The impression was normal. An MRI of the brain without contrast was performed. The impression concluded, “In the supratentorial distribution of the temporal, parietal, and occipital distribution is fairly diffuse cortical dysgenesis/ polymicrogyri.” A blood karyotype was analyzed as well. The result showed 46, XY. The interpretation was, “Normal male karyotype. No consistent structural or numerical abnormalities were observed.” (Akron Children’s Hospital, personal communication, August 2008).

Previous Treatment and Response

The patient began occupational therapy on 7/11/02 with the diagnosis of polymicrogyria and developmental delay. The family’s goal for the patient was, “for him to do as much as he can.” The initial evaluation included hearing and vision, sensorimotor status, fine motor function, and activities of daily living abilities.

Hearing and vision: within normal limits.

Sensorimotor status:

Range of motion: both upper extremities within normal limits passively and actively.

Movement patterns/ muscle tone: moderate hypertonicity of lower extremities; hypotonicity in the neck and trunk.
Fine motor function:

Grasp: Patient does not reach out for or grasp toys. Minimal interest noted in grabbing for a toy; once placed in hands- maintains grasp minimally.

In hand manipulation: Patient rarely brings both upper extremities together for play. Not transferring objects.

Hand dominance: Not applicable. Patient’s posture while standing and weight bearing through both lower extremities is fists clenched and toes pronated.

Overall function: Patient has strong asymmetrical tonic neck reflex (ATNR); not integrated yet.

ADL abilities: Mom reports patient does not eat well (solids). He spits them out frequently. She states he sleeps well.

Impression/ Recommendations: Patient in need of ongoing occupational therapy due to fine motor delays and neurological concerns, including tone and ATNR presence.

Goals:

1. Patient will bring both hands to midline and engage in play in three months.

2. Patient will reach and grasp a toy, maintaining grasp for approximately 30 seconds to bring to mouth within three months.

The occupational therapy sessions were scheduled for one day per week. The patient participated in occupational therapy for six years with the diagnosis of spastic quadriplegia. The last progress note, prior to the patient’s first time in the Steps to Independence program, was on 5/11/07. The patient showed adequate progress toward the goal of incorporating use of left hand in play with minimal verbal cues which was initiated on 9/26/06, but the patient continues to need cueing. The goal of improving visual perceptual skills to complete age-appropriate puzzles
with minimal assistance, initiated on 5/11/07, was still in progress, as the patient continued to need moderate to maximal assistance. The goal of increasing bilateral use of hands to manipulate 2-3 pop beads with minimal assistance which was initiated on 9/26/06 was met, although the patient continued to need assistance and cueing to incorporate the left hand. A new goal of following directions during seated tasks to complete simple worksheets with minimal redirection was made with the patient’s current status of having his own agenda and not following directions.

Prior to the patient’s second enrollment in the Steps to Independence program, the most recent progress note was on 7/1/08. The patient was working on motor control to construct vertical and horizontal lines with adaptive equipment. If the patient was excited, he could fairly construct the lines. The patient was making very slow progress of participating in sensory motor activities to increase postural control to sustain positions with minimal assistance. The patient was still making progress on the goal of following directions during seated tasks to complete simple worksheets with minimal redirection which was initiated on 9/12/07.

The patient began physical therapy on 7/11/02 as well. The family’s personal goal for the patient was, “To learn how to help Jason with his gross motor development.” The initial evaluation consisted of hearing and vision, range of motion, gross motor function, neurological testing, and posture.

Hearing and vision: within normal limits.

Range of motion: upper extremities and lower extremities within normal limits in all planes.

Gross motor function:

Prone: Able to hold head ½ in the vertical plane, tends to prop on an extended arm and seems unable to prop onto his elbows.
Supine: Holds head in midline, attempts pull to sit, showed Jason extending through the trunk and legs with mild to moderate head lag. Patient does not bring hands to midline, rather tends to keep his arms held in a scapular retracted position.

Rolling: He is able to roll from prone to supine towards his right side, he may be able to also perform this task to the left but this was not visualized this date. Patient is not able to maintain side-lying once placed.

Sitting: Requires support to the trunk, he does not show protective reactions in any direction. He is able to maintain midline head position for brief periods but when fatigued tends to drop his head into extension.

Transitional movements: Not applicable.

Neurological testing: Patient shows moderate hyper tonicity throughout the bilateral hamstrings and bilateral adductor muscle groups. He also demonstrates moderate hypo tonicity throughout the trunk and neck musculature. He also shows strong prevalence of ATNR with his movement patterns.

Posture: Tends to keep his hands fisted as well as toes curled under/flexed. In a supported standing position he takes weight through his legs, but shows a pronated and everted position of the ankle with the right being more pronounced than the left.

Goals:

1. Mom will be independent with a home program to encourage age appropriate gross motor skills within three months.

2. Jason will maintain side-lying and hold a toy with both hands while in the position within three months.
3. Jason will roll from supine to prone and prone to supine to both directions within three months.

4. Jason will prop onto elbows in the prone position and hold his head in a vertical position within three months.

Recommendations/ Impression: In addition to showing delays in his gross motor development, there are neurological concerns. Neurological concerns include: presence of ATNR, hypertonicity throughout the legs, extensor thrusting, and hypotonicity throughout the trunk and neck.

Plan/ Frequency: Plan to see patient one day per week. Treatment to include neurodevelopmental treatment facilitation techniques, therapeutic play and positioning, education, and other modalities as needed.

The patient participated in physical therapy for a total of six years. The patient’s progress was monitored every three months. Therapy goals consisted of increasing walking ability, trunk control, balance, upper extremity strength, and sit to stand. On 6/18/07, the last progress note, prior to the patient’s first experience in Steps to Independence, showed the patient was showing greater trunk control and less lateral leaning in standing. The patient’s goal of being able to stand at supportive surface with one hand for contact, while playing, which was initiated on 9/1/06, was extended for an additional three months. The patient was showing better upper extremity control to perform the goal of transitioning from sit to stand and returning to sit with minimal assistance, which was initiated on 9/1/06 and extended for an additional three months. The patient was ambulating with his wrist and gait trainer utilizing hopping steps and scissoring with maximal assistance. His gait pattern was improving with the use of his SWASH brace. The goal of ambulating using assistive device for >100 feet with minimal assistance was initiated on
3/23/07 and continues to be monitored. Lastly, the patient was able to sit with contact guard or stand-by assistance for one minute. He would lose balance to the left and be unable to prop to prevent loss of balance. The goal of sitting independently on the floor and maintaining play for up to three minutes which was initiated on 3/23/07 was extending for additional three months. After the patient’s first summer of 4 weeks in the Steps to Independence program, his traditional physical therapist noted, “This appeared to be very helpful with Jason and progress is noted.”

Prior to the patient’s second enrollment in Steps to Independence, the last dated progress note was on 6/24/08. At this time, the patient was still continuing the goal of ambulating, using an assistive device > 100 feet requiring minimal assistance. The patient’s status was a continued scissoring gait due to lower extremity tone. The goal of sitting independently on the floor and maintaining play for up to 3 minutes was still in progress with the patient’s status being capable of sitting on the floor independently when wearing his SWASH braces, but being unable to sit in a tailor position unless maximum support provided. Utilizing the ring sit position, the patient was able to maintain independent sitting, however, any loss of balance was not controlled. The patient was not able to demonstrate sit to stand and stand to sit without moderate assistance. The patient was having significant difficulty assuming quadruped position.
Intervention

In 2007, the patient’s mother first heard about the Steps to Independence program from Jason’s neurologist. Jason has the manifestations of cerebral palsy due to having polymicrogyria. Mom had never met another child with this same diagnosis. The neurologist gave her the name and contact information of another mother who had a son with polymicrogyria who was enrolled in Steps to Independence. After hearing such positive feedback about the program, Mom enrolled Jason into the program. She felt he needed to be challenged to meet his full potential.

Steps to Independence

The patient’s first participation period in Steps to Independence was during August of 2007. A general medical history, orthopedic, spasticity, and equipment history, and a social and therapeutic history were taken by both the physical therapist and occupational therapist involved. Behavior, cognition, and sensory systems were also reviewed and evaluated. Physical exam revealed decreased range of motion of the knees and ankles. Gross motor skills were significantly dependent upon assistance, including sitting, positioning in quadruped position, kneeling, and standing, crawling, and ambulation. The functional limitation assessment consisted of gross motor delays, functional mobility and locomotion impairments, and balance impairments. Other impairments included atypical muscle tone, atypical movement patterns, specifically impaired disassociation and fixing, and muscle weakness. Other areas of concern included dependent activities of daily living, tightness of extremities, body awareness, grasp, and a decreased protective response. The main priority of the parent was improving upper body strength. The treatment plan consisted of 3 sessions per week for 4 weeks, 2.5 hours per session. The physical therapy goals included: 1. Family will demonstrate 100% of home exercise
program and use of adapted equipment as recommended by physical therapy team, 2. Patient will ambulate 50 feet in gait trainer with/without external support garment to prevent scissoring, with minimal assistance, 3. Patient will spontaneously use dissociation 3x/session, and 4. Patient will transition from sidelying to sitting, with minimal assistance. The occupational therapy goals included: 1. Patient will demonstrate functional grasp and placement of various objects for age-appropriate play 3/5 trials, 2. Patient will demonstrate increased body awareness of left upper extremity and hand by initiating activation of switch 50% of trials, and 3. Patient will maintain weight bearing through both upper extremities quadruped for 30 seconds-1 minutes without loss of balance.

In August of 2008, the patient returned for a second enrollment in Steps to Independence. A physical examination revealed decreased core strength. The patient was now able to maintain static sitting balance, but not dynamic sitting balance. The patient showed improved dissociation. The patient had limited muscle strength and muscular and cardiovascular endurance. The patient had increased tone in lower extremities and in shoulder girdle, wrists and hands, and decreased tone of the trunk, and difficulty initiating activities. The patient also showed increased motivation and positive interaction with the therapists, a change from the previous year. Assessment areas of concern included using extensors for posturing to achieve a motor task, a flexion synergy seen in the arms, which may be a remnant ATNR, decreased hamstring length, and a strong scissoring gait. The treatment plan consisted of 2.5 hours for 3 days per week for 4 weeks. Physical therapy goals included: 1. Ambulate with an assistive device, 1.1. Patient will increase endurance in ambulation, in most appropriate assistive device, with use of external supports to prevent scissoring and reduce physical prompts from therapist, 2. Transition between sit and stand, 2.1. Patient will extend arms to reach for the floor during
transfer from standing to floor, with moderate assistance at pelvis, 2.2. Patient will transfer from bench sit to stand by shifting weight over pelvis with moderate assistance to ground legs for stable base, 3. Improve crawling skills, 3.1. Patient will climb up on a surface, demonstrating dissociation of legs and weight-bearing through arms with minimal assistance. Occupational therapy goals included: 1. Demonstrate increased strength, endurance, and stability in the upper extremities and hands for greater success with play, self-help, and mobility tasks, 1.1. By week 4, patient will demonstrate increased awareness of upper extremity use for transition from stand to floor by initiating reach with upper extremities with therapist cues to minimal assistance to place upper extremities in alignment in coming to the floor 100% of trials, 1.2. From floor to low surface, patient will demonstrate dissociation of upper extremities and lower extremities with therapist cues to minimal assistance and the ability to push into upper extremity weight-bearing and weight shifted forward to complete transition with minimal assistance 2-3x per session, 1.3. In floor sitting, patient will demonstrate awareness of left upper extremity with intermittent therapist cues to maintain weight-bearing and upright trunk while engaged in dynamic reach/play activity for a duration of 3-5 minutes without loss of balance. The typical treatment session consisted of: stretching to lower extremities, sensory input like swinging, spinning, deep pressure, or brushing, crawling up to a surface, such as a mat table from the floor, for dissociation of his lower extremities and use of his upper extremities, walking in his gait trainer and problem solving for adjustments to any durable medical equipment, and use of the universal exercise unit for strengthening as well as stretching with pulleys and the spider system.
Outcomes

Steps to Independence 2007

All three of the occupational therapy goals were achieved or partially achieved. The patient made strength gains and increased repetitions of exercises; however, he was often so resistant during exercise that his refusals interfered with participation. Major gains in side push-ups translated into improvement in side-lying to side-sit transition. The patient did consistently achieve functional grasp with right hand. The left hand required assistance to abduct thumb for grasp. Finally, in floor sit, the patient consistently maintained upright posture.

Three of the physical therapy goals were achieved, and one was partially achieved. The goal of family will demonstrate 100% of home exercise program and use of adapted equipment as recommended was met and continued. With minimal assistance, the patient was able to ambulate in the gait trainer up to 50 feet, but does not consistently hold on with hands. Different hand placements were trialed but the patient was resistant to change. He rotates his body to the left during ambulation with support through forearms. Without the use of external support garments, Jason scissors and at times steps on his feet which prevented him from ambulating increased distances. With verbal cues, the patient was able to dissociate his lower extremities but often uses extensor tone to initiate movement. He was able to spontaneously dissociate in the pool with kicking, and by the end of the four week session, initiated dissociation at times with pigeon pose and also climbing off the scooter board. The patient’s transition from side-lying to sitting improved throughout this session with increased ability to push up through the arms and shift weight over hips on the left side. He was often resistant to doing this transition and prefers to use left side. He still had difficulty with the weight shift over his hips when pushing up from the right.
Two of the occupational therapy goals were met and two were still emerging. The patient was able to demonstrate increased awareness of upper extremity use for transition from stand to floor by initiating reach with upper extremities. The patient required minimal assistance to bring upper extremities in alignment with shoulders when on the floor. The patient was able to demonstrate the ability to tailor sit for a duration of 20 minutes without loss of balance while reaching for items and maintaining an upright trunk. Occasional therapist cueing and/or minimal assistance were required to keep the right upper extremity positioned on knee while reaching with the left. Patient was able to reach outside his base of support with his right upper extremity, but had decreased shoulder range of motion of left upper extremity. The goal to demonstrate increased strength, endurance, and stability in the upper extremities and hands for greater success with play, self-help, and mobility tasks is still emerging. The goal of demonstrating dissociation of upper and lower extremities, while pushing inter upper extremity weight bearing to complete the transition from floor to low surface is also still emerging.

Of the 11 physical therapy goals, one was met, two were discontinued, and eight were still emerging. Transitioning from sit and stand positions is still emerging. However, the patient was able to extend his arms to reach to the floor during transfer from standing to floor, with moderate assistance. He initiated reach for the floor when coming down. The patient required minimal to moderate assistance to help lower with control. Once on the floor, he needed moderate to maximal assistance to adjust knees apart for a wider base of support. Jason was able to transfer from bench sit to stand, but would most often throw himself into extension to try to complete the sit to stand, rather than shifting his hips with his nose over the toes. The patient’s crawling skills are still emerging. The patient requires minimal to moderate assistance to place
his hands in position and shift weight over the upper extremities as well as verbal cues to keep arms extended. He can initiate movements of the lower extremities, but needs assistance to complete placement of legs as he tends to kick his legs into extension. His goals of ambulating with improved alignment and posture, and walking with a one person assist are still emerging. The goal of ambulating with an assistive device was discontinued. The goal of increasing endurance in ambulation was also discontinued due to inconsistency. It was recommended that the patient continue this activity more frequently at home. Equipment fit and function monitoring is still in progress.

It was recommended that the patient continue traditional physical therapy one to two times per week and traditional occupational therapy once per week. It was also recommended that the patient attend future sessions of Steps to Independence. The patient’s family was given a home therapy program to continue.
Discussion

Although, not all physical therapy and occupational therapy goals were met during the four-week Steps to Independence program, gains and progress were made. It would have been more useful to list a percentage of improvement for goals not yet met, rather than “emerging.” The goals that were met and the progress he made were achieved in 4 weeks, in contrast to the 3-6 months or longer with traditional therapy. With Steps to Independence, the patient was not granted “goal met” just for achieving the goal, for example, “sit to stand.” The patient had to achieve the goal with correct body posture alignment and body mechanics. In comparison, the traditional therapy evaluation would give “goal met” upon the patient performing the task, regardless of whether proper form was used. In Steps to Independence, because the occupational therapist and physical therapist worked together with the patient, the occupational therapist could work with the patient’s hands and extremities to help achieve correct movement and more efficient functioning during the physical therapy movements and tasks. With traditional therapy, physical therapy and occupational therapy occur independently of one another. Physical therapy tasks are not attained as quickly or are not performed efficiently because the patient does not have correction of hand placement or extremity location, for example wrist flexion inhibiting the patient to achieve pushing of the floor in side-lying. In addition, Steps to Independence has a variety of advanced equipment that may not available with traditional therapy. One example is the Universal Exercise Unit that is used to target specific muscles to allow for isolated movement and increased extremity function, in order to train the muscles during task steps.

It is possible that some of the rapid improvement may be due to the Hawthorne effect secondary to increased attention of an occupational therapist, physical therapist, and assistant. Rosenthal effect may have stimulated motivation for task completion because Jason appeared to
relate well to the therapists; especially during the second summer (2008). The patient was motivated and encouraged by multiple therapists and Mom. The therapists incorporated fun play, but yet used authoritative instruction when necessary. The increase in ability to progress and achieve tasks could also be partially attributed to his increased age, improved overall functional ability at the time of therapy, and improving self-motivation. Another confounding factor may be the fact that the patient received conventional occupational and physical therapy sessions between the Steps to Independence programs in 2007 and 2008. Minimally these interventions should have helped Jason to maintain any gains and optimally may have had the gradual effect of contributing to his improvement. Another contributing factor may simply be the multiple weekly sessions of therapy in the Steps to Independence program as compared to the once weekly sessions.
Conclusion

The purpose of this study was to describe and compare the Steps to Independence with the traditional therapy for children with cerebral palsy. The results of the traditional occupational therapy and physical therapy compared to the Steps to Independence results suggest that the patient, Jason, made more progress during the Steps to Independence program. The four-week program, three days per week, two to three hours per session appeared to result in a noteworthy improvement in the patient’s overall function; specifically left hand use and extremity dissociation. Whether one can recommend this therapy for other children with cerebral palsy remains illusive because this report is based upon only one child. Nonetheless, this approach to therapy should also be considered for children with motor or developmental delays who are not making anticipated progress with other approaches. Initially, Steps to Independence was used as an adjunct to traditional therapy. However, because of the results obtained by children who participated in the short term summer program, Steps to Independence is now being offered year round. Continued study of the outcomes of the Steps to Independence program in comparison to other approaches with an appropriate number of children is necessary. Until those studies are performed, one cannot conclude that the wonderful progress Jason experienced with Steps to Independence is typical and preferable to the traditional approaches.
References


Tables

<table>
<thead>
<tr>
<th>Goals</th>
<th>Objectives</th>
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</thead>
</table>
| 1) Increase aerobic activity and endurance | 1.1 By the end of the 6-week treatment session, Christopher will complete a 5 minute warm-up walk/jog with the treatment team twice a week for 6 weeks.  
1.2 By the end of the 6-week treatment session, Christopher will participate in assigned recreation activities with the treatment team for 30 minutes, twice a week, for 6 weeks.  
1.3 By the end of the 6-week treatment session, Christopher will complete a 5 minute cool down walk/jog with the treatment team twice a week for 6 weeks.  
1.4 By the end of the 6-week treatment session, Christopher will complete 30 minutes of physical activity, 3 times a week with a caregiver, for 6 weeks. |
| 2) Increase strength          | 2.1 By the end of the 6-week treatment session, Christopher will be able to complete 1 pull-up without assistance.  
2.2 By the end of the 6-week treatment session, Christopher will be able to complete 1 push-up without assistance.  
2.3 By the end of the 6-week treatment session, Christopher will be able to complete 10 sit-ups without assistance.  
2.4 By the end of the 6-week treatment session, Christopher will have increased his score on the grip dynamometer by 25%. |
| 3) Increase gross motor skills | 3.1 By the end of the 6-week treatment session, Christopher will be able to catch an 8" foam ball 3 out of 5 times thrown from a distance of 8 feet.  
3.2 By the end of the 6-week treatment session, Christopher will be able to kick a soccer goal 3 out of 5 times from a distance of 36 feet. |

(Groff, Lawrence, & Griven, 2006).
### Goals/Results for Steps to Independence and Traditional Therapy
**Data from 2001-2003**

<table>
<thead>
<tr>
<th>Child</th>
<th><strong>Steps to Independence</strong></th>
<th><strong>Traditional Therapy</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>1. Will walk 20 feet with mobility device with minimal-moderate assistance.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will walk on treadmill or with walking device 20 feet with moderate assistance.</td>
</tr>
<tr>
<td></td>
<td>2. Will maintain standing at support surface and adjust pants/shorts for toileting with maximum assistance.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will print full name independently with minimal assistance 90% of trials.</td>
</tr>
<tr>
<td></td>
<td>3. Will walk with reverse walker 25 feet with standby assistance and supervision.</td>
<td><strong>Goals</strong>&lt;br&gt;2. Will assist to put on/take off pants before/after toileting in standing supported position 90% of trials with maximum assistance.</td>
</tr>
<tr>
<td>6.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will print full name within 1/2' of line, in correct order, no cueing and with slant board as needed.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will print full name independently with minimal assistance 90% of trials.</td>
</tr>
<tr>
<td></td>
<td>2. Will maintain standing at support surface and adjust pants/shorts for toileting with maximum assistance.</td>
<td><strong>Goals</strong>&lt;br&gt;2. Will assist to put on/take off pants before/after toileting in standing supported position 90% of trials with maximum assistance.</td>
</tr>
<tr>
<td></td>
<td>3. Will walk with reverse walker 25 feet with standby assistance and supervision.</td>
<td><strong>Goals</strong>&lt;br&gt;3. Will walk with postural walker with upper extremity support 25 feet, standby assistance for safety.</td>
</tr>
<tr>
<td>7.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will independently write letters to name.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will write letters to name with minimal assistance.</td>
</tr>
<tr>
<td></td>
<td>2. Will stay on task for 10-minute period.</td>
<td><strong>Goals</strong>&lt;br&gt;2. Will stay on task for 45-minute period</td>
</tr>
<tr>
<td>8.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will finger feed with minimal assistance 75% of trials, with adaptations.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will bring right hand to mouth 50% of trials.</td>
</tr>
<tr>
<td>10.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will scoop and bring food to mouth with minimal assistance.</td>
<td><strong>Goals</strong>&lt;br&gt;1. Will scoop and bring food to mouth with minimal assistance.</td>
</tr>
<tr>
<td>12.</td>
<td>1. Will shift weight forward over feet when bench sitting; stand with arms against higher surface and pull up.</td>
<td>Partially Achieved</td>
</tr>
<tr>
<td></td>
<td>2. Will reach spontaneously with right upper extremity 3/4 trials.</td>
<td>Achieved</td>
</tr>
<tr>
<td></td>
<td>3. Will stab food with fork and bring to mouth independently 5 times during one session.</td>
<td>Achieved</td>
</tr>
</tbody>
</table>

| 13. | 1. Will reach and grasp object/finger foods at eye level 50% of trials with minimal assistance. | Partially Achieved | 4 weeks | 1. Will reach for a toy 75% of trials with minimal assistance. | No change | 2 months |
|     | 2. Will hold two-handled cup and bring to mouth 50% of trials with minimal assistance. | Partially Achieved | 4 weeks | 2. Will hold two-handled cup and bring to mouth 75% of trials with minimal assistance. | No change | 2 months |
|     | 3. Will make eye contact with therapist 50% of trials with verbal prompting. | Achieved | 4 weeks | 3. Will make eye contact with adult 30% of trials with verbal prompting. | No change | 2 months |
|     | 4. Will sit independently in ring fashion with arms propped forward for 2 minutes. | Achieved | 4 weeks | 4. Will sit with minimal assistance with arms propped forward for 2 minutes. | Partially Achieved | 2 months |

| 15. | 1. Will stay on task for 15 minutes without any distractions. | Achieved | 60 minutes with no distraction | 1. Will stay on task for 45 minutes with less than 3 distractions. | No change | 3 months |

| 16. | 1. Will hold cup and drink out of straw with good lip closure 80% of trials. | Achieved | 4 weeks | 1. Will drink out of cup with straw 75% of trials with minimal assistance. | Partially Achieved | 3 months |

18. 1. Will sit 20 seconds 1/3 trials. Achieved 4 weeks 1. Will sit 60 seconds 1/4 trials. No change 6 months 2. Will ambulate with gait trainer with minimal assistance to keep head in midline for 20 feet. Partially Achieved 4 weeks 2. Will ambulate using supportive device with minimal assistance for 20 feet No change 6 months 3. Will self feed finger foods, 5 bites per 10 minutes with moderate assistance & adaptations. Achieved 4 weeks 3. Will self feed finger foods 50% of trials with moderate assistance. No change 6 months


25. 1. Will transfer from walker to floor with moderate assistance. Achieved 4 weeks 1. Will transition from walker to floor 90% of trials with minimal assistance. No change 3 months 2. Will lift cup with both hands and bring to mouth, 3/5 trials independently. Achieved 4 weeks 2. Will drink out of a 2-handled cup independently, 3/4 trials. Partially Achieved 3 months

(United Cerebral Palsy, personal communication, August, 2008).
Figures

PT & OT Goal Achievement: STEPS vs. Traditional Therapy

(Cerebral Palsy Foundation, personal communication, February 15, 2008)
Abstract

Cerebral palsy describes a group of disorders manifesting in movement and posture abnormalities that causes limitations in activity. This is not a progressive disorder, but must be treated at an early age to prevent worsening of function. The need for intensive and short duration therapies for successful management of cerebral palsy is increasingly apparent. This case report describes a four week therapy program call “Steps to Independence” that works by combining physical therapy and occupational therapy for intensive conditioning through conductive therapy. Interventions included stretching, strengthening, gait training, and sensory-motor integration. Results indicated that the patient met three of 16 goals, was emerging in progress of eleven goals, and did not meet two goals which were then discontinued. Implications for practitioners are presented as well as suggestions for future research.