

Improving Performance in Adults with Cerebral Palsy: A Long Distance Consultation Model

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Abstract

Very little exists in the literature regarding effective physical handling treatment programs for adults with cerebral palsy. Adults with neuromotor disorders general experience deterioration of physical skills over time, due to lessened availability to treatment programs and secondary physical and orthopedic issues. This article presents two different long distance consultation models for improving functional skills in adults with long standing neuromotor disorders. A series of single-subject anecdotal studies demonstrate that loss of functional skills can be abated and indeed significant improvement of functional skills can be attained through specifically designed consultation services and skilled application of treatment principles for the adult population.

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Background

Once a child with a neuromotor disorder reaches adulthood, there are fewer and fewer long term therapy or rehabilitation programs available. Emphasis on rehabilitation is relatively intense in early childhood and early intervention programs, however even within the pediatric population, therapeutic intervention decreases with age and as the child progresses through the school years the availability of intensive therapy becomes increasingly less. Private therapeutic services supplement school-based therapy programs where available and only where circumstances afford families access to these services.

As children age they are subject to increasing degrees of functional problems such as contractures, osteoporosis, pain, hip dysplasia and loss of mobility. These factors are often related to decreased intensive therapy and less physical mobility opportunities such as are offered in many early intervention programs. Throughout the secondary and high school years, many children who were able to walk with assistance or use of a walker, become more and more dependent on wheelchairs and lose further mobility, not only in actual physical movement, but loss of mobility of joint range, tissue flexibility and an increase in muscle disuse atrophy. These factors are compounded for adults.

Blackman & Conaway (2013) concluded, when referring to adults with cerebral palsy, that "inadequate adult health care services have a direct and unsatisfactory impact on the adult life span." Liptak (2008) found that there is a decrease in utilization of health related services in adults with cerebral palsy and that there is a high presence of simultaneous secondary conditions such as pain and functional mobility restrictions. Further Liptak states that there are few studies that identify interventions that would lead to improved outcomes socially and physically for adults with cerebral palsy.

Aniek et al (2011) found there were no intervention programs that "optimize" physical abilities in the adult cerebral palsy population. Other studies (Leslie et al 2009, Roebroek et al 2009 & Opheim et al 2009) concur with findings of deterioration in physical skills, joint pain, musculoskeletal restrictions, decreased socialization and increased emotional health issues. In fact Parish (2005) states that "There is an impending crisis in long-term care for people with developmental disabilities.

Mentes con Alas Program for Adults with Neuromotor Disorders



Clients of Mentes con Alas



Ruth Berlanga de Avila with client

In response to the needs of adults with cerebral palsy, Ruth Berlanga, a mother of an adult son with cerebral palsy, started a non-profit program in Torreon, Mexico: Mentes con Alas, to address the issues of her son as well as other adults with cerebral palsy within her community.

Like many other non-profit civil society associations, Mentes con Alas was born out of the love and motivation of a mother at the birth of her son Fernando in 1979, with cerebral palsy. Together as a family, Fernando's parents, Juan Fernando Ávila Garza and Ruth Berlanga Quintero, devoted their efforts to researching ways to provide their child with the medical support and loving care required for his development.

At that time, knowledge about the therapeutic methods of rehabilitation for cerebral palsy was precarious, especially within the region. So, it was necessary to carry out in-depth research and frequent trips to different locations in Mexico and abroad.

It was in Cuernavaca, Morelos, Mexico, where they met Dr. Christine A. Nelson, Ph.D., OTR. A US citizen, who lived and worked in Cuernavaca, she was woman with a big heart and a tireless

spirit dedicated to working with children who live with neuromotor impairment. Together with a team of professionals, she supported Fernando's rehabilitation for 15 years.

Ruth Berlanga worried about her son's future, since there were no follow-up options for his adult life, so her entrepreneurial and socially committed spirit lead her to dream about the creation of a life community; a small group of men and women with cerebral palsy who would come together as a family, establishing deep bonds of love, understanding and respect, in an environment where they could share and discover the meaning of life, growing as human beings, and working together to develop their own capabilities and manifest themselves as people with rights and values.

Mentes con Alas began in 2004, in the home of the Avila Berlanga family, in Torreón, Coahuila. In 2006 it was formalized and legally established as *Mentes con Alas, A.C.* (Minds with Wings, Civil Society Association).

The mission was to provide a warm and safe living space for adult men and women with cerebral palsy where they could receive professional integrated care that included health programs, physical and emotional rehabilitation, development of educational, communication, and expression skills, as well as a productive and social integration promoting social interaction and inclusion.

As part of the ongoing efforts of Mentes con Alas, there has been a dedicated emphasis on physical treatment to decrease musculoskeletal deterioration, increase independence in mobility and activities of daily living such as self-feeding efficiency, and enhance and improve physical performance in all areas.

As part of those efforts and with the dedication of Alejandra Colores, PTA, primary therapist at Mentes con Alas, a long distance consultation model was developed in 2010 with W. Michael Magrun, MS, OTR, to assist in identifying specific physical needs of their clients and targeted therapeutic intervention strategies.

Initial Consultation Model

The initial consultation model included a video assessment of various postural factors including alignment and movement efficiency. The video was analyzed and a detailed written treatment program was provided. The programs were discussed and modified via email and changes and modifications were incorporated into the client's programs.

The first step in developing an effective physical handling treatment program is the ability to observe the clients' alignment and movement patterns and to problem-solve the reasons for inefficient or restricted motor functions. Without a foundation in observation and problem-solving it is unlikely that an effective treatment approach can be initiated.

Conceptual Basis for Assessment and Treatment

One of the major factors influencing functional movement, and therefore efficiency in activities of daily living, is musculoskeletal alignment. Dynamic alignment of the body is required to initiate

movement, grade the transitions of movement and establish alignment and control throughout a movement.

Factors influencing normal dynamic alignment include joint restrictions or lack of full joint mobility, soft tissue trauma and restrictions, paralysis or paresis of the musculature interfering with anticipatory activation of postural tone, weakness and kinesiological imbalances in muscle function and control. These factors must be addressed through physical handling treatment with a careful analysis of the postural alignment, compensations, restrictions, and imbalances demonstrated by the client.

Effective observation and problem-solving require:

- Analyzing the starting position
- Identifying the initiation of movement
- Identifying proximal and/or distal compensatory tightness
- Identifying compensatory substitutions in movement patterns
- Determining initial factors that inhibit efficient functional control

The ability to control and grade weight shift and weight distribution over the base of support establishes a bilateral relationship between body sides around an organized and stable central midline core. Without such an ability and relationship, efficient coordinated movement and functional performance with adaptability are compromised. Movement and functional performance become compensatory to the underlying postural inefficiencies and splinter skill learning results. Normal alignment allows weight to be distributed appropriately to the task and allows the task to be performed in a coordinated and efficient way (Magrun 2007).

Alignment is so critical to balance and the maintenance of posture that structural integrity of the musculoskeletal system is the first thing that should be evaluated in order to determine its effect on postural control (Crutchfield & Barnes 1993). Moore (2003) emphasizes that the upright posture provides the most efficient alignment for the maximal integration of all sensory systems.

With these concepts in mind an individualized assessment and treatment program was developed for clients at Mentos con Alas.

Video Assessment Procedures

The video assessment procedures presented below emphasized the importance of postural organization and dynamic alignment. Postural organization determines the efficiency or lack of efficiency in daily activities and functional abilities. Each subject was videotaped performing the protocol.

Video Assessment Procedures

Assessing General Body Organization

Body Alignment

Observe the orientation of the body to vertical midline in sitting and standing in relation to where the body weight is distributed. Determine if the client can correct his position. Observe what areas of the body are less mobile. Determine if there are any musculoskeletal deformities or restrictions.

Sitting and Standing

1. Neck/Shoulder asymmetries: Observe if neck is shorter on one side. Observe if shoulder is higher on one side. Observe the resting position of the scapula.
2. Trunk asymmetries: Observe if trunk is shortened on one side. Observe the alignment of the spine.
3. Pelvic alignment: Observe if pelvis is higher on one side and/or tilted.
4. Weight distribution: Observe if one side is more consistently taking weight.
5. Foot/Ankle: Observe if the ankle and foot are aligned or if the arch of the foot is collapsed.

The importance of analyzing alignment is to determine the functional relationship of the head/neck and shoulder girdle which provides the base of stability for the visual system and upper extremity use. The asymmetries of the body, weight distribution, equilibrium and righting reactions, mobility and stability of the pelvis, trunk, and shoulder girdle affect the ability of the head to maintain vertical and provide a normal foundation for upper extremity skills.

Normal postural alignment is the most critical prerequisite for establishing efficient functional movement capabilities. The ability to maintain dynamic alignment provides the basis for an organized initiation of movement with graded control of movement components during the process of performing a functional task or movement sequence. Alignment refers to the relationship of each body part to each other and to the relationship of the body to the base of support (BOS). Body alignment is dependent on the kinesiological alignment of muscle groups which in turn depends on joint alignment.

Musculoskeletal Status

This assesses the relative mobility of the joints and the dissociation of body parts.

1. Joint mobility (Passive and Active)

- a. Shoulders: Move the shoulders in elevation, depression, flexion. Move the scapula in adduction and abduction.

The purpose of this observation is to evaluate the ease and mobility of the shoulder to move in various ranges, and assess any presence of tightness or resistance.

The significance of this is important. Efficient movement requires various levels of mobility-stability and ranges of the degrees of freedom (dissociation) of movement to initiate:

- Righting and equilibrium responses
- Head righting to maintain vertical
- The ability to activate rotation with combinations of flexion and extension.

If the shoulder girdle cannot move freely and establish the graded requirements of mobility-stability, then it interferes with arm and hand use, trunk rotation, the ability of the head to maintain vertical and thus it inhibits a normal visual-motor relationship. This affects functional use of the upper extremities and visual-motor coordination, due to the inability of the head/neck and shoulders to be free to maintain dynamic vertical orientation.

- b. Pelvis: Move the pelvis anteriorly, posteriorly, and laterally

The purpose of this procedure is to assess the mobility of the pelvis in anterior, posterior and lateral movements, and to assess how the trunk, head and neck respond to the initiation of movement from the pelvis. What is important to recognize is that initiation of movement from various body postures has consequences in the sequence of response of the entire body. How a movement is initiated has an impact on sequential organization for performing a function.

- c. Trunk Rotation: Move the trunk in rotation to each side with arms down, then with arms out in front and then with arms elevated.

The purpose of this procedure is to assess rotational ranges with different alignments of the arm and shoulders, which affect the range of rotation with extension. As the arms are elevated, there is more shoulder stability required and therefore more trunk extension activated. The significance of this relates to the ability to activate trunk extension with different shoulder positions and shoulder stability requirements. If the shoulders do not have the mobility-stability to activate trunk extension and stabilize the arms for distal control, the eyes will be less able to organize eye-hand control in various postures. There may be a limited postural set in which the client can use the eyes and hands well, or to move and reach with eyes leading.

Musculoskeletal Status continued

2. Rib Cage Mobility

- a. Thoracic expansion: Evaluate anterior thoracic expansion.
Palpate the anterior thorax and identify any shortening and the ease or lack thereof to spreading the thorax and expanding the chest area.
- b. Intercostal mobility: Evaluate the mobility of the ribs.

Place your hands on the ribcage and move it anteriorly and posteriorly and in rotation. Note any restrictions to the facilitated movement. These procedures are important to identify any restrictions to the thorax and intercostal muscles. Movement requires good respiration and the respiratory muscles need to have adaptive flexibility, particularly in rotation movement patterns.

3. Hand/Arm

- c. Structure: Move the hand and forearm to evaluate supination/pronation, flexion/extension, grasp and release, arches of the hand, and individuation of digits.

The purpose of this procedure is to identify the functional structure of the hand and proximal control of the forearm and wrist. Specific attention must be given to the hand and forearm to normalize structures and enhance coordinated movements prior to any practice in hand function. Practice on an inefficient structural base will embed the dysfunction of the hand.

Independent Movement Abilities

This assesses the efficiency of active and passive movements. Observe where the areas of stability and the areas of mobility are. Observe the relative dissociation or lack thereof of body parts required in the movement patterns. Observe associated reactions of tightness, over-reactions to weight shifts or lack of equilibrium and righting reactions.

1. Arm movements away from body

- a. Reaching forward.
- b. Reaching to the side.
- c. Reaching up.
- d. Reaching down.

Independent Movement Abilities Continued

2. Weight shifting abilities in sitting and standing

- a. Shifting to the right.
- b. Shifting to the left.
- c. Shifting forward.
- d. Shifting backward.

3. Weight shifting while reaching in sitting and standing

- a. To the right.
- b. To the left.

4. Trunk rotation with active arm movements across body in sitting and standing

- a. Rotating while reaching right.
- b. Rotating while reaching left.
- c. Rotating while reaching forward.
- d. Rotating while reaching backward.
- e. Rotating while reaching down.
- f. Rotating while reaching up.

5. Hand Use

- a. Grasp and release with each hand.
- b. Manipulation of objects.

Assessing General Skill Set

Identify what skills are present and to what degree of efficiency they can be accomplished. Identify what components of movement inhibit better efficiency and the nature of the components in terms of lack of dissociation, associated tightness, excess effort, compensatory stability factors and functional use of abnormal or inefficient patterns.

- 1. Observe activities the client can perform independently.
- 2. Observe activities the client can perform with assistance.
- 3. Observe the client transfer to different surfaces and seats independently.
- 4. Observe the client transfer to different surfaces and seats with assistance.
- 5. Identify skills to improve or achieve.

Building a Program

Positioning Needs: Identify what adaptive equipment is needed to improve posture in sitting.

Preparation of musculoskeletal system: Identify what preparation techniques are needed to prepare the body for more efficient effort.

Functional movement component Training: Identify what functional patterns should be facilitated and practiced, based on the desired skill.

Skill set training: Identify what skill set should be practiced only after preparation and movement practice.

Appropriate Equipment use: Identify what equipment is best for standing tolerance, etc. and what activities can be engaged in while upright.

Exercise management: Identify what exercise equipment or exercises are appropriate and set up a reasonable schedule.

Implementation

What preparation of the physical body is required to improve mobility and stability factors, alignment, dissociation and rotation?

What active movement experiences need to be facilitated?

What set of skills need to be practiced?

Management

Consistent attention to positioning.

Appropriate exercise management (with preparation.)

Appropriate use of equipment (with activity and preparation.)

Video Analysis Example

Karla is a 37-year-old female with cerebral palsy. Excerpts using still photographs of the video analysis protocol are presented here along with examples of treatment recommendations. The following analysis was the basis for developing the treatment program. After analysis, a detailed treatment program with both video and still frame examples and demonstration of treatment techniques were provided to the primary therapist to be carried out.

Client: Karla

The primary emphasis will be on establishing more active trunk extension and rotation in movement patterns and establishing better dynamic alignment for initiation of movement. Fluidity of movement will be accomplished through specific approaches to weight shifting and activation of more efficient movement patterns. General goals include establishing a dynamic postural alignment, improving rotational movements, gaining mobility-stability interaction in the shoulders to allow more experience in adaptation of arm and hand movements, and increasing efficiency in walking. The following activities are designed to accomplish the stated goals.

Activities

1. Preparation activities to establish trunk extension for more active trunk control, lateral shifts and rotation.
2. Organization and dynamic alignment of the shoulders and neck.
3. Facilitating active lateral weight shifting in sitting and standing.
4. Organization of active pelvic movement to support alignment.
5. Specific activities to increase adaptation of movements of the arm and hand.
6. Specific hand functional adaptation.
7. Guiding of self-feeding efficiency.
8. Specific facilitation of standing and walking efficiency.

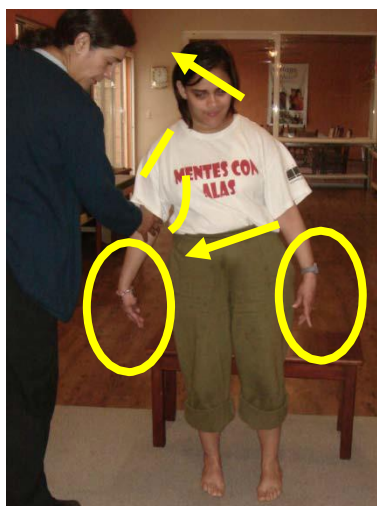
The goals for Karla for purposes of this treatment program were:

1. Improve dynamic alignment.
2. Improve use of arms and hands.
3. Increase efficient mobility of the shoulders and trunk.
4. Increase rotational components of movement and dynamic weight shifts for more efficient standing and walking.

Postural Analysis



- Inactive extension of left trunk.
- Inactive lateral right trunk.
- Left shoulder dropped.
- Inactive right shoulder.
- Head/neck tilted to left.
- More weight on left side.



- Unequal distribution of weight in standing.
- Inactive trunk.
- No rotation or arm swing in walking.
- Arms passively inactive, compensatory hand posturing.
- Straight plane movement without good lateral shifts or rotation.



- Compensatory patterns with intent to use fine motor control.
- Shoulder fixation disallowing mobility-stability.
- Wrist/hand/forearm patterns of inefficiency.
- Inability to organize head/neck with elevation of the shoulder to bring food to the mouth.

A detailed treatment program was developed based on the observational findings. Specific treatment approaches were provided with both video and photographic examples of therapeutic handling techniques. Treatment frequency was several times per week.

It is important to emphasize that skilled physical handling requires an understanding of, and experience and training in a variety of treatment modalities, including neurodevelopmental treatment and manual therapy techniques such as soft tissue and joint mobilization. Treatment using a physical handling approach requires a working knowledge of facilitation techniques and their application. Using various key points for control and stability to support the facilitation of more efficient client activated movement requires constant modification and adaptation within and during each therapy session. Physical handling is not a "paint by numbers" protocol to be followed. It requires sophisticated handling cues and on-going problem-solving to continually change and modify the handling based on the client's responses to decrease or increase control, use different or a combination of facilitation techniques to elicit an active response, provide preparation techniques to mobilize areas of tightness before using activate facilitation, and knowing when to gradually withdraw support as the client begins to have better control and activation of her body.

The following is a small excerpt from Karla's recommended treatment program. Keep in mind that these procedures are only presented in part. Karla's program included a series of sequential activities to increase the challenge of postural control as she began to gain more efficiency in movement. Activities were modified and/or changed based on Karla's responses and her ability to be successful in the activity. Preparation techniques were utilized when needed before initiation of some activities such as inhibition of muscular tightness, oscillation techniques to increase freedom of movement, mobilization techniques to increase range and tolerance for joint and tissue mobility needed to achieve success in the activities. In addition to the detailed written program, a series of DVDs were provided to the attending therapist demonstrating specific handling techniques related to the client's program so they could be reviewed and studied.

Excerpts from Karla's Treatment Program

Activity #3: Prone Extension on Extended Arms



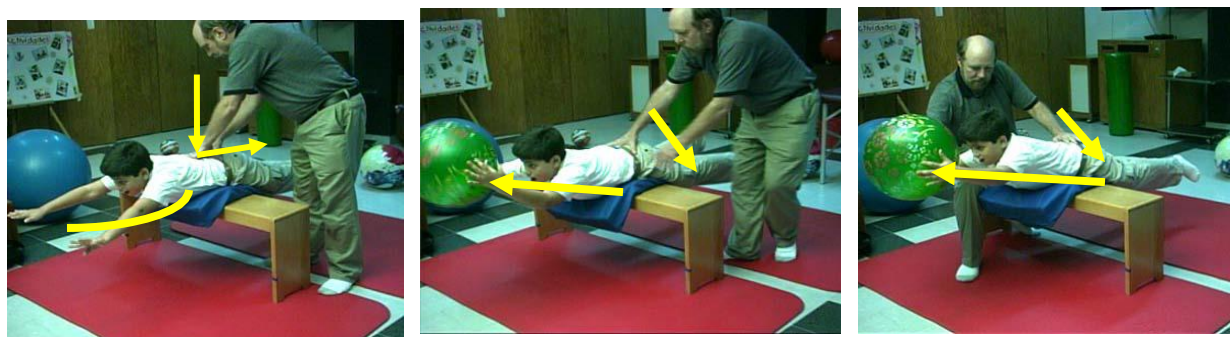
Bring the arms into extension over your legs and assist Karla to push up in full extension of the arms. This weight loads distally from the hands to the shoulders and activates trunk stability in extension.

Activity #4: Shoulder Compression with Trunk Extension



Place the arms tight to the shoulders and compress medially to activate scapular abduction. Assist Karla to push up into extension. Alternate raising one arm and then the other to weight load each side alternately.

Activity #5: Activating Prone Extension



Over a bench place stable pressure inferiorly and posteriorly on the pelvis to assist activation of prone extension. Have Karla reach her arms out in extension. To maximize prone extension and make it more active, have Karla hold a ball and lift up. Assist in arm extension as necessary.

Activity #13 Activating Lateral Weight Shifting in Prone



Prone over a ball have Karla move a smaller ball laterally first with one hand and then the other, then with both hands.

Activity #14: Activating Trunk Rotation in Prone



From a prone supported position facilitate Karla to reach up with one side and then the other. This increases weight loading on the opposite side and therefore stability while activating rotational components of the trunk. Emphasize reaching with the left arm to get more experience with weight on the right arm and hand. Make sure you control arm alignment. Make sure Karla follows her hand with her eyes.

Activity #17: Dynamic Trunk Activation



Combine extension with lateral shift and rotation by elevating the legs and controlling at the arms to facilitate the reactions.

Activity #19: Preparing the Shoulder to Support Dynamic Activity



Mobilize the shoulder in elevation and depression and in circular retraction/protraction. Maintain the palm of the hand on the surface and control good arm alignment.

Activity #20: Weight Loading through the Arm and Shoulder in Sitting Weight Transfer



Assist Karla to maintain extension of her arms with palms on surface. Have her push up to un-weight the hips and scoot laterally. Do this in both directions.

Activity # 29: Weight Loading the Standing Leg



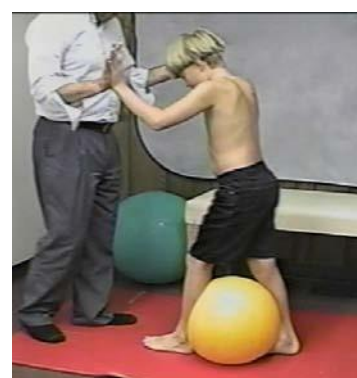
Standing on a roll with one hand controlling at the knee requires more trunk activity and shifting over the standing leg. Standing on a higher surface adds more weight loading to the standing leg.

Activity # 30: Rotation in Standing



Increase the challenge by having the client hold a ball and rotate. This requires more trunk and shoulder activity.

Activity #31: Control in Standing and Walking



Use a ball between the feet to help facilitate a better glide step and stride.



Practice forward and backward steps while controlling the legs to introduce graded control of stepping by facilitating the weight from heel to toe. Hold the client at the hands and pull them forward to initiate a step and then add compression into the shoulders through the arms at each step to increase graded control and shoulder and trunk stability.

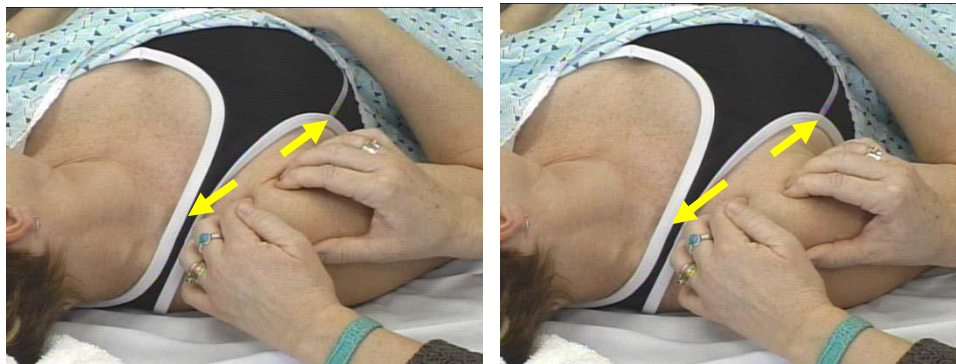
Upper Extremity Preparation Activities: Activities to Improve the Functional Use of the Hands, Wrists, and Arms

During functional upper extremity activities such as self-feeding, Karla shows a lot of associated reactions of the wrists and hands with arms pulling into flexion and the shoulders elevating with tightness. To improve general manipulation skills we need to work on the synergy of hand movements supported by the wrist and forearm. Karla needs mobile-stability in the wrists and forearm with more dexterity of the hand, particularly in:

- Activating the arches of the hand.
- Separation of the two sides of the hand.
- Smooth control of pronation and supination

It will be important to do some preparation activities prior to using the hands for manipulation and guiding self-feeding in order to reinforce good alignment and efficiency while reducing the compensatory movement patterns.

Activity #33: Preparation of the Shoulders



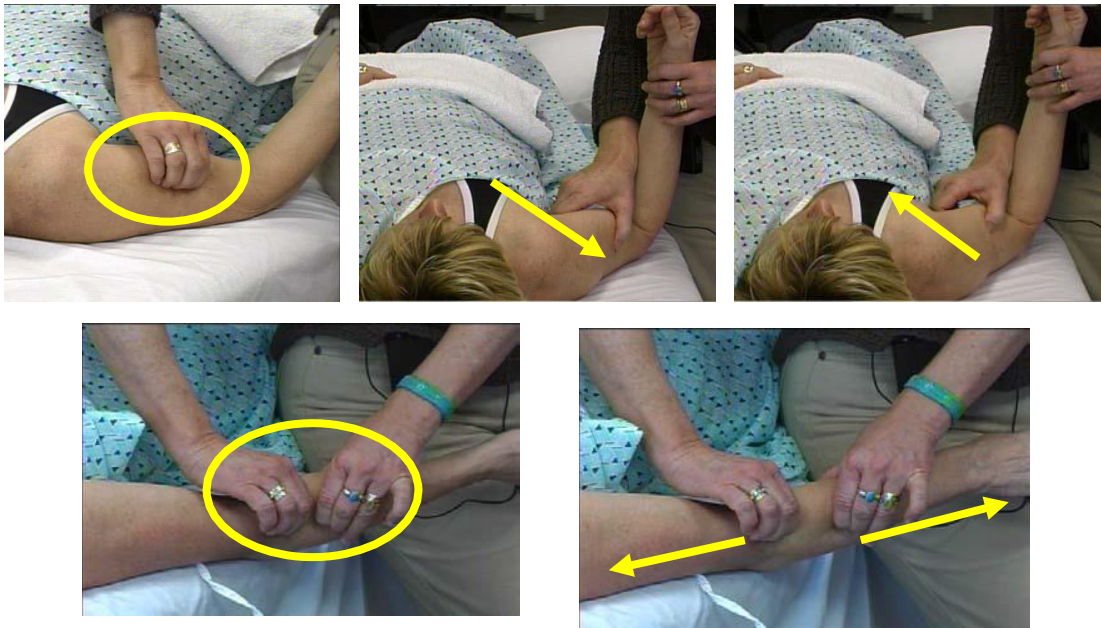
Locate the musculature along the humerus and spread along the border outward.

Elevate the elbow so the humerus is in alignment with the shoulder and not protracted forward. Place your hand under the scapula to stabilize.



Bring the web space of your other hand around the humerus. Mobilize by pushing inferiorly. Do this several times. Repeat to both sides.

Activity #34: Preparation of the Biceps and Elbow



With sustained pressure into the muscle belly distract upward and then spread along the muscle anteriorly and posteriorly.

Activity #35: Preparation of the Wrist and Hand



Place one thumb on the capitate and one thumb on the scaphoid and bring the wrist from flexion to a more neutral position. Stabilize the capitate and distract the scaphoid down. Repeat several times.



Next stabilize the lunate and distract the scaphoid up. Repeat several times. This brings the thumb upward and is a preparation for better supination.

Activity #39: Activities to Help Develop Better Arches of the Hand



Palm shaping can be accomplished by using a firm ball and nestling it into Karla's arches. Press the ball gently into the arch and turn it side to side as you do. As the arch forms around the ball have Karla close her fingers around the ball. This helps develop the arch, and give her experience with finger flexion while the wrist is extended.

Shape the palm to establish an active arch. Load the palm with rice or coffee. The more rice or coffee the client is able to hold the more she must activate arch control.



Activity #37: Pronation-Supination of the Forearm and Hand



Have Karla roll a ball with her forearm by pronating and supinating her arm.

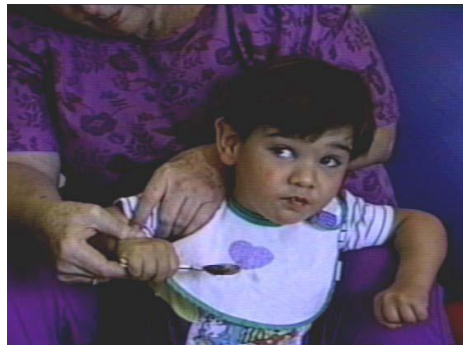
Activity #41: Improving Self-Feeding Patterns and Efficiency



Relax Karla's arms and trunk prior to beginning eating by elevating the arms and oscillating gently to reduce any tightness. Repeat this several times during the feeding session as needed if Karla begins to tighten into flexion.



One of the most critical things for Karla is to get elbow elevation so she does not flex her arm and drop her head to reach the spoon. With your arm under her elbow you can control the elevation of the arm as the spoon approaches the mouth.



By controlling the shoulder and rolling it into neutral alignment with scapular abduction it may be helpful in preventing Karla from dropping her head toward the utensil. It is very important to achieve bringing the utensil to the mouth without forward head flexion.

Results

Results of treatment demonstrated significant changes in functional efficiency and overall postural organization. These improvements were documented over the 2011 program year. The importance of these findings is significant because adults with cerebral palsy and neuromotor disorders generally deteriorate over time, and there are few if any studies indicating that direct physical handling treatment can either slow deterioration or in fact improve function in these adults. The following before and after results of this single-subject anecdotal study suggest that not only can deterioration be slowed, but that improved function can be attained and sustained through very specific problem-solving and skilled physical handling treatment.

Report from the primary therapist:

During 2011 we worked on:

- Improving dynamic alignment.
- Improving use of arms and hands.
- Increasing efficient mobility of the shoulders and trunk.
- Increasing rotational components of movement and dynamic weight shifts for more efficient standing and walking.

What we achieved:

- A better distribution of weight in standing
- A more active trunk.
- A less passively inactive arms, and also a less compensatory hand posturing
- A better trunk rotation
- And a better stability in her shoulder girdle
- Now she has less compensatory patterns when she intends to use fine motor control
- Now she is able to hold a disposable glass without squeezing it.



Postural changes in sitting

- alignment show a more erect trunk.
- Alignment of the shoulders and hips.
- Neutral pelvic alignment no longer in posterior tilt.
- Less passive abduction of the legs and proper foot placement.
- Vertical alignment of the head with neck elongation.
- Equal distribution of weight.
- No longer laterally displaced to the left.



Changes in Gait

- Better stride length and swing through.
- Trunk rotation with lateral weight shift on stance leg with arm swing.
- Less leaning to the left.
- Active trunk extension.
- Alignment of shoulders to hips.
- Right hip hike decreased.
- Better vertical alignment of the head to trunk.



Changes in self-feeding

- No longer pronates the forearm with excessive elbow flexion.
- Less wrist flexion and pronation.
- No longer flexes head down to meet the utensil.
- Better elbow elevation when bringing food to mouth.
- Better head to trunk alignment.
- Shoulders relaxed and aligned
- Trunk more dynamic and extended for stability.

Additional Results

The same process of observational assessment and treatment implementation was carried out for three additional clients. The following are the reports from the primary therapist.

Fernando: 35 year old male

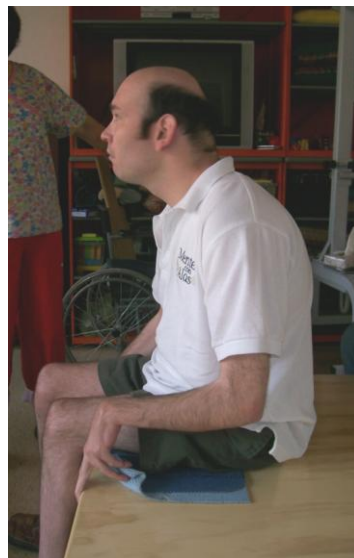
During 2011 we worked on:

- Global relaxation and elongation of body.
- Mobility techniques for the shoulders and neck.
- Specific joint and tissue mobilization for the trunk.
- Mobilization for alignment of the pelvis in sitting.
- Weight loading to the right side in sitting.
- Trunk and chest/respiratory mobilization activities in preparation for rotational activities.
- Weight loading on the left arm.
- Specific facilitation of rotational activities.
- Standing weight tolerance in best alignment possible.

What we achieved:

- Better alignment of the head.
- Less forward trunk flexion.
- More active trunk.
- Better activation in the dorsal area.
- Reduced shoulder/elbow/wrist tightness.
- Better alignment in standing.

Fernando has orthopedic deformities and kyphosis, and experiences a great deal of pain periodically. Gaining a more active trunk with better weight distribution and lessening his kyphosis to the extent that there is the possibility for more flexibility in the spine, is important for Fernando to lessen his pain and assist his caregivers in transfers.



Changes in Sitting

- More even alignment of the shoulders.
- More even distribution of weight on the hips.
- Less leaning to the left side.
- More active trunk extension.
- Less kyphotic posturing.
- Better head to trunk alignment.

This is not a function position for Fernando and he is not treated in this position. This assistance in standing was performed only to observe the distribution of weight on his feet and his postural response to standing. He stands in a standing frame with his alignment controlled. Improving his ability to take weight with better alignment will help him with more endurance and less pain while in his standing frame and more ease in transfers.



Changes in standing

- More ease in caregivers controlling in standing (important for transfers)
- Less internal rotation of the legs.
- Better overall alignment
- More hip extension
- More active trunk
- Better head to trunk alignment

Angeles: 54 year old female

During 2011 we worked on:

- Improve dynamic alignment and synergy of the head/neck and shoulders.
- Improve use of arms and hands without head/neck posturing.
- Increase efficient movement with the head leading the movements dynamically.
- Increase rotational components of movement and dynamic weight shifts for more efficient standing and walking.

What we achieved:

- Better alignment of the head.
- Active elongation of the trunk during an activity.
- Better trunk rotation.
- Able to bring her body over her feet in preparation for standing.



Changes in lateral shifting and reaching to the side

- Improved weight shift with elongation on the weight bearing side and lateral flexion on the opposite side.
- Better head to trunk alignment and head righting.
- More active trunk.
- Improved shoulder mobility-stability.



Changes in reaching forward and crossing midline

- Better head control and head righting during activity.
- Active trunk rotation in reaching across body.
- Better alignment of head/neck/trunk in reaching forward.



Changes in sitting and standing

- Better ability to bring body weight over the feet while coming to standing.
- Better alignment of the head to trunk.
- Better shoulder alignment to the hips.
- More equal distribution of weight in standing.
- Better head control and alignment in standing.

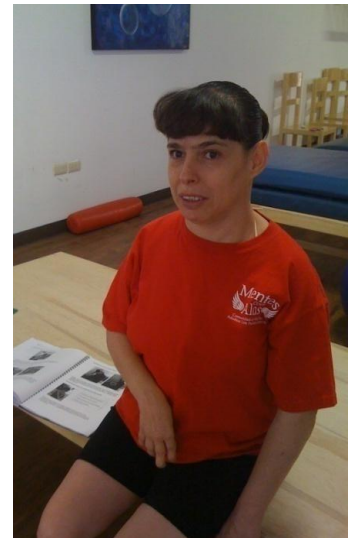
Lorena: 50 year old female

During 2011 we worked on:

- Improve general alignment.
- Improve elongation of muscle groups.
- Increase mobility of joints.
- Increase rotational components of movement.

What we achieved:

- Better trunk alignment
- Greater trunk elongation
- More active trunk
- Now includes her right arm to the activities
- Better weight loading in her legs.



Changes in Sitting

- Better head to trunk alignment with neck elongation.
- Better alignment of the shoulders with less elbow and wrist flexion.
- Better alignment of the shoulders over the hips.
- More active trunk extension.
- Less posterior pelvic tilt with more neutral alignment.
- Better distribution of weight.



Changes in Reaching

- More active organized weight shift with elongation and lateral trunk flexion.
- Better elbow and wrist extension.
- Better head control, alignment and head righting.
- Better trunk extension and pelvic alignment.



Changes in Gait

- Better stride length and lateral weight shift.
- Better head alignment.
- Better shoulder alignment.
- More trunk rotation.
- More trunk extension and stability.

Real-Time Consultation Model

The positive improvements shown by these adults, make it clear that even with long standing disabilities, which over time generally lead to less and less function, it is the possible to attain improvements in postural control, alignment and performance of daily activities.

Based on these results it was determined that a real-time consultation model would have additional benefit. In 2013 a model of real-time consultation through Skype was established. This allowed the primary and consulting therapist to interact in real-time and problem-solve specific issues of concern expressed by the client and initiate treatment techniques that could be modified and refined immediately.

In many cases improvements in postural alignment and function control were observed within the hour consult and further refined through the application of recommended treatment strategies established during the consultation.

The following single-subject anecdotal examples show changes obtained through the real-time consultation model. Changes occurred within a one hour video consult session for adult clients with long standing physical disabilities. Keep in mind these changes were accomplished within one hour of consultation and with adults who have significant disability. It shows that change is possible through skilled physical handling treatment and problem-solving, even with adults with long standing disabilities. The actual treatment application is not shown here but the techniques were demonstrated via video to the attending therapist who performed the techniques and achieved the results.

Example of Skype consultation process:



The consultant therapist demonstrated various handling techniques that were carried out by the primary therapist. The client's responses were discussed and modifications to the handling techniques were initiated and then further evaluated.

Session Results; Beto: 34 year old male

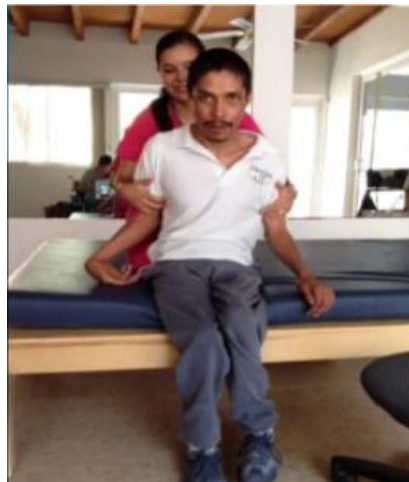


Before

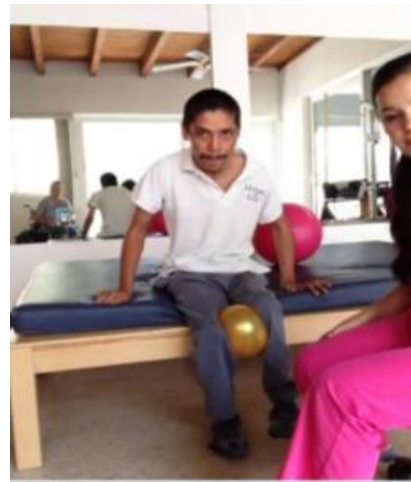


After

Initial sitting posture in the chair shows elevation of the right shoulder, unequal distribution of weight to the right side and internal rotation of the legs. After the treatment consult and separation of the legs, the trunk is more active. Weight is more equally distributed and the shoulders are in alignment. He is more efficient in using his wheelchair.



Before



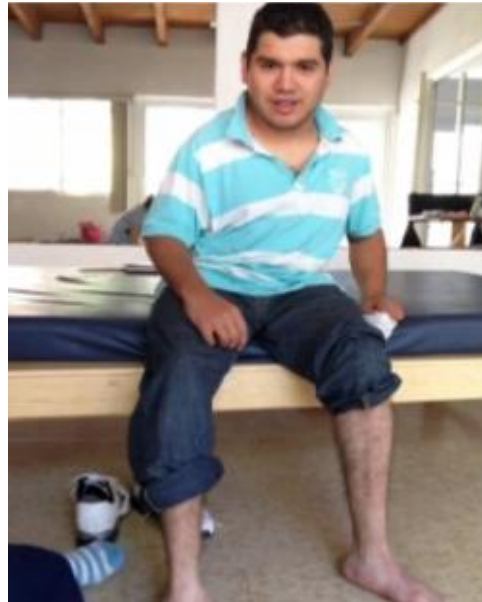
After

Sitting posture before shows poor alignment, legs together, shoulders uneven and flexion of the arm and poor hand placement. After the treatment consult weight distribution on the ischial tuberosities is more even, shoulders are aligned and the right hand, is less flexed with better hand placement.

Session Results; Gilfiro: 24 year old male



Before



After

Sitting before shows collapse of the right side and unequal weight distribution with the head tilted. After the treatment consult we see more equal weight distribution, better alignment of the shoulders, and good alignment of the head to trunk.



Before

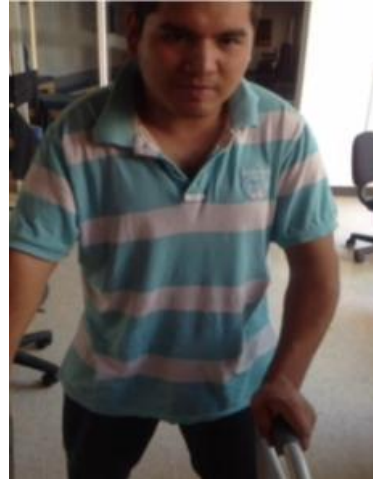


After

Standing with his walker before shows hip flexion and a rounded back without trunk extension. After the treatment consult there is less hip flexion and more trunk extension.



Before



After

Standing before shows misalignment and unequal distribution of weight. After the treatment consultation Gilfiro shows better alignment and better distribution of weight.



Before



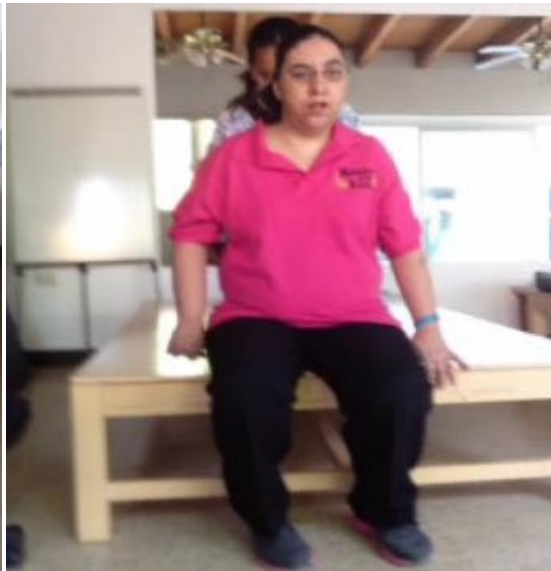
Walking before shows dragging of the right foot with circumduction instead of swing through. Flexion of the trunk and more weight on the right side



After

After the treatment consultation, Gilfiro shows better trunk extension, better swing through without as much circumduction, better stride length and more appropriate weight bearing on each side.

Session Results; Carmina: 40 year old female



Before

After

Before the trunk is inactive and the right arm is passive with the right shoulder slightly lower. After treatment consultation the shoulders are more even, the trunk more active and extended and the right arm more active.



Before

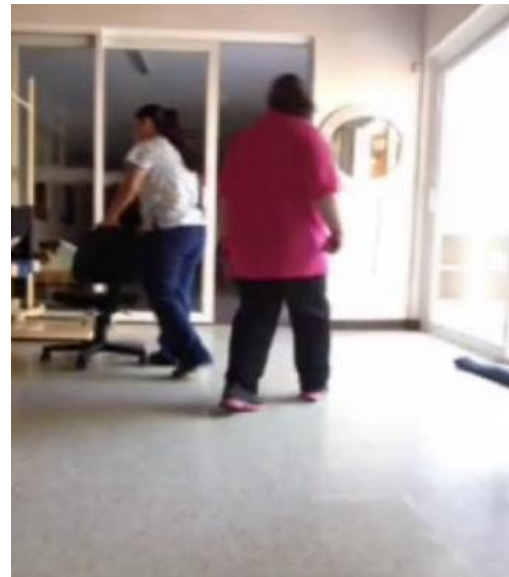


After

Before standing showed leaning to the left, with the right shoulder retracted and depressed. The arm is flexed and there is more weight to the left side. After treatment consultation the weight is more equally distributed with the shoulders aligned.



Before

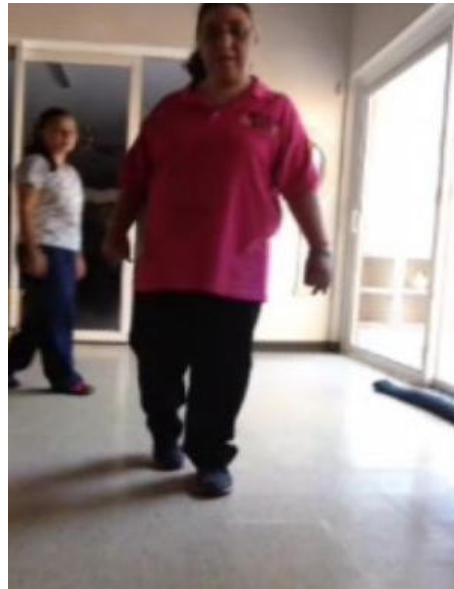


After

Walking before shows the hips out of alignment with the left side dropped and the left trunk inactive. The left knee is flexed with alignment and swing through out of alignment. After treatment consultation, the hips are aligned, the swing through is more appropriate, the trunk is active and extended, with less left knee flexion and shoulders even.



Before



After



Before



After

The same improvements can be seen from the front view in both right and left step.

Session Results; Maria: 32 year old female

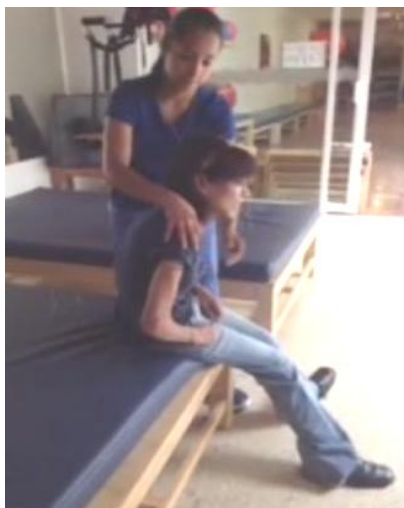


Before



After

Before there is misalignment of the trunk over the hips with head and neck extension. After treatment consultation there is alignment of the head to trunk and trunk to hips. There is less flexion of the more involved arm.



Before



After

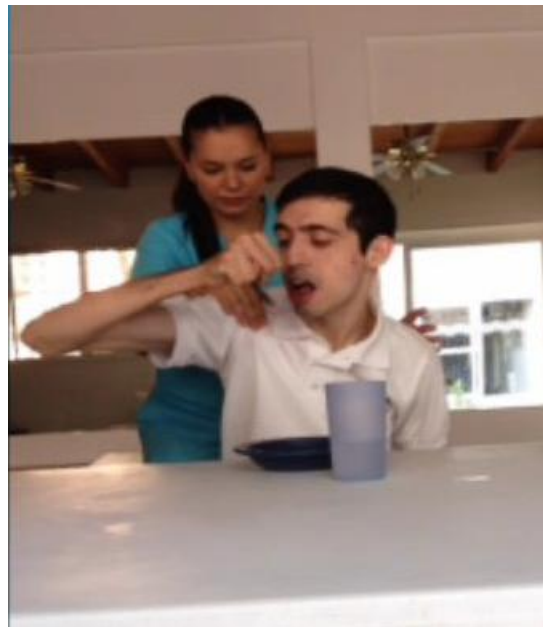
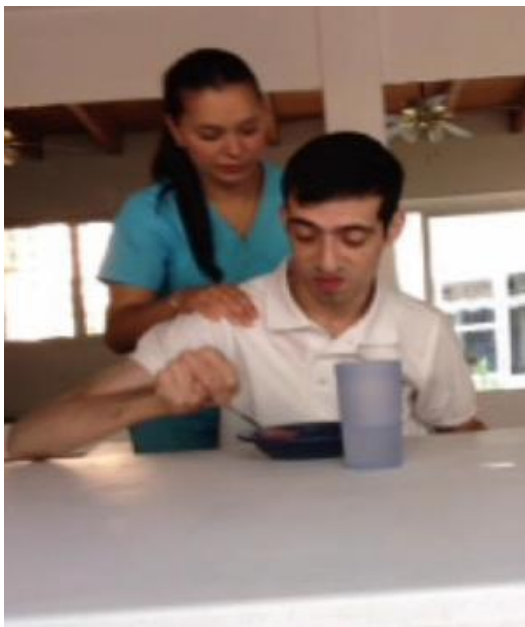


Sitting improved through physical handling allowing the trunk to become active and better distribution of weight and alignment.

Session Results; Nacho: 31 year old male



Before



After

After physical handling to organize the trunk to become more active and to activate dissociation of arm to trunk, this client is able to use a much more efficient feeding pattern.



Before



After

After the treatment consult, we see the same improvements in cup drinking.

Session Results; Teresita: 32 year old female



Before



After

Sitting after treatment consultation shows a better ability to maintain alignment with less fluctuating tone.



Before

Attempts at self-feeding show extreme fluctuations of tone and extreme posturing.

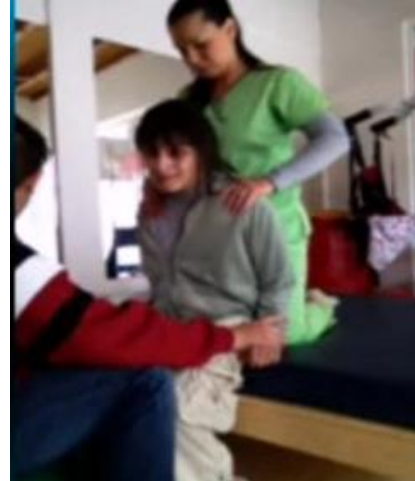


With Facilitation Feeding

This is an example of how important facilitated feeding is in cases of extreme postural disorganization. With control the client is able to accept food and chew without extreme compensatory movements. This process allows the client to experience more postural control with less fluctuation. Over time control can be lessened with facilitated self-feeding patterns. It is important not to have the client struggle at each meal, but to assist to develop an more efficient motor experience as well as a more pleasant eating experience.



Before



With Physical Handling

This is another good example of the benefits of physical handling in organizing more controlled postural stability and positioning.

Here we see an additional follow up after several months of treatment based on the consultation Session. Fluctuation of tone is greatly diminished, with active alignment of the head and trunk. The trunk is actively extended and there is equal distribution of weight on the hips.



Conclusion

This series of single subject anecdotal studies demonstrates that change is possible in adults with long term physical disabilities, when carried out with skilled observational problem-solving and physical handling. Not only is change possible over time, but also possible within one session of treatment. This series of single subject studies clearly shows that deterioration and loss of function with age, so often the case in adults with neuromotor disorders, can be diminished and in fact functional improvements can be achieved. The significance of these studies should encourage more aggressive and intense treatment programs for adults with neuromotor disorders.

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**Improving Performance in Adults with Cerebral Palsy:
A Long Distance Consultation Model**

Verification Exam

These are the questions you will be asked when you click on "Take Exam."

1. Functional efficiency general decreases with age for adults with cerebral palsy.
 - a. True
 - b. False

2. Osteoporosis is a condition seen primarily in children.
 - a. True
 - b. False

3. Services for adults with developmental disabilities are widely available.
 - a. True
 - b. False

4. Effective intervention strategies are more dependent on standardized tests than clinical observation and problem-solving.
 - a. True
 - b. False

5. Alignment is critical to the ability to improve functional task efficiency.
 - a. True
 - b. False

6. Alignment refers to the relationship of each body part to each other and to the relationship of the body to the base of support.
 - a. True
 - b. False

7. Musculoskeletal status is important to evaluate mobility of proximal and distal joints.

- a. True
 - b. False
8. Efficient movement requires practice regardless of the alignment.
- a. True
 - b. False
9. If the shoulder girdle cannot move freely and establish the graded requirements of mobility-stability, then it interferes with arm and hand use, trunk rotation, the ability of the head to maintain vertical.
- a. True
 - b. False
10. What is important to recognize is that initiation of movement from various body postures has consequences in the sequence of response of the entire body.
- a. True
 - b. False
11. As the arms are elevated, there is less shoulder stability required and therefore more trunk extension activated.
- a. True
 - b. False
12. Practice on an inefficient structural base will embed the dysfunction.
- a. True
 - b. False
13. Skilled physical handling is a set of protocol exercises.
- a. True
 - b. False
14. Skilled intervention and physical handling can make significant gains in long standing disabilities in adults.
- a. True
 - b. False