“Believe nothing, no matter where you read it or who has said it, not even if I have said it, unless it agrees with your own reason and your own common sense.”

-buddha

Chapter 1: Introduction

Frequently Asked Questions

- **What is Hypotonia?**

In a 2005 Pediatric Physical Therapy magazine article, Martin et al concluded, “A preliminary characterization of hypotonia indicates that PT’s and OT’s concur that a child with hypotonia displays decreased strength, decreased activity tolerance, delayed motor skill development, rounded shoulder posture with a tendency to lean onto supports, hypermobile joints, increased flexibility, and poor attention and motivation.”[1] This conclusion is consistent with what I observe to be true about the way therapists interpret and perceive the delays presented by children who have hypotonia. However, it is not a good description of what I believe are the major challenges of children who present with hypotonia, and it does not begin to explain the complexities of what doctors and therapists call HYPOTONIA.

So what is hypotonia? In my opinion, hypotonia is characterized by a depressed ability to organize and use the motor system against the pull of gravity. The person who has hypotonia appears to be collapsed into gravity. This diagnosis typically is determined based on the appearance of the floppy posturing along with weakness, abnormal reflex responses and ligamentous laxity. Many times muscle biopsies, MRI’s, EEG’s and other testing may indicate no recognizable injury to the muscles or brain to explain this apparent collapsed motor control.

Experience draws me to speculate that the missing component is a global neurological ability to organize the information from all systems adequately to generate and support typical antigravity motor control. Therefore, therapists often observe that the person who presents with hypotonia has both a primary motor impairment that is recognizable, as well as, or stemming from, a primary neurological organization and integration impairment. If you cannot feel your body or understand how all the parts are connected, you not only find it difficult to move, you may also lack the desire or drive to move. In their 2007 follow-up to the above referrenced article, my interpretation is that Martin et al support this global impairment theory in the introduction stating: “Many disorders, including neurological diseases, endocrine and systemic metabolic diseases, Down syndrome, …Prader-Willi syndrome, cerebral palsy…have hypotonia as a component of the clinical presentation. This partial list of medical diagnoses and disorders that are associated with hypotonia represents a wide variety of etiologies, including central nervous system pathology, peripheral nerve pathology, metabolic disturbances, and hypotonia of unknown etiology.”[2]

The motor delay of hypotonia may cause a child to feel heavy to carry and actually feel like she/he may slip through your arms. They may have difficulty moving every part of their body or only move with big bursts commonly described as an all-or-none response. The child presents as being very passive, then suddenly appears to have a surge of activation causing them to move an arm or shift or even knock themselves over. When they are positioned and you look at them, they may look poorly aligned as if the bones are not stacked appropriately to look comfortable.

The child is heavy to carry because he has not learned how to turn on his muscles to help hold his weight against gravity while he is being carried, thus making him feel lighter. Hypotonic children slip through your hands because their muscles are not active enough to hold the tension as a base for your grasp. They try to move and find it to be difficult so they learn to generate a burst of effort, like we would do when we try to move the refrigerator. The weight of their extremities is as overwhelming to their posture as that refrigerator is to most of us. The burst occurs when they have generated adequate muscle activity to lift or move against gravity. Secondary to their decreased movement experiences, they lack the awareness of how far or fast to lift or move and their lack of consistent experiences further contributes to their inability to grade and control the movement they can initiate. Unlike children with dystonia, when they are assisted to consistently generate muscle activation and holding, people who have hypotonia can learn to hold using graded control and co-activation instead of continuing to rely on their poorly graded bursts to move their extremities or trunk. When they are in supportive positions, the people who have hypotonia may become still and actually sink into the support because they can feel themselves stacked against the surface, and they feel the stablity being provided by the supportive equipment.

The processing delay of hypotonia may cause children who have hypotonia to be very irritable and easily upset. Or, they may be “too good.” Babies that are “too good” fail to complain or fuss even to meet basic needs like satisfying hunger. They appear to be content to stay in one spot and look around. They like routines and will actually train their parent to treat them in ways that are routine and predictable so they do not have to experience novelty. They may almost seem to disappear or shut down when things are out of their routine (birthday parties and holidays). Or, they may become overwhelmed and inconsolable so that they can be removed from all the unpredictable newness.

The irritability may be a communication that the world is coming at them too fast and out of control for them to be able to decipher any of the details. The "too good" behavior is actually the child slightly shutting down so that she/he can tune out the overwhelming information. But children with hypotonia aren't necessarily shutting out everything and actually can learn in an apparent withdrawn space, as long as they are not avoiding and turning away the input. Routines are their survival mechanism and they will fuss and complain until caregivers figure out that routine is what makes their children happy and able to function. Although it is great that children can calm down once rigid routines are followed, they begin to be deprived of variety in all kinds of daily tasks because they are demanding rigid predictability. This begins to lead to decreased opportunity for learning at a very young age. When a child can not tolerate being in family gatherings, extended family may resent the child for making it impossible for the parents to attend and they may feel he is spoiled, or a behavior problem even from a very young age. This is true even when the parent tries to explain that the child is obviously overwhelmed by the chaos of family gatherings.

One of our most important jobs as infants, besides eating and keeping our airway clear, is modulating state. Infants must learn to move smoothly between being asleep, awake, aware and alert. When they are too unorganized to smoothly make these transitions they may be demonstrating a processing deficit or challenge. When the world is overwhelming in this way, some individuals will withdraw and this posture may look floppy, so these children may initially be identified as having hypotonia. In this example, the motor system is not the primary reason these individuals appear to be collasped in their posture. Instead, their poorly organized or integrated sensory system is unable to make sense of their surroundings causing them to withdraw. These are people who present with hypotonia secondary to sensory system impairments.

This book is presented in a effort to define hypotonia as a major sensory and/or motor challenge that can affect development on a continuum, having a mild to profound impact on the individual's ability to move and interact. It not only affects the motor system but has repercusions on breathing, learning, G-I functioning, visual motor development, independence and accessing the world. It also affects the sensory systems and can affect a persons sense of place and comfort in her/his home, community and in the world. When a person receives no help or is pushed when she should be supported and protected, it can even affect her willingness to stay present and try to overcome the complexities of interpreting the information surrounding her.



Fig. 17 **Fig. 18** **Fig. 19**

In Figure 17, the child is able to lift her arms and head using good alignment in the neck and shoulders because the girdle of proximal control is adequate to allow this lift when the resistance of gravity is minimal. In Figure 18, the head is lifted laterally and the child is using co-activation in her neck and left shoulder to maintain this aligned lift now that the resistance of gravity is stronger. In Figure 19, the child is horizontal to the resistance of gravity and her proximal stability is overwhelmed by the weight of her head staying lifted against the pull of gravity. Despite my best efforts to help the ribcage remain stable on the pelvis, the ribs and shoulders elevate toward the head and alignment is lost. Figure19 shows there is inadequate proximal stability to allow the extremities to lift without the alignment of the trunk collapsing. This is proximal instability.

The only indication of alignment problems mentioned in the lists from the Martin et al articles was rounded shoulder posture. I would call this collapsing into joint structure to achieve ‘stuck-stability” to overcome the lack of proximal stability. In addition to thoracic flexion and shoulders rounding, other areas of primary collapse observed in hypotonia would include head-neck hyperextension secondary to hyper-mobility in the cervical-thoracic region allowing the head to be collapsed onto the shoulders for ‘stuck stability.”

Figures 20-22 depict a child using this type of poor alignment in prone, sitting, and supported 4-point.

Fig. 20

Fig. 21

Fig. 22

Thoraco-lumbar hyper-mobility due to architectural instability in this region allows collapse of the upper body onto the lower body in transverse and sagittal planes for ‘stuck stability.’

Observing the architecture of the cervical (4:7[9]), thoracic (4:8[9]) and lumbar (4:9[9]) spinal segments allows us to see that despite the fact that the 7 cervical, 12 thoracic and 5 lumbar vertebra are connected. They each allow distinctly different movements to occur. The articular facets in the cervical region face mainly upward and downward, in the thoracic region mainly backward and forward, and in the lumbar region mainly medially and laterally.

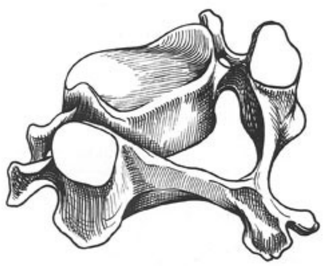

Fig. 23

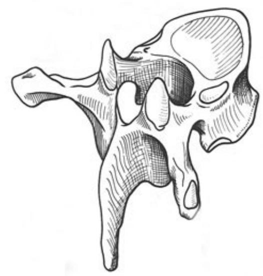

Fig. 24

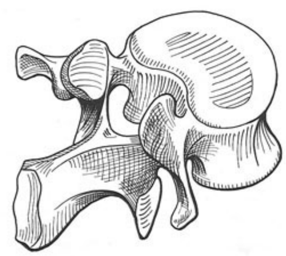

Fig. 25

Another significant difference is in the size of the bodies of the different segments. The third major difference observed is in the size and projection of the spinous and transverse processes. In general, the job of the cervical region is to support the weight of and allow freedom of movement for the head. This region has the greatest overall mobility and specifically can rotate up to 50º compared to 35º in thoracic and 5º in lumbar. The thoracic region is designed to be what I call the 'internal coat of armor' protecting the vital organs in the chest. These vertebra are limited in lateral movements by the ribs and extension by the overlapping spinous processes. This segment of the spine has the greatest flexion, up to 105º compared to 60º in lumbar and 40º in cervical. The lumbar region is designed with its bulky bodies to support mass. Therefore the freedom of movement is more limited but this region has the greatest mobility in flexion to 60º and extension to 35º[9] The spinal column develops in the individual from having a concave structure in the lumbar region at birth to assuming the adult state of lumbar lordosis by 10 years of age. The development of the cervical lordosis begins with the activation of lifting and turning the head. The thoracic spine maintains a concave anterior alignment that is present in the infant. This kyphotic alignment decreases or increases based on the activation of muscles and their effect on the overall structure of the spine and shoulder girdles as well as the development of the respiratory system and expansion of the ribcage during movement of the diaphragm.

Each of us has an architectural instability between the cervical and thoracic regions as well as between the thoracic and lumbar regions due to the changing bony structures of the different vertebra. Here is how you can feel what I am describing: Place you hand on your neck and extend your head back while collapsing your occiput onto your shoulders. Feel how there is one major area that absorbs that extra collapse? Now return to an upright position and extend your neck while keeping your cervical spine elongating toward the ceiling and backward. This time you should feel the cervical spine linking together to create the available extension and you may feel the thoracic spine elongating toward the extension as well. In hypotonia it is very common to observe stacking into excessive extension at these two regions as the child tries to lift his body and hold it upright against the pull of gravity. When the cervical spine extends mainly at the cervical thoracic junction, the thoracic spine receives decreased demand for moving out of its kyphotic alignment so this newborn rounding can persist. When the head can be lifted using excessive extension, the shoulders don't have to work as the point of stability and they remain primitive and underdeveloped sloping off the rounded spinal and rib structure. This is perhaps why rounded shoulder posture is a common characteristic therapists report observing when evaluating children who present with hypotonia.

I believe this primary alignment challenge is directly connected to proximal instability because the children are able to perform the movement of lifting their heads to clear their airways, or even to visually explore, but they are not using normal trunk and shoulder girdle co-activation to perform this lifting. Is this because they are too weak to activate the trunk? Is it because they present with less physiological flexion resisting the lifting of their head? Is it because they cry when they are in prone and only hold their head when they are held in vertical allowing them to stack into their spinal structure? It could be all of these reasons or many others but the common factor is proximal instability and lack of co-activation in the trunk for a point of stability to lift and move their heads.

When the topic is proximal instability, hip joint instability with collapse into external rotation and abduction or internal rotation and adduction due to instability in joint structure are also common concerns. The child with severe hypotonia often presents with the depicted hip abduction, flexion and external rotation (Fig. 26). As mentioned in the chapter on treatment, one strategy for maintaining consistent improved alignment is to have the child wear hip helpers®[10] Other possible products that can be used to prevent internal rotation adduction or external rotation abduction are Kinesiotaping and TheraTogs.™[11] As soon as the abnormal and excessive alignment is observed in the hips, an Orthopedic consultation is warranted to access the stability and development of the bony structures in the pelvis and femurs. Based on the outcomes of the doctor's evaluation, therapists work with parents to minimize the use of these excessive postures throughout the day and during the time spent in bed at night. Prevention is possible even with minimal effort due to the availability of the creative devices mentioned.

Fig. 26

Significant hip instability is a major problem in children who have spina bifida and from this population therapists have learned that the hip extensors must activate in order to keep the pelvis well aligned with the spine both in sitting and standing. When a child is weak or paralyzed in the hips and they attempt to use their trunk control to lift higher against gravity, the lower back will move into thoraco-lumbar hyper-extension or hyper-flexion gravity by using an incline or use a mobile surface. Once I have control of his base, work in patterns of eccentric lengthening and isometric holding is promoted to elicit the greatest changes in strength and sustained holding through the proximal muscles. After giving adequate time for sustained activation, small movements or some other type of novel input is introduced to keep the experience new or distract the child, thus allowing for even longer intervals of sustained holding. Doing “heavy” work of weight bearing or resisting leads to strengthening, and in my experience, leads to a more organized and centered child who is then able to interact without the need for speed and crashing.

3. Prevent joint deformity

As physical therapists, we are well trained to think about muscle contractures in the spastic population, and may tend to overlook the potential for this in the hypotonic population. However, because the patterns of fixing can be so ingrained in this population, they can be at a high risk for certain deformities. Further complicating the situation, the hypotonic population will always try to find the path of least resistance to any given goal. So, they will collapse into their joint structures, use asymmetric patterns and avoid variety; again, possibly setting them up for a future of joint deformity that will eventually impair function and create undue pain. Due to their lack of movement and possible use of stereotyped movement patterns, another reason for joint deformity can be lack of normal weight bearing and pulling through the muscles causing the bones and joints to fail to develop. Therefore, our job as therapists is to keep a watchful eye on all joints of the body and incorporate ongoing strategies in the present to avoid problems in the future.

Fig. 88

Fig. 89

Fig. 90

Fig. 91

A good example of a child who benefited from this point of view is the child pictured in Figures 88-91, at age three and a half years she had a moderate degree of hypotonia and was unable to stand independently or walk without assist. In order to prevent her from getting collapsed arches, she was fitted with SureSteps. Although she had better alignment through her legs and feet, she continued to be challenged by her ankle instability and weakness when trying to stand independently, balance and move from stance to a bench.

In these pictures we see that despite wearing the SureSteps she continued to collapse in her ankles and knees (Fig. 88), as well as her hips and trunk, making it impossible to find balance for standing. In 1990, I developed a product I call Moon Sandals (Fig. 92) to help with this type of problem.

Fig. 92

Although I want the child to have a free ankle so she can learn ankle strategies required for overall balance and walking, especially on uneven surfaces, I designed the Moon Sandals to attach a rigid surface to the base of the shoe so that when she leans forward as seen in Figure 89, her heels stay on the ground. This provides a crucial extra few seconds to allow the child to recruit trunk, hip and knee control to move into a more upright position as seen in Figure 90. When she desires to move to the surface as seen in Figure 91, she is able to go down using graded control in her hips, knees and ankles instead of falling forward and catching herself. This child had struggled with severe knee hyperextension and joint hypermobility. As she continued to strengthen her motor control using well aligned patterns these locked compensations were no longer her preferred or required motor patterns so she stopped using them. Despite these gains, to stay upright in standing for extended periods she continues to revert to collapsing and using knee hyperextension so her parents are aware her endurance continues to be challenged by her hypotonia and they plan ahead to have breaks and supports available during shopping, or other excursions in the community.

As stated above, this was a three and a half year old girl. It is NEVER too early to start thinking about joint deformity. Therefore, the most important thing to keep in mind when the topic is joint deformity is, <u>never let it develop</u>. Prevention is possible even with minimal effort due to the availability of many creative devices on the market now.

For example, in Figure 93, the child with severe hypotonia often presents with the depicted hip abduction, flexion and external rotation. As mentioned in the chapter on common compensations, one strategy for maintaining consistent improved alignment is to have the child wear hip helpers®.[1]

Fig. 93

Other possible products that can be used to prevent internal rotation adduction or external rotation abduction are Kinesiotaping and TheraTogs.[3] As soon as the abnormal and excessive alignment is observed in the hips, an Orthopedic consultation is warranted to assess the stability and development of the bony structures in the pelvis and femurs. Based on the outcomes of the doctor's evaluation, therapists work with parents to minimize the use of these excessive postures throughout the day and during the time spent in bed at night.

Dynamic activity and adaptive equipment can be your two best friends when it comes to minimizing joint deformity. Dynamic activity forces the situation to stay novel, encourages the hypotonic child to work, and inhibits him from collapsing. Dynamic activity is shown in Figure 94 along with elbow splints. This set up is being promoted to prevent this child from using thoracic spine flexion when he is asked to lift his head and use his arms. In this type of activity, strengthening to the upper trunk, shoulders, head and neck can be achieved while persistent collapse into thoracic spine flexion is prevented.

Fig. 94

Adaptive equipment along with dynamic activity is shown in Figure 95. The child is asked to stand and step when given assist while wearing elbow extension splints and using forearm crutches. Using the equipment during the dynamic activity inhibits him from collapsing into flexion through his trunk and hips, making the stepping possible without great struggle. In this way, he is learning to keep his weight aligned over his legs and hips when he is assisted to step, thus promoting greater alignment and preventing him from developing joint deformity.

Fig. 126

Fig. 127

Fig. 128

Over the next six weeks therapy occurred every two weeks with suggestions to help this child integrate more variety in his motor control. The intervention was provided by his parents who were given suggestions to stimulate him to use his motor system. Since they had a therapy ball at home, strategies to promote righting reactions in all directions in sitting and prone were demonstrated (Figs. 126 & 127). They were also encouraged to have him bear weight through his arms in prone since he showed limited skills in hands and knees or during transitions from the floor pushing up to higher positions.

They were also shown how to promote hands and knee positioning by keeping his legs tucked under his body and between their legs as seen in Figure 128. Even though this hands and knees positioning is more collapsed, parents were encouraged to help him maintain this position while rocking forward and back to learn to enjoy the freedom of movement possible in this position. Standing activities were not encouraged because he already demonstrated a strong desire to move only in vertical straight plane patterns and standing would allow him to continue to use primarily this control.

After two months of this home carryover, this child continued to have delayed motor control despite gaining some new skills. He cooperated with home carryover but persisted in using his established motor patterns. My focus in therapy changed to providing persistent input to his sensory system over extended periods to cause him to feel his body in new positions long enough to attend to and organize the new alignment. For the first time he cried and complained throughout the therapy session. He was stressed and seemed to struggle with how to make sense of simple repetitive input such as rolling over and over from prone and supine or bouncing up and down in prone or sitting. It was suggested that his parents focus on trying to consistently provide input through the

Fig. 184

The boy being assisted to step on the treadmill in Figure 184, is able to step independently when he holds the stable handles on the front of the treadmill. But, when given no support or as shown, a mobile support, he demonstrates no ability to move his legs to keep up with the movement of the treadmill. Setting him up with a mobile set of handles and giving him the needed assist for stepping allows him to experience stepping while relying on his legs to support and shift his weight. He also feels how the needed shifting for stepping occurs in his hips rather than by swaying his trunk side-to-side while keeping his arms elevated to maintain balance.

A ladder can be suspended in a variety a ways to create a climbing structure to strengthen legs and balance for climbing as shown in Figure 185, or to emphasize pulling and strengthening through arms along with trunk and hip extensors as seen in Figure 186. Note the neoprene wrap around the child's hips used to secure her to the platform swing so that she can use her arms to pull herself up the ladder before releasing the rung and swinging.

Fig. 185

Fig. 186

In Figures 187 and 188, the swing is lifted on one end to create a ramp. The child is challenged to stay on the moving surface as well as assisted to climb up and down the incline. This helps him to learn how to push his feet into the surface and rely on his ankles and legs for balance and control. When this type of work is performed on a mobile surface, swaying his arms and trunk is inhibited because it causes him to fall and does not allow him to move his legs. Since children with balance and movement disorders often demonstrate deficits in loading their extremities into the surface, this type of work creates the need for them to execute a new plan of control to successfully negotiate the task. Here

Poor Abdominal Alignment

My low tone child seems to be weak. Should I help him do sit-ups, chin-ups and push-ups? This question was addressed in the first chapter. Here the issue of proximal instability and abdominal alignment is discussed with the focus on treatment.

SIT-UPS

These pictures illustrate a common problem that can occur in children who have hypotonia. Notice how the child's belly seems to bulge along a vertical line in the middle especially noticeable in Figures 232 and 233. This occurs when the ligament called the linea alba is too weak or stretched to sustain good alignment in the belly while the abdominal muscles contract.

Fig. 231

Fig. 232

Fig. 233

Whenever this child tries to lift her arm, leg or head, her belly muscles must work to stabilize her trunk as the base of support upon which the extremity is lifted. Therefore, even though it looks like she is just lying on the floor, since she is lifting her legs, her abdominal muscles are firing. In the third picture she is also trying to lift her head and sit up, so the bulging is more obvious. Secondary to having hypotonia, this child presents with decreased proximal stability. She has learned to "fix" her trunk together using the one abdominal muscle that travels straight down the middle of her trunk. The important oblique and transverse abdominal muscles are inadequately firing to allow her ribcage to stay stable and well aligned in their connection at the sternum and the sides of the pelvis. The straight plane front muscle travels on both sides of the linea alba and shortens, however the rest of the muscles, working inadequately, don't support the linea alba, so the area where the tendon runs bulges. In addition to the bulging, note the elevated shoulders as well as flaring ribs in Figures 234 and 235.

Fig. 234

Fig. 235

If this child is encouraged to do sit-ups with the intention of strengthening her belly muscles, she will pull through her arms, bring her legs up to lock them onto her pelvis so the weight of the legs will assist in lifting the rest of her body, and fire her straight plane belly muscles rather than strengthen the oblique and transverse muscles that are inadequately active.

Figure 234 shows the child's rib elevation; in Figure 235 the therapist begins a pull to sit. Note how the child is extending her head back rather than beginning the sit-up by lifting her head on her trunk. The arms are extended into the surface (Fig. 234) and ready to strongly pull in (Fig. 235). Lastly, notice how the child has pulled her left leg up and is even everting and dorsiflexing her left foot as a way to stabilize her lower body onto her trunk (Fig. 235). If a pull to sit occurs, these compensations of extension in the spine, flexion in the legs with fixing in the feet, pulling in the arms and bulging of the belly will be strengthened.

Fig 236

Instead of pulling the child to sit, Figure 236 shows how the therapist demonstrates to her parents a technique to keep her arms out to her sides and decrease the pulling she does through her arms once she lifts her head. The parents are encouraged to have their child work in this crunch position where her legs are extending, her head is up, her neck flexors are working hard, her ribs are pulled toward her pelvis and her belly is not protruding along the midline. Helping her parents see the value of strengthening these components of control she needs to master focuses them on exercising the trunk to treat the core problem, rather than focusing on the task of helping their child get from her back into sitting.

Fig. 237

In Figure 237, the same partial sit-up is being promoted and this time the neck is having to work much harder because the therapist is keeping the child's arms further apart with her elbows extended. Viewing Figure 236 we see how the belly region is more aligned and there is greater co-activation of muscles connecting the ribcage to the pelvis. In Figure 237 the child is shifted into a diagonal pattern, bringing her trunk and head toward her left hip.

A different type of head support system is seen in Figure 273. This six-year-old has a one-piece system that promotes some chin tuck and good alignment through his shoulders and head. The U-shaped unit pivots back sliding off the shoulders and neck when he moves out of his chair. The side supports contour his trunk to support him and inhibit further scoliosis. He is also tilted back allowing his pelvis to stay positioned at ninety degrees while decreasing the pull of gravity.

Fig. 273

Keeping in mind that one system does not work for every child, therapists and vendors must once again be creative in developing equipment that allows each child to keep his head well aligned and allow for input to as many sensory systems as possible.

The next case study involves a child who was born at term and developed his motor skills quickly. At the age of six months he was able to creep on hands and knees until he contracted bacterial meningitis that was misdiagnosed as a cold. Although he survived the assault this illness waged upon his neurological system, he sustained significant cortical damage. I met him when he was discharged from the hospital and he came to an outpatient clinic for therapy. He was beyond low tone, (Fig. 274) presenting as what could be described as floppy or flaccid. He demonstrated no ability to fire muscles to lift his extremities against gravity and he was very content to be held and passively positioned.

Fig. 274

Fig. 275

As seen in Figure 275, he presented with excessive hip joint abduction and external rotation, even at age three. The challenge in working with this child was to create the need for him to have to move or react. Even though it appears that he is passively resting on the floor, the therapist is providing input through his shoulders by slightly distracting them apart and pushing them down toward his pelvis as well as down toward the floor at his belly. By expanding and depressing his shoulders she is creating a weight shift and dissociating his head from his shoulders causing his head to be elongated off the base and placed into space. Looking carefully at Figure 275 you can see the therapists' right thumb and notice how his neck muscles are firing between where her thumb and his ear are located. He is actually trying to lift his head secondary to this sustained weight shift. Honestly, it amazed me that he would lift his head, but it only occurred when I sustained the weight shift and dissociation for a long enough period to allow him to recruit a response. He truly taught me how long WAIT needed to be if my outcome was to see him respond rather than just to look like I was doing therapy. A parent or therapist observing this therapy might wonder when I was going to actually do something since it appeared that I was holding his shoulders and allowing him to lie there motionless. Looking again at that picture and the fact that his head is not buried into the blanket because we can see the active effort to lift his head, we can imagine how the therapist who is paying attention to her hands against the child's body can feel him responding and is motivated to keep holding the three dimensional shift because this floppy child is recruiting a response.

Following prolonged sustained input through his shoulders to expand his upper back and shoulder girdle from side to side, (Fig. 276), he is observed lifting his head and even pushing through his legs. As a matter of fact, he would become angry and yell at me even causing his abdominals to fire, making his effort and activation even more complex than what was being facilitated. I used to wonder why he would yell at me and pick up his head since doing nothing would make me stop, but responding only made me want to stimulate more. His mother also commented that she would become excited about hearing him yell because she recognized the tenacious spirit of her son. Despite these facilitated interactions, he was able to exhibit almost no other interactions except during feeding since he continued to tolerate oral feeding and his mother was a great cook.

In order to provide the family with a way to achieve this type of response during home carryover, I taught them how to work on a similar type of head lift using a bolster. In Figure 277, prone positioning with the arms over the front and the head, somewhat supported, is initially provided to work his spine into greater extension and to promote the posterior weight shift so the weight of his head would not feel so overwhelming.

Fig. 276

Fig. 277

Fig. 278

Next they were encouraged to move in front and help him feel his hands pushing into the floor. This moved his head off the bolster and began to add a load through his shoulders (Fig. 278). As his head was allowed to hang forward, the drive to lift his head and right his shoulders and head on his trunk could be triggered and this would be easier to facilitate by a caregiver. Of course they were strongly encouraged to hold the position for long periods to give him time to respond.

Once his shoulders and upper back were more active, they were encouraged to lift his arms into humeral flexion to promote head lifting and active holding through his upper back and shoulders. In Figure 279 he is even lifting his legs slightly indication that he is more dynamic in his trunk in response to having his head and arms shifting into space. Notice that even though some input could be introduced (Fig. 278), he becomes much more active when he is shifted into space (Fig. 279) rather than when he is placed into weight bearing against a surface.

Fig. 279

Fig. 280

He could be moved into side sitting using the bolster and continue using his head lift as seen in Figure 280.The key element again was to move him into the position while maintaining an expansion between the two sides so that he would stay dynamic in his shoulders and upper trunk. Here stability is provided to his trunk while a graded distraction is applied to his right arm and shoulder. Being careful not to pull beyond his ability to resist, the response to distraction is to contract the structure being separated. He is not only holding his right shoulder stable enough to keep his head lifted, he is also pushing slightly through his left arm.

From side sit, a new position is added without taking a break, and he is transitioned into long sitting. Although he loses his head lift, he is not completely collapsed through his trunk and head or it would be impossible to help him stay somewhat upright from these distal points of control. Once again distraction between the right and left sides is being promoted by applying graded distraction through his arms in Figure 281, to create the need for activation in his shoulders and upper back. At the same time, his legs are moved out of the extreme flexion, external rotation and abduction into a more neutral alignment in order to provide a base of support through his hips.


Fig. 281


Fig. 282


Fig. 283

After recruiting some increased response through his trunk and legs, the input is changed as seen in Figure 282. The elbows are stabilized to promote some weight into the arms allowing the weight to be shifting slightly forward. This creates greater demand on the head and neck and he makes some effort to lift using asymmetry. His legs are also stabilized under the therapists' legs to promote the best pelvic/spinal alignment possible.

In Figure 283, the therapist challenged him to bring his head forward while his shoulder girdle expansion was stabilized with his arms behind his trunk. Lifting his head in all of these sitting positions was too difficult for him to successfully right his head in vertical alignment, so these activities were promoted in therapy to strengthen his attempts to lift his head. These activities were also promoted to increase the variety of muscles activated during head lifting.


Fig. 284


Fig. 285

For home carryover, once again the bolster was used as seen in Figure 284. Caregivers were encouraged to sit behind him to provide an exoskeleton for him to right his body against. They were shown how to provide a graded distraction through his arms to expand and activate his shoulders and upper back since that is the base of support he needed to successfully lift his head. Once he successfully lifted his head against the support provided, caregivers were encouraged to have him hold himself against the support they provided in order to strengthen his ability to hold his head and upper trunk upright as shown in Figure 285. It was explained to them that in order for him to keep his head lifted when positioned in a wheelchair, he would need to be able to orient his head against a support and keep it lifted. Although he could use his active head lifting for his favorite task, eating his mother's home cooking, he frequently allowed his head to stay dropped onto a tray. Therefore he was fitted with a mulholand shoulder support system in his wheelchair and he required a tilt system to keep him well positioned.

Therapists and caregivers need to understand that in order to keep the head lifted on the spine, the alignment of the structures must be maintained, and the base of support for head lifting is shoulders and upper trunk, so these must activate. When the weight of the arms is pulled down, they can cause the upper back to round, so lifting the weight of the arms to shoulder height or even higher can have a huge impact on keeping the head upright. That is why a tray may be placed at axial height, then a pillow be placed under the arms to decrease the downward pull through the shoulders. Head support systems added to chairs can assist in head lifting but no system will allow sustained alignment when the cervical spine is collapsed into extreme extension causing the chin to jut forward. Using a combination of head support systems with tilt or recline as tolerated, the pull of gravity on the head structure can be modified to allow for good head positioning for most patients.

Having strategies to treat these common problems seen in hypotonia, arms therapists with an understanding of how to help their patients attain their maximal motor alignment and control. In addition, by understanding why children use the common compensations, therapists are able to educate patients and caregivers on ways to avoid or minimize impairments throughout their development.