Enhancing occupational performance in a child with severe hypoxic brain injury

Morgan Wilcox
*The University of Toledo*

Follow this and additional works at: [http://utdr.utoledo.edu/graduate-projects](http://utdr.utoledo.edu/graduate-projects)
Enhancing Occupational Performance in a Child with Severe Hypoxic Brain Injury

Morgan Wilcox, B.S., OTS

Faculty Mentor: Alexia Metz, PhD, OTR/L

Site Mentor: Liza Gleckler, MOT, OT/L

Department of Occupational Therapy

Occupational Therapy Doctorate Program

The University of Toledo Health Science Campus

May 2010

Note: This document describes a capstone dissemination project reflecting an individually planned experience conducted under faculty and site mentorship. The goal of the capstone experience is to provide the occupational therapy doctoral student with a unique experience whereby he/she can demonstrate leadership and autonomous decision-making in preparation for enhanced future practice as an occupational therapist.
Abstract

Pediatric occupational therapists frequently work with children with complex medical histories and significant functional limitations. Determining an appropriate approach to treatment begins with selecting models of practice which complement each other and provide evidence-based guidelines for interventions. The current case study describes methods for evaluation and intervention for a five-year-old male child with a complex medical history including acute disseminated encephalomyelitis and severe hypoxic brain injury. He consequently has multiple limitations including decreased self-care skills, limited functional mobility, and poor play skills due to cortical visual impairment. The Person-Environment-Occupational Performance frame of reference as well as neurodevelopmental treatment and Warren’s model of perceptual visual dysfunction were utilized to direct this case study. Using these models, goals were identified for improving performance in self-care, feeding, functional mobility, and play/vision. Twelve supplementary intervention sessions were conducted in the child’s home over eight weeks. Outcomes demonstrated improvements made in all goal areas; however limitations still exist due to the extent of the child’s brain injury. Implications for occupational therapy practice include developing a greater understanding of cortical visual impairment, choosing appropriate models of practice for complex patients, and incorporating occupation as a therapeutic medium.
Introduction

This case study describes an intervention program for improving occupational performance in a pediatric client. "M." is a five year old boy with a complex medical history who has been receiving therapy services since he was eight months old. He has a history of left-side hemiparesis as well as severe hypoxic brain injury with resultant cortical visual impairment. These diagnoses will be discussed in more detail in later sections. At the beginning of this case study, M. was dependent for all self care tasks. Additionally, M. rarely engaged in play, did not focus on objects or people, and was severely limited in terms of functional mobility. Over the course of eight weeks, M. received one or two supplementary sessions of home therapy each week to address self-care, vision, and functional mobility. Improvements were made; however, M. continues to have limitations in these areas due to the severity of his brain injury.

M. lives with his mother and older brother (age 7) in an apartment in a suburban Midwest town. He attends a public elementary school four mornings a week where he is placed in a special needs preschool class which also includes typically developing peers. M. has an aide at school and receives one-on-one attention for all classroom activities. In the afternoons, M. is cared for at home by an LPN while his mother is at work.

At the time of this case study, M. was attending an outpatient children’s rehabilitation clinic one time a week for two hours of outpatient therapy (occupational therapy, physical therapy, and speech therapy). He also had home physical and occupational therapy (co-treatments) twice a week and home speech therapy three times a week. M. received therapy (occupational, physical, and speech) services once a week at school as well. This case study was conducted by the occupational therapy doctorate student (MW) under the onsite mentorship and clinical supervision of LG and faculty mentorship of AEM. M’s mother provided consent to participate in the case study. Names of the client and his family members have been changed.
Diagnoses/Medical History

When M. was seven months old, he suffered from acute disseminated encephalomyelitis (ADEM). This is an inflammatory disease of the central nervous system and is commonly associated with recent infection or vaccination. This is a fairly rare disease with an estimated incidence of 0.6/100,000 children per year for those between the ages of 0-4 years (Leake et al., 2004). The prognosis for children with ADEM is generally good; however, a minority of children who present initially with a severe manifestation of the disease can suffer from “significant neurological and neuropsychological handicaps” (Rostasy et al., 2009, p. 211). M. was most likely in this minority group as he suffered left-side hemiparesis from the ADEM. This then resulted in gross and fine motor delays and an initial referral for therapy services.

When M. was approximately 20 months old, he was diagnosed with viral immune deficiency which caused him to become ill frequently. Since that time, he has gone to a local hospital once a month to receive infusions of intravenous immunoglobulin (IVIG) to boost his immune system and decrease the likelihood of illness occurring. This disorder contributed to a change in interventions provided in which therapy goals were changed to address walking versus crawling in order to prevent M. from coming in contact with germs on the floor. Also, frequency of outpatient treatments is typically reduced during the winter months when there is a higher likelihood of M. catching an illness.

In February 2009, when M. was four years old, he was on the way to a doctor appointment for a suspected case of pneumonia when he suffered a seizure that lasted for approximately 45 minutes. He was air-lifted to a regional children’s hospital and remained there in acute rehab for the following three months. M. was diagnosed with severe hypoxic brain
injury from the limited flow of oxygen to his brain during the seizure. As a result of this acquired brain injury, M.’s mobility, speech, and vision were severely impaired.

Of interest in this case study is M.’s diagnosis of cortical visual impairment (CVI). This is a disorder which is defined by Fazzi et al. (2007) as “a deficit of visual function caused by damage to, or malfunctioning of, the ret geniculate visual pathways…in the absence of any major ocular disease” (p. 294). There is commonly a decrease of visual acuity in children with CVI, however this is not a necessary component of the definition. There are also frequent co-morbidities of ophthalmological and/or oculomotor impairments such as strabismus, and neurological impairments such as seizures (Fazzi et al.).

Children with CVI display unique visual behaviors that can aid a clinician in diagnosing this disorder. Such behaviors include turning the head when looking at or reaching for an object (uses peripheral rather than central vision), brings objects closer to reduce “crowding effects,” light gazing, photophobia, and frequent gaze aversion immediately before reaching (Baker-Nobles & Rutherford, 1995). M. displays many of these behavioral signs which will be discussed further in later sections.

**Models of Practice**

The neurodevelopmental treatment (NDT) approach developed by Bobath and Bobath (1956) and Warren’s (1993) Model of Visual Perceptual Dysfunction are two models of practice that were used to guide M.’s evaluation and treatment. Also utilized was the Person-Environment-Occupational Performance (PEOP) frame of reference (Christiansen & Baum, 1997). This helped to tie together the two models of practice and ensure that all aspects of the client, including the environment, were explored to promote the best possible outcomes.
The PEOP frame of reference has a basic belief that “people are naturally motivated to explore their world and demonstrate mastery within it” and “their success in doing so is a measure of how successfully they have adapted” (Christiansen & Baum, 1997, p. 48). It is stated that when one experiences success, he feels positive about himself and is then motivated to try new things and has more confidence. Thus, a sense of identity and fulfillment is developed through performing occupations. This framework is client-centered and requires consideration of the person’s characteristics, the unique environment and the meaning of the occupation to the person. Also, PEOP encourages multi-disciplinary involvement in order to effectively facilitate both the person’s health and function when his occupational performance is either impaired or threatened.

PEOP is broken down into its three principle elements: the person, his environment, and his occupational performance. The person is examined in terms of motivating factors and self-perception. The environment always influences occupational performance and is comprised of not only the physical space, but also cultural, societal, and social aspects. The occupational performance of the person is described in terms of the types and complexity of occupations.

Goals should be identified based upon strengths and weaknesses gathered during the assessment period and should be developed with the patient. Treatments should fall into one of five major categories outlined in this chapter. These are: 1) use of occupation as a therapeutic medium; 2) education and training strategies; 3) strategies for sensory and neuromotor remediation; 4) modification of the physical environment; and 5) application of technological aids and devices.

NDT was chosen as the strategy for sensory and neuromotor remediation for this case study due to the fact that M. has left side hemiparesis with a resultant increase in tone and
atypical patterns of movement. Additionally, his severe hypoxic brain injury also caused gross
motor impairments and poor stability. NDT was developed with a focus on correcting faulty
movement patterns in children with neurological impairments. The Bobaths (1956) developed
techniques to decrease abnormal muscle tone and increase normal movement patterns through
reflex inhibition and facilitation of typical movement. In addition to the motor component of
NDT, Blanche, Botticelli, and Hallway (1995) included a further explanation of atypical
movement due to poor sensory feedback. They stated that inaccurate sensory feedback from
movement reinforces and exaggerates the existing movement problem. Thus, children learn the
sensation of a movement rather than the motor component of it. In other words, children are
learning with disorganized information which results in a disorganized outcome (i.e. abnormal
movement patterns). NDT is geared towards changing the movement which will then change the
sensory feedback.

Schoen and Anderson (1999) described normal motor development as having three basic,
important components which are the foundation for NDT. These are the relationship between
stability and mobility for performing motor tasks, the role of postural tone in movements, and the
“ability to dissociate movements” (p. 86). Thus, interventions, such as handling, should be
geared towards these areas. Handling is “graded sensory input provided by the therapist’s hands
at key points of control on the child’s body” and is done for facilitation of movement and
encourages active involvement of the child (p. 108). Furthermore, Blanche, Botticelli, and
Hallway (1995) stated that when there is abnormal tone, reflexes and righting reactions will be
impaired thus decreasing postural control. This is true of M. and his lack of protective response
limits his ability for safe functional mobility.
NDT has been used as a base for treatment with children and adults with abnormal muscle tone and/or hemiparesis for over 50 years. According to Kollen et al. (2009), NDT “has become the most popular approach for the treatment of neurologically impaired patients in the Western world” (p. e90). It has developed over time and is now less rigid in its approach to treatment and encourages use in typical settings during functional tasks. However, a review of the literature shows that evidence supporting NDT is limited. One review does discuss improvements shown in joint contractures and motoric responses when NDT was used as a primary method for intervention (Butler, & Darrah, 2001). The mixed review of evidence may possibly be due to the evolution of the NDT approach as more positive findings were documented in later, rather than earlier, studies on NDT.

To address a different faucet of M.’s sensory and neuromotor remediation, Warren’s (1993a) model of visual perceptual dysfunction was selected for its framework for the evaluation and treatment of patients with visual deficits. A hierarchy was established that emphasizes the importance of three foundational areas which are required in order for accurate visual processing to occur. These are oculomotor control, visual fields, and visual acuity. Other higher level functions, such as visual attention, cognition, and memory, are dependent upon these basic skills. It is important to understand the interaction of the various levels, because what appears to be a deficit in a higher skill level may actually be a deficit in the foundation below. This may be especially true for patients with brain injuries as visual deficits are common in this population.

In terms of treatment, Warren suggests three general principles for effective intervention. These are first “to remediate or minimize the sensory deficit,” second to educate the patient for increasing awareness of the deficit, and third “to institute consistent systematic training to develop compensation strategies for the deficit” (Warren 1993b, p. 61). Specific training
guidelines for directing treatment include broadening the visual field, reinforcing the “visual experience with a sensorimotor experience”, and to “practice the skill within context to ensure carryover of application to daily living activities” (p. 62-3).

M.’s CVI effects higher level areas of visual processing and thus can be viewed according to the hierarchy illustrated by Warren. For example, M. is unable to successfully scan his environment and ignore irrelevant stimuli. This would then effect all of the higher levels in the hierarchy and ultimately lead to a decrease in visual cognition. Also, studies on vision therapy specifically for CVI emphasize treatment strategies similar to Warren, such as consistency in interventions and including other sensory systems to enhance the visual experience (Baker-Nobles & Rutherford, 1995).

A decrease in functional vision can lead to impairments in various aspects of one’s life, including self-care and safety within the environment. Occupational therapists have the goal of improving function in all areas of one’s daily life and thus include visual perceptual dysfunction in assessments of patients with brain injuries. McKenna, Cooke, Fleming, Jefferson, and Ogden (2006) discussed using a screening tool, The Occupational Therapy Adult Perceptual Screening Test (OT-APST), for assessing deficits in this area. Within this, Warren’s model is referenced and it is stated that her hierarchy is followed and the primary visual skills are evaluated prior to completing the OT-APST.

**Evaluation**

Evaluation for the purposes of planning the interventions of this case study were in addition to those already performed by M.’s usual therapist (LG). Baseline evaluation was done during regularly scheduled intervention sessions in the outpatient clinic and in additional visits to M.’s home and school.
The Toddler and Infant Motor Evaluation (T.I.M.E.) was utilized for evaluating M.’s motor capabilities (Miller & Roid, 1994). This assessment was chosen because it focuses on the quality of movement and is capable of detecting subtle improvements in motor development. It also falls within the NDT model of practice and was mentioned by Schoen and Anderson (1999) as an appropriate tool for use under this model.

The T.I.M.E is comprised of eight subtests, however only the mobility subtest was determined to be appropriate to use with M. This component requires the child to be placed in one of five starting positions (supine, prone, sitting, quadruped, and standing). The examiner then observes and records the child’s posture within the position as well as any transitions out of that starting position. The child is observed until it is thought that the highest level of mobility has been reached. Several trials are allowed, depending on the child’s tolerance level. It is stated in the test manual that 95% of the time, the child will repeat the exact same movement pattern during each trial.

Due to M.’s limited function, he was only able to be placed in three of the five starting positions (supine, prone, and sitting). The assessment was videotaped and scored at a later time by MW and LG to ensure accurate observations were made. M.’s movements show that while his posture in supine is immature, the rest of his positions and transitions between positions were mature. The highest level of mobility M. achieved was tall kneeling, however he did not maintain this for long before sitting back onto his heels. Overall, M.’s total raw score was 254 points. A score greater than or equal to 715 point is what would be expected to be achieved by typically developing three year old children.

The T.I.M.E. is designed for use with children between the ages of four months and 3½ years, thus we were unable to interpret the scores in terms of age equivalency and percentile
ranks. However, using normative reference data, M.’s raw score of 254 was found to be in the 25th percentile of typically developing nine to ten month old children. This thus indicates that M. is severely delayed for a child his age.

During the assessment, it was observed that M.’s movements were uncoordinated and he appeared to use a lot of effort to push himself up into a sitting position from supine or prone. This was evidenced by vocalizations made during transitions. When attempting to move about his environment, M. would lower himself to the floor and roll until reaching an obstacle. He also displayed a significantly delayed protective response with his right upper extremity thus decreasing the quality of his transition from sitting to prone or supine. M. has increased tone in his left upper extremity which limits his functional use of it and eliminates any evidence of a protective extension reaction on this side.

M. very briefly achieved tall kneeling and appeared to be very unstable when in this position. Although M. was not assessed while in standing, his transition from kneeling to standing was uncoordinated and unsteady, requiring moderate assistance for completion. When standing, M. would seek out any available support and was unable to remain upright on his own. Additionally, M. had a very low tolerance for circle sitting and would move out of this position seconds after being placed in it.

Several further aspects of M.’s developmental structure were observed during baseline sessions, including visual abilities, engagement in play, sensory needs, and cognitive abilities. M. displayed characteristic behaviors associated with CVI, including turning his head away from a stimulus and continuously looking away from an object before attempting to reach for it. M. also responded better to bright colors (e.g. red) and shiny objects that reflect light. M.’s processing time for reacting to stimuli was extended and his visual behavior was inconsistent on
a daily basis. M. also had a difficult time discriminating between objects when presented together. M. also expended a large amount of energy when using his vision and thus was unable to tolerate motor and visual demands placed upon him at the same time. M.’s CVI severely limited his ability to interact with his environment, both in terms of mobility and play. When placed on the floor, M. would lie down and roll without apparent awareness to obstacles in his way. When he would come into contact with an obstacle (e.g. a bolster placed on the mat), M. would attempt to roll through it a few more times before giving up and changing directions. In terms of engagement in play, M. rarely focused on objects and when he did focus it was for a matter of seconds. Additionally, his exploration did not appear to be driven by any source of internal motivation.

M. also continuously seeks oral stimulation and will chew on his hands, clothes, or any object placed in his hand. At the time of his evaluation, M. wore “chewelry” around his neck to satisfy his need for stimulation. These are firm, rubber toys that are designed for children with this need and can be placed on a stretchy cord around the neck to be easily accessed by the child. It was thought that if M. had proper stimulation, his hands would be free more often for exploring his environment.

It was deemed important to assess M.’s cognitive level to determine how to plan appropriate interventions. Due to the fact that M. is nonverbal, has decreased mobility, and has a visual impairment, no formal assessment was available for use. Thus, informal assessments were made using Piaget’s cognitive-developmental theory as a guideline (Berk, 2006). Piaget described a general theory consisting of four stages of cognitive development which are described as invariant and universal, meaning they are representative of all children and occur in
a fixed order with no skipping of stages. However, Piaget did emphasize that the speed in which children transition between stages varies according to genetic and environmental factors.

M. was observed during play facilitated by MW to assess his awareness of object permanence, cause and effect, problem solving, and direction following. M.’s motor limitations made engagement in play challenging, however with assistance he was able to demonstrate a basic understanding of cause and effect. This was evidenced through interactions with switch toys as well as by dropping plastic eggs into a tin that produced loud noises. M. also displayed the concept of object permanence by removing a cover placed over the tin of plastic eggs to continue cause/effect play.

M.’s problem solving skills were limited. When confronted with a barrier to mobility in the environment, M. would attempt to push through it several times before changing direction. However, his new course did not always take him around the barrier and thus does not display adequate problem solving. Direction following was the final cognitive measure assessed and M. did display an understanding of simple directions, however he has a very strong personality and this may have played a factor in some refusals to follow commands. For example, when presented with a visual stimulus, M. would be asked to “get it.” Many times M. would lean towards the object and attempt to retrieve it with his mouth. However, when told “no M., get it with your hand – not your mouth” he would sit back up and reach with his right upper extremity. During speech therapy sessions, M. would imitate sounds to request food or a drink, however he was not always consistent with this which suggests either a lack of motivation or a strong-willed personality, or both.

These observations of M.’s cognitive performance place him in Piaget’s sensorimotor stage. This is the first of the four levels and typically spans from birth to two years of age.
Piaget believed that such a plethora of cognitive attainments are achieved during this time that he further broke down the sensorimotor stage into six substages. Analysis of M.’s behaviors shows that his ability to understand cause/effect and object permanence is roughly equivalent to that of a child between 8 and 12 months old. However, his visual and motor impairments make this comparison weak as he is not physically capable of demonstrating some of the higher cognitive behaviors (e.g. searching for hidden objects in several places).

The Canadian Occupational Performance Measure (COPM) was conducted via an interview with M.’s mother (Law, et al., 2005). This assessment has a client reflect on a typical day and identify occupations in which he has difficulty completing or has a decreased level of satisfaction with his performance of that occupation. These tasks fall into one of three categories: 1) self-care (e.g. bathing, dressing, functional mobility, and community management); 2) productivity (e.g. work, household management, play, and school skills); and 3) leisure (e.g. quiet recreation, active recreation, and socialization). After identifying areas in need of improvement, the client ranks his performance and satisfaction with this performance on a scale of 1-10. Scores are determined and can be used to track progress during reassessments.

The COPM was chosen for this case study in order to ensure that the goals developed were client-centered. M.’s mother identified five areas in which M. struggles with his occupational performance. These were ranked in order of importance according to his mother of which she would like to see improvement and were as follows: play, functional mobility, feeding, bathing, and dressing. All of these areas were scored low in terms of how his mother perceived M.’s performance as well as her satisfaction with his performance. The total performance score was calculated to be 2.2 whereas the total satisfaction score was 2.
Goals

Based upon the assessments administered and the informal observations made of M. during everyday activities, goals were developed. These goals were then reviewed with M.’s mother to ensure that her viewpoint was represented thus furthering the client-centered approach to treatment. All goals were written to be met at the end of eight weeks and were broken down into four areas: self-care, feeding, functional mobility, and play.

Goals developed for self-care were as follows: 1) M. will assist with 25% of dressing daily including bridging during diaper changes 3/4 times; 2) M. will assist with 10-15% of bathing during bath times 2/3 times; 3) M. will wash his face with minimal assistance after meals and during bath time 4/5 times; and 4) M. will tolerate passive range of motion (PROM) of left upper extremity, as evidenced by not pulling away, 5/5 times, for maximizing functional use of left upper extremity.

Feeding related goals for M. were established to include: 1) M. will self feed all finger foods during mealtime when placed on tray in front of him 4/5 times with minimal verbal cues; 2) M. will independently drink one cup of juice from hard top sippy cup or sip-a-mug without perseverating on chewing spout/straw 2/3 times; and 3) M. will reach for fork (with food already placed on it) when held in front of him and self feed with utensil with 75% accuracy 2/3 times with no verbal cues.

The goals for functional mobility were: 1) M. will knee walk 10 feet with moderate assistance for advancing bilateral lower extremities 3/5 times for increasing independence with mobility for exploration of environment; 2) M. will pull to stand at couch or bench with minimal assistance for safe hand placement for increasing exploration of the environment 2/3 times; 3) M. will stand independently against a wall for support for 2-3 minutes for engagement in play 2/3 times.
time; and 4) M. will increase safety to good when transitioning from chair sit to floor sit and from standing to sitting as evidenced by protective extension reaction with right upper extremity 5/5 times.

M.’s goals relating to play also included vision related components with the idea that improving his vision would lead to more successful play interactions. These goals include: 1) M. will increase use of left upper extremity during play activities to use for stabilization of objects 50% of the time with moderate physical prompts; 2) M. will engage in cause/effect play with good attention for 3-5 minutes with occupational therapy student or caregiver 2/3 times; 3) M. will locate toys within visual field and retrieve them for independent play with minimal verbal cues 4/5 times; 4) M. will attend to visual stimulus with no auditory stimulation for 10-15 seconds before looking away 2/3 times; and 5) M. will reach for visual stimulus with right upper extremity for supervised engagement in play 4/5 times.

Interventions

During the eight weeks following the initial assessment of M.’s functional abilities, he received 12 occupational therapy sessions in his home conducted by MW. These were supplementary to his current therapy schedule described earlier. Additionally, M. was visited at school three times for observing his performance and subsequently providing his classroom teacher and aide with strategies for improving his performance and increasing his involvement in classroom activities. Intervention strategies in the home addressed all of M.’s goal areas by providing opportunities for him to engage in self-care, feeding, functional mobility and vision-related play.

All sessions adhere to the PEOP frame of reference through various intervention components, such as inclusion of engagement in naturalistic occupations (e.g. dressing and
feeding). Environmental and task modifications were also explored and care providers, including M.’s mother and nurse, were educated about following through with the modifications. When providing physical assistance, key points of handling were selected according to NDT. Additionally, when presenting visual stimuli, principles of Warren’s model were utilized.

**Self-Care**

Home visits were frequently scheduled for Friday mornings with instructions for M.’s mother to not dress him for the day. This allowed for sessions to include dressing as a therapeutic medium. Previously, M.’s mother and his nurse would struggle with dressing M. because he does not sit still for long. Thus, they would just get the task completed and not generally attempt to encourage M. to participate. Thus, these sessions were mainly comprised of educating both women through demonstration and verbal discussion. It was first discussed that PROM should be completed for M.’s left upper extremity before dressing tasks to decrease spasticity and allow for more typical movement and thus an easier session.

MW experimented with different ways to complete upper body dressing and determined that a typical hemi-dressing approach was the most appropriate. For M., this involves donning a shirt beginning with his left arm and then putting his head through before finishing with his right arm. Doffing a shirt is the reverse order (i.e. start with his right arm and end with his left). This method was explained and demonstrated to M.’s caregivers and it was agreed that this was the simplest approach.

In order to encourage M. to participate in upper body dressing, MW would place M. on her lap to keep him from moving away. Then, each step of dressing was spoken out loud to increase association of verbal instructions with physical doing. M. was asked to “reach” with his right arm to find the shirt hole, and then “push” through the sleeve. Physical prompts were given
in addition to the verbal instructions to enhance his understanding. The importance of consistency with this dressing routine and encouraging active participation was emphasized to M.’s caregivers.

Multiple sessions included a bath to address M.’s bathing goals. Intervention strategies included providing M. with a bath mitt adapted to fit securely on his right hand as well as including songs to help him associate vocalizations with motor sequences. For example, the song “this is the way we wash our belly, wash our belly, wash our belly, this is the way we wash our belly early in the morning” was sung while he washed his stomach with hand-over-hand assistance. M.’s mother attended the majority of these sessions and demonstrated a good understanding of consistency with routine and use of hand-over-hand initially to teach him the movement patterns associated with bathing.

Feeding

Most home visits fell around meal times and thus provided ample opportunities to address self-feeding goals. Interventions for this area had a large focus on environmental modification based upon M.’s level of success. For example, M. is unable to lift a cup to drink from it in a typical manner, thus a sippy cup with a straw is used. However, M. has a constant need for oral stimulation and chews the straws requiring them to be replaced on a daily basis. Thus, a search for an appropriate cup was completed which led to the fabrication of handles for a cup with a hard spout. This allowed M. to independently hold the cup and decreased his perseveration of chewing.

At the beginning of this case study, M. had just begun to self-feed when the food was placed in his hand. He had then begun to refuse to eat unless he was allowed to feed himself. His mother stated that she had begun to give M. “anything that can be wrapped in a tortilla.”
Utensils had never been introduced as a method for self-feeding and thus the first treatment session included providing M. with a fork. This was placed in M.’s hand (with food already on it) and he was immediately successful with bringing the food to his mouth. However, his motor planning was uncoordinated and he frequently “overshot” and missed his mouth, but was able to correct himself by sliding the fork along his cheek until reaching his mouth.

Subsequent treatment sessions explored the use of a variety of forks as well as foods to increase M.’s performance. This time was also used for addressing vision since food is a motivator for M. He demonstrated significantly faster processing time as well as accuracy of reach when asked to reach for a forkful of food than a toy. Thus, the fork was held in various positions within M.’s visual field and decreasing amounts of auditory stimuli (tapping the fork on the tray or verbal cues) were given to enhance his vision as well as his independence in self-feeding.

*Functional Mobility*

*Enhancing Occupational Performance*
MW to utilize handling techniques for facilitating movement and encouraging active involvement. MW frequently placed her hands on M.’s hips as this was a main point of control for him.

In addition to increasing M.’s sitting tolerance, safe transitions were also taught for moving from the chair to the floor. M. required maximum assistance initially for safely lowering himself to the floor, however he improved immediately and only minimal assistance was given to ensure his safety. Although, when he was not physically prompted, M. would take up to five minutes to move onto the floor from the chair.

Standing tolerance was addressed through interventions requiring M. to stand with decreasing amounts of support. The location for standing interventions was changed frequently to encourage exploration of the environment. For example, M. would be placed facing the couch with a toy visible on the surface for him to reach and engage in play. However, because M. was expending a significant amount of energy on his motor exercises, he was not pushed to engage in play during standing tasks but rather was provided with the opportunity to do so.

Knee walking was determined to be a potentially successful mode of functional mobility for M. and thus was addressed in intervention sessions. When M. would come into tall kneeling he would sometimes advance his right lower extremity as though he was trying to move forward. Thus, once M.’s trunk strength had increased and he would achieve tall kneeling more frequently and for longer periods of time, he was given assistance for mobility. It was expected that M. would require more assistance for advancing his lower extremities, however it was determined that support was needed instead for maintaining an upright position and for weight-shifting. When provided with these areas of assistance, M. independently advanced his lower extremities. Interventions included having M. knee walk across the floor to obtain a toy. He would then be
given a break and was allowed to play before knee walking again. Further intervention strategies included explaining activities to M.’s caregivers and demonstrating safe handling techniques. His nurse was present during many of the home sessions and demonstrated good understanding of how to help facilitate movement patterns.

It should also be noted that during the time of this case study, M. received his first custom-fitted wheelchair. This provides a more appropriate mode of transportation during outings than the use of a stroller, however M. is not able to propel himself in this chair for exploration of his environment. Thus, future interventions may address this area, although his limited vision should be considered when encouraging independent use of this device.

**Play/Vision**

M. has CVI which significantly impacts his ability to interact with his environment and thus improving his vision was a large focus of interventions. Nearly all activities done with M. could also address his visual impairments. For example, it was discussed earlier that M. was required to locate and reach for his food rather than simply being given the fork.

MW attended a meeting given by a vision specialist on M.’s specific limitations. This meeting in conjunction with a literature review of specific treatment strategies for children with CVI provided a guideline for intervention. Both of these sources of recommendation were consistent with some aspects of Warren’s model of visual perceptual dysfunction (Warren, 1993a). For example, the main focus of intervention should be on remediating M.’s visual function. Additionally, inclusion of tactile and auditory stimulation to enhance M.’s visual experience was a recommended strategy given by the vision specialist as well as documented in CVI literature and Warren’s model (Baker-Nobles & Rutherford, 1995; Warren, 1993b). The literature MW located regarding CVI was compiled and formatted into a PowerPoint
presentation (Appendix A). This was then presented by MW to other clinicians at the outpatient facility.

M. is more responsive to bright red items, as well as those with are shiny and reflect light. A plethora of items meeting these recommendations were gathered and presented to M. during home sessions. M. was observed for any reaction indicating awareness of the visual stimulus (e.g. turning his head, smiling, leaning towards the object). The objects were presented individually beginning in the periphery of M.’s vision. They were moved slowly and noise was added (small bells were sewn to some items) in order to attract M.’s attention to the stimulus. Interestingly, one of the items M. responded to the most consistently and with the fastest processing time was a red slinky. This provided a bright color as well as produced an audible noise and a breeze when moved quickly. According to the PEOP frame of reference, assistive technology should be included in interventions when appropriate, thus additional devices used during sessions included adapted switch toys and light boxes (Christiansen & Baum, 1997).

A specific intervention session conducted early on in the case study included presenting M. with a visual stimulus for increasing visual attention. A stuffed animal was utilized as this stimulus which was green in color. This session took place in the therapy gym on a blue mat with a plethora of items in the surrounding area as well as multiple other therapy sessions being conducted. M. continuously shook his head and turned away from the stimulus. The stimulus was moved all around M.’s visual field and M. focused on it for no longer than a few seconds at a time. He did not reach for it at all, and grabbed it only when MW moved his arm and placed his hand over the toy. From this it can be inferred that M. did not find the stimulus meaningful and thus did not have motivation for purposeful engagement in play.
After meeting with the vision specialist, changes were made to improve M.’s occupational performance and therefore enhance his meaning and purpose associated with it. The next session took place in M.’s house, which is a familiar environment with fewer distractions and thus is more likely to result in better performance outcomes. The stimulus was replaced by a bright red, sparkly piece of netting that created a noise when rubbed against itself. This was then introduced to M. starting in his peripheral field of vision again a black background created by multiple poster boards. The vision specialist had stated that children with CVI respond more positively when a black background is used versus a white background.

M. immediately turned his head towards the stimulus and focused on it for about ten seconds before turning away. Additionally, M. smiled and laughed from which it can be inferred that there was a meaning associated with this stimulus. M. also leaned towards the stimulus as though he was trying to put his mouth on it. When told “no M., get it with your arm” he sat back up and reached for the stimulus with his right upper extremity. This implies he had a purpose in obtaining the object for examination. Based upon M.’s performance, future interventions should continue to utilize the black background as well as bright, shiny objects that produce an audible sound.

M.’s mother also attended the meeting with the vision specialist and thus is aware of M.’s level of functional vision and methods for improving it. MW did educate M.’s nurse on CVI and what interventions are appropriate for use with him. She was also provided with an article written by Baker-Nobles and Rutherford (1995) which effectively explains CVI, behaviors associated with it, and treatment strategies.

Outcomes of Interventions
M. has very complex medical problems and functional limitations; however, he did show improvement in all goal areas over the course of eight weeks. For self-care, M. met or partially met all of his goals. He has increased his participation in dressing to about 10% (pushes right upper extremity through sleeve with minimal physical prompts); however, he is not consistent with bridging, requiring physical prompts to do so. M. still requires hand-over-hand assistance with bathing; however, he tolerates this well and when his “bath song” is sung, he will attempt to move his hand to wash his belly. His movements remain uncoordinated, but he demonstrates more understanding of the occupation and his role within it. M. met his goal for tolerating PROM of his left upper extremity.

Regarding his feeding related goals, M. has met or partially met all goals. M. will self feed with finger foods; however, he does not have the fine motor coordination to pick up small items, such as green beans or grapes. It should be noted that M.’s oral motor skills are intact and he is able to successfully eat all types and textures of food without concern for safety. The goal for independently drinking from a sippy cup was met after many trial-and-error experiments with various cups, straws, and handles. He is currently using a hard spouted straw sippy cup with custom-made handles that are brightly colored and easy for him to locate and grasp. Finally, M. successfully reaches for a fork and brings it to his mouth with 75% or greater accuracy during each meal. However, due to his fluctuating behavior, he requires auditory cues ranging from none to moderate. Also, M. will rarely reach across midline to grab the fork, although he will do so consistently to obtain his cup.

In terms of functional mobility, M. partially met his goal for knee walking. As discussed earlier, M. required assistance for upper body stability rather than advancement of lower extremities. With this support he is able to knee walk six feet 4/5 times. M. has improved in
transition to standing, however he requires minimal to moderate assistance to achieve a half-
kneel position and is dependent for safe hand placement to pull up into standing.

M. improved greatly in his standing endurance and tolerates standing at a wall with
intermittent facilitation of trunk muscles and/or hamstrings to maintain posture for up to five
minutes. M. transitions from chair sitting to floor sitting with fair/fair plus safety. His
movements are excessively slow, but consistent with more evidence of a protective extension
reaction with his right upper extremity. This reflex is also more evident during transitioning
from standing to sitting. However, M. does not stand alone and thus has not been allowed to
completely fall in order to accurately test the achievement of this goal.

M. improved his performance in terms of play and vision-based activities, meeting or
partially meeting all of the set goals. M. requires moderate to maximum assistance for
placement of his left upper extremity for stabilizing objects during play. M. varies in his
attention span on a daily basis, however he has maintained fair attention to cause/effect play in
the form of switch toys for around three minutes. M. is able to successfully locate toys within
his visual field; however he does not engage in typical independent play. M. attempts to put
almost every object in his mouth due to his need for oral stimulation, thus limiting his
independent play skills.

In terms of his visual attention, M. demonstrated improvements in the length of fixation
on an object. M. has been observed attending to a visual stimulus for up to 25 seconds before
looking away. However, this remains inconsistent. He has also improved in his ability to
visually track and has followed the movement of a person from one side of the therapy gym to
the other before looking away. M. is consistent in reaching for visual stimuli, however his
processing time is the fastest when the stimuli is either food or drink. He will also at times lean
towards the object rather than extending his arm, but is easily redirected when told to “get it with your hand.”

In addition to assessing M.’s performance in goal areas, the T.I.M.E. and the COPM were re-administered to assess gains in these areas. The T.I.M.E. resulted in a score of 327 showing a gain of 73 points. This put M. in the 25th percentile for typically developing 11-12 month old children. This session was videotaped and compared to the initial assessment which then illustrated an increase in his speed of movement as well as an increase in coordination. M. appeared to move easier and expend less energy than during the initial assessment. He achieved tall kneeling more frequently and with more stability as evidenced by remaining in that position for longer periods of time. He also attempted to knee walk on his own while in tall kneeling. M. also demonstrated less delay in terms of his upper extremity protective extension during transitions. Finally, M.’s tolerance for circle sitting was dramatically improved as well as his transition from sitting to standing (with assistance).

M.’s mother completed the reassessment section of the COPM, marking improvement in all areas of performance as well as satisfaction (see Table 1). The total performance score was 3.6 and the satisfaction score was 2.6. This shows improvements of 1.4 and .6 points, respectively. M.’s mother stated that although she is able to see an improvement in M.’s performance, he is still not where she would like him to be. Thus, her satisfaction ratings remain low. M.’s mother stated that she will not rank either section with the highest scores until M. is independent and performs at the same level as his peers. She stated that she realizes this is an unrealistic expectation, but will not stop hoping and praying for M.’s success and improvement.

In summary, M. made several gains in all goal areas during the eight weeks of supplementary interventions. M.’s ability to care for himself remains limited, however he has
become a more active participant and his caregivers have been taught to continue to encourage him in his daily self-care tasks. In terms of self-feeding, M. has improved tremendously. He consistently reaches for both his fork and his cup to feed himself with growing levels of accuracy. M. has improved in his trunk stability which allows him to achieve tall kneeling more frequently as well as successfully knee walking with assistance. M.’s vision has improved in terms of tracking and fixating which allows him to engage in supervised play more successfully and for longer periods of time.

**Plan for Discharge**

At the termination of this case study, M.’s mother was provided with a manual (Appendix B) that outlined various interventions that MW conducted with M. This also had instructions and pictures for how his caregivers can continue to work with M. to improve his functional performance. All areas in this manual were reviewed with M.’s mother as well as his nurse. A schedule was also outlined to provide structure and opportunities for completing the various activities outlined in the manual.

Discharge planning also included a discussion with LG who is M.’s regular occupational therapist at the outpatient clinic. It was decided that when the school year ends, M.’s outpatient sessions will be increased to twice a week. Until that time, M. will continue to receive outpatient services once a week, home therapy twice a week, and school-based treatment once a week. With M.’s caregivers addressing goal areas outlined in the manual, these services should be sufficient to maintain and improve his occupational performance until additional outpatient sessions can be included.
Discussion/Conclusion

M.’s improvements made during the eight weeks of supplementary intervention lend support to the models of practice utilized to guide this case study. The PEOP frame of reference complemented both NDT and Warren’s models well in terms of structure for interventions. The PEOP frame of reference provided guidelines for treatment which were utilized throughout the sessions conducted with M. Those that were most successful include using occupation as a therapeutic medium, modifying the environment, and educating M.’s caregivers. These strategies were beneficial and can be applied to future case studies having an emphasis on client-centeredness and naturalistic settings.

NDT-based interventions done with M. focused on normalizing muscle tone and developing typical patterns of movement. These were done within naturalistic settings frequently using occupation as the therapeutic medium. M. responded well to interventions and improved in terms of quality of movement, although he still has severe gross motor limitations due to the extent of his brain injury. Typical use of NDT involves rote movements without the inclusion of occupations. Anderson, Hinojosa, and Strauch (1987) discussed the difficulties therapists have when attempting to incorporate play into NDT sessions with children. While it may be challenging to handle the child and simultaneously encourage engagement in play, it should be attempted whenever possible. This will act as a motivator for the child as well as create generalizability for the movements facilitated by the therapist.

Warren’s model of visual perceptual dysfunction has foundations and treatment guidelines that correlate with literature relating specifically to CVI. This model was created for use with adults and research on its efficacy with children has not been previously identified. Thus, this case study provides evidence supporting the use of Warren’s model with new
populations. Treatments were focused on modifying the environment, reinforcing visual awareness through the addition of tactile and auditory cues, and using occupations to ensure generalizability. These again are consistent with the ideas of the PEOP frame of reference and thus are very compatible.

Future areas of research should further explore the use of these models of practice being used concurrently. Huo, Burden, Hoyt, and Good (1999) found that over 75% of the children with CVI in their study (n=170) had neurological co-morbidities, including cerebral palsy and hemiparesis. This demonstrates a need for a combined vision and motor-based approach to treatment which can be achieved through use of NDT and Warren.

This case study provides new methods for approaching patients with complex medical and physical needs. M.’s diagnosis of CVI is unique and thus a literature review was required to develop an understanding of his limitations and to find appropriate strategies for remediation. Occupational therapists should be aware of what constitutes CVI and behavioral characteristics associated with it. Therapists frequently have on caseload children who are more susceptible to CVI (e.g. children who were born premature) and thus may play a role in detection and intervention. Overall, this case study provides an innovative approach that is client-centered and addresses all aspects of M. including cognition and vision as well as functional skills.
References


Table 1.

*COPM scores given by M.'s mother at initial assessment and at re-assessment following eight weeks of intervention*

<table>
<thead>
<tr>
<th>Occupational Performance Problems</th>
<th>Initial Performance</th>
<th>Final Performance</th>
<th>Initial Satisfaction</th>
<th>Final Satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Functional Mobility</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Feeding</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Bathing</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Dressing</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total Score</td>
<td>2.2</td>
<td>3.6</td>
<td>2</td>
<td>2.6</td>
</tr>
</tbody>
</table>
Appendix A
CORTICAL VISUAL IMPAIRMENT
Morgan Wilcox, OTS
TABLE OF CONTENTS

- Visual Processing
- Defining Cortical Visual Impairment
- Etiologies
- Characteristics
- Co-morbidities
- Outcomes
- Treatment/Intervention
- Implications for OT
STAGES OF VISUAL PROCESSING

- Optical – projecting an image onto the retina
- Retinal – detecting the image and translating it into neural impulses
- Neural – processing the image

Colenbrander (2009)
“organ related aspects” = visual function
“person related aspects” = functional vision
“Vision is not just a function of the eyes, but...the most complex part of visual functioning resides in the brain”
WHAT IS CORTICAL VISUAL IMPAIRMENT (CVI)?

- “Difficulty in processing and interpreting visual information in the visual cortex” (Baker-Nobles, & Rutherford, 1995, p. 89).
- “A loss in visual function in the absence of damage to the anterior afferent visual pathways or ocular structures” (Khetpal & Donahue, 2007, p. 235).

- Single largest cause for binocular visual impairment in children in developed countries...
ALSO KNOWN AS...

- Cerebral Visual Impairment
- Neurological Visual Impairment
- Cortical Blindness
60% of children with perinatal hypoxic ischemia have CVI.
Medical advancements and decreased infant mortality → increase in CVI
Many children with CVI have intact color vision which may be due to the fact that color is everywhere in the visual field and cortical areas responsible for interpreting colors are relatively spared.

The responsiveness to color is explained in that there is a bilateral cerebral representation of color and therefore is more likely to remain intact. The characteristic head movements are thought to possibly be due to the child attempting to use residual peripheral vision. The author also included differential diagnosis that may mimic certain characteristics of CVI, but are actually unrelated. These include autism, oculomotor apraxia, and a delay in visual maturation.
This study videotaped children, focusing on eye movements as well as body movements. Determined behaviors that indicate that the children perceived the stimulus. The indirect signs were accompanied by the direct signs in at least one or more children.
CVI rarely is an isolated condition
Good et al. stated ocular disorders to be present in 65% of CVI cases
Acuity was decreased in 87% of subjects in one study (n=121)
Fixation was absent, sporadic or unstable in ~48%
Smooth pursuit was absent or discontinuous in ~80%
Saccadic movements absent or abnormal in ~34% - used compensatory strategies
Strabismus was present in ~73%, with 58% having esotropia and 42% had exotropia
Not all of the subjects were able to be tested for ocular motility due to absence of fixation and smooth pursuit
The sample for nystagmus consisted of the children who were already determined to have abnormal ocular movements, thus smaller sample size (n=43)
Overall, the results of this study found that even though the standard definition of CVI does not include major ocular pathologies, ophthalmologic abnormalities are frequently associated with it. The majority of this sample had a decrease in visual acuity, and the 13.2% that had normal acuity demonstrated oculomotor abnormalities or visual-perceptual disorders. Residual vision, however, was found in all of the children and was determined through clinical observations of visual behaviors.
N=170; n=98
Developmental delay was assessed by Fazzi et al. and it was found that 75% of their subjects had either mild, moderate, severe or profound delays.

COMMON CO-MORBID IMPAIRMENTS: NEUROLOGICAL

- Seizures (53%; 61%)
- Cerebral Palsy (26%; 37%)
- Microcephaly (15%; 21%)
- Hemiparesis (12%; 21%)
- Hypotonia (without CP) (5%; n/a)
- Hearing loss (2%; 11%)
- Behavioral problems (n/a; 4%)
Simultagnosia = one or more isolated elements of a visual scene can be recognized, but not the whole complex scene. Agnosias such as cerebral akinetopsia, simultanagnosia, central achromatopsia, prosopagnosia, topographic agnosia, and astereocognosis. (good et al.)
LONG TERM OUTCOMES

- Gradual improvement in vision

<table>
<thead>
<tr>
<th>Scale of Visual Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level One</td>
<td>Light perception only</td>
</tr>
<tr>
<td>Level Two</td>
<td>Occasional fixation on large objects, faces, or movement</td>
</tr>
<tr>
<td>Level Three</td>
<td>Occasional fixation on small objects (i.e. pennies or stickers) or reliable fixation on faces</td>
</tr>
<tr>
<td>Level Four</td>
<td>Reliable fixation on small objects; visual acuity 20/400 to 20/200</td>
</tr>
<tr>
<td>Level Five</td>
<td>Reliable visual acuity not better than 20/50 (both eyes open)</td>
</tr>
<tr>
<td>Level Six</td>
<td>Completely normal vision</td>
</tr>
</tbody>
</table>
RESULTS

- Iluo et al. (1999) n= 96
  - 60% improved at least one level
    - 40% improved one level
    - 14% improved two levels
    - 5% improved three levels
    - 1% improved four levels
    - 1% improved five levels
  - 38% showed no improvement
  - 2% experienced a decline in vision
Thus, outcomes differ for type (cause) and severity of injury as well as timing (at what age incident occurred)
So how do we, as occupational therapists, help these children improve their functional vision?
The major treatment goal for children with CVI is to “maximize the use of residual vision” for increasing opportunities to learn from the environment (Baker-Nobles, & Rutherford, 1995, p. 902).
MODIFY THE VISUAL ENVIRONMENT!

- Simplify
  - Reduce “crowding” effect
  - Decrease number of toys in visual field
  - Decrease the number of different colors present

- Use common/familiar objects
  - Children with CVI tend to prefer “old” toys rather than new items
    - May need to introduce new items repeatedly before achieving a response from the child
    - Introduce new items with familiar objects

- When possible, treat in a familiar environment (e.g. home)
Switch toys may be overstimulating for some children, so use clinical judgment skills.
EXAMPLES OF ITEMS USED FOR INCREASING VISUAL ATTENTION
ADDITIONAL NOTES TO CONSIDER

- When there is a motor impairment present, it is not advised to combine interventions
  - Work on motor control or vision
- Find stimuli that are motivating for the child
- What works one day, may not work the next, but keep trying it!
Also, any acquired brain damage may result in a decrease in visual functioning. Be aware of the behavioral signs and use observation skills to assess this area.
REFERENCES

ANY QUESTIONS?
Appendix B
Schedule

Mornings:

* Stretch left arm before dressing
* Trunk stretches
* Vision-based play time
* Stretch ankles and legs before putting on AFO’s
* Do standing activities before lunch

Afternoons:

* After lunch, engage M. in vision-based play
* Do sitting activities after his lunch has settled
* Do standing activities in the late afternoon

Evenings

* Play games with bother (incorporate stretching if possible)
* Deep pressure massage before bed
Meal Time

Goal: For M. to increase his independence with eating

Ways to help M. achieve this goal:

* Let M. feed himself during *each* meal
* Use a fork whenever possible
* Encourage M. to reach for the fork and cup
  o To work on improving his vision, move the fork/cup around so he has to locate and reach for it. Try to get him to cross midline by holding fork/cup on his left side.

* Try using hand-over-hand to have M. help you to “spear” his food
* Use a cup that M. can hold by himself (i.e. one that is light and has a handle)
  o Place M.’s left hand on the cup when drinking to encourage use of both hands

This cup is ideal to use because it has bright handles which will be easy for M. to see and the hard spout will decrease his chewing on straws.

Self Care

Goal: For M. to assist with basic self care tasks
Ways to help M. achieve this goal:

* Use hand-over-hand to have M. wipe his face and hands after each meal.
  o Be sure to tell him that it is time for him to wash his face so that he can connect verbal instructions with physical doing.

* Bathing
  o Use bath mitt on right hand.
    Use hand-over-hand to have M. wash trunk, left arm, and face.
    Sing, or talk, to M. during bathing.

* Dressing: Talk during dressing, for example, ask M. to “push” his right arm through the sleeve while you do so
  o Putting on shirts: put M.’s left arm in sleeve first, then his head, then his right arm.
  o Taking off shirts: start with his right arm, finish with his left
  o Pants: when M. is lying on his back, bend his knees and tell him to lift up his bottom. Help him lift his bottom off the ground 2 or 3 times before pulling his pants up (or down). Doing this at each diaper change will help him to be consistent with helping to dress.
Bridging

Goal: Increase leg strength for walking

“Up M.!“
Ways to help M. achieve this goal:

* Put on AFO’s an hour before lunchtime (if they aren’t on already).
* Have M. stand for 15-20 minutes before lunch (see list for ideas of standing activities)
* Repeat standing again in the late afternoon (with AFO’s)
* When M. comes to a standing position, have him bring his R leg up into a half kneel and push up from there.

* During standing, keep hands close to M.’s hips, but don’t hold him up – let him do the work. If he starts to bend his hips to sit down, press on the boney part of his bottom (this is where the hamstrings insert and will encourage him to use these muscles).
* When getting down from a standing position, encourage M. to bend at his hips and knees and to extend his R arm to catch himself. (This may not happen until he is close to the ground, so hold on tight so he doesn’t get hurt!).

**Standing Activities**

Have M. stand in various locations which can challenge him in different ways

* Standing in a corner (facing out) will give M. support from both sides, making standing easier
* Standing against one wall will still provide support, but still make him work to stay upright
* Standing in the middle of the room forces him to do all of the work to maintain balance while really working on increasing leg strength
* Stand at the couch can make it easier for you so that if M. loses his balance he could land on a soft surface
* Stand at the arm of the couch and encourage M. to place his arms on it for support if needed
* Stand at the kitchen table and place a few toys on it to encourage play while standing
* Have M. stand facing a mirror so he can look at himself and you can watch his reactions
* Hang toys or a bright picture on the wall so it is eye level with M. so he can look at it while standing.
Sitting

Goal: Increase trunk strength for increased independence with mobility

Ways to help M. achieve this goal:

* Every afternoon, have M. sit for 30 minutes on a stability ball or bench. Give him breaks as needed.
* When M. is sitting on the stability ball, give him support at his hips and rock the ball from side to side and front to back.
* Placing the ball against the couch will help to keep it in place and it is a soft place if M. falls onto it.
Play Time

Goal: For M. to engage in play by himself and with brother

Games to play with brother 😊

* Wii Rock Band
  - Have M. sit in a chair and hold drum sticks. Use hand-over-hand to help him play. Have brother be in charge of the foot pedal (and possibly the left drumstick if M. won’t tolerate holding it).

* Wrestling
  - Let the boys be boys. You can play too and help M. to stretch his left arm and “pin” brother.
* Stability ball play
  o Have both boys lie on their tummies on the balls and walk forward on their hands to get toys. Or, have them face each other and have brother crawl forward to get M.’s arms and help him to get a toy.

* Have the boys sit on the floor and pass a bright colored ball back and forth. Encourage M. to reach for the ball and push it back to brother (may need to do hand-over-hand). Also try to have M. reach with his left arm to get the ball!

* Set up bowling pins (or plastic cups) and have the boys bowl. Again, try to get M. to use his left arm to push the ball towards the pins.
Vision

Goal: For M. to increase his visual function so he can interact more with his environment

Ways to help M. achieve this goal:

* Everyday after breakfast and lunch, get out some toys to work on improving M.'s visual attention for about 30 minutes.
* Have M. sit in a chair or on the floor – working on standing takes a lot of energy and won’t leave much for him to use on vision
* Use bright colors (Red and yellow)
* Use items that are shiny
* Put the objects against a black background to make them stand out more
* Present the objects one at a time and hold them to the side. M. has difficulty seeing directly in front of him
* Moving the objects slowly up and down and side to side will help to draw attention to it
* Adding in noise, such as shaking the toy or putting a bell on it will also help get M.'s attention
* Keep things clutter free – the more things that are out, the harder it is for M. to focus on a single item
* Ask M. to reach for the item (with his arm, not his mouth!)
* Be patient! M. may take a long time to understand what he is seeing and respond to it.
* Try to use familiar toys
* M. may vary each day on which objects he will respond to, but continue to use all items.
* Use the light board with M. two or three times a week.
* Use switch toys frequently so M. can understand the cause-effect relationship

* Here are some toys that would be appropriate to use with M. to increase vision function
Stretching

Goal: To increase range of motion and keep M. “loose” so he can be more successful during play and other activities

Stretches should be performed every day.

* The **yellow** pages are examples of stretches for M.’s left arm. These should be done each morning before dressing to make this task easier.

* The **blue** pages are examples of stretches for M.’s trunk. Since he tends to sit on one side, his back needs to be stretched to make sure it doesn’t become crooked.

* The **green** pages are examples of stretches for M.’s legs and feet. The ankle stretches should be done before putting on his AFO’s each day.

* The **red** pages are additional miscellaneous reminders.
M. should sit upright in a chair to promote good posture. This should be part of his day at school, but can also be encouraged while at home during playtimes.

Massage is a perfect way to provide deep pressure which is calming to M. This is a good exercise to add to his nightly routine.