REVISED

The Hypotonic Child

TREATMENT FOR POSTURAL CONTROL, ENDURANCE, STRENGTH, and SENSORY ORGANIZATION

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TREATMENT FOR POSTURAL CONTROL, ENDURANCE, STRENGTH, and SENSORY ORGANIZATION (REVISED)

Regi Boehme, noted NDT instructor, offers practical treatment ideas in this revised edition of her work shop manual. This easy-to-use reference tool gives you an understandable overview of basic problems of low tone. The Neuro-Developmental Treatment approach is included in the illustrated treatment rationale. This "hands on" resource includes–

- early diagnostic signs
- quality of postural tone and its impact on movement
- principles of NDT and its relationship to hypotonicity
- effective sensory-motor input
- suggestions for carryover at home

Clear line drawings and descriptions will help you understand conditions and treatment techniques.

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Contents

Basic Problems of the Child with Hypotonia

1. **Early signs:** The parents notice excessive floppiness and general inactivity. The child feels more flexible than expected and is difficult to handle. This is particularly noticeable during feeding, when a secure position seems difficult to find. There is excessive head lag, and considerable support may be necessary for the head, neck, and trunk during burping, dressing, bathing, and carrying of the child.

2. **Quality of tone:** Hypotonicity is associated with postural limpness and a marked head lag. Head, neck, and trunk control are often insufficient to support functional movement.

3. **Consequences:** The child is greatly limited in physical ability to maintain a secure posture in which to interact with the environment. This can be the start of a long, unbroken period of exploration deprivation that may add to existing deficits. It is difficult for the child who cannot move around to develop cognitively. The child may become busy with self-stimulation in an attempt to fill the sensory-input void.

4. **Postural instability:** The limbs and body sink into gravity, causing the typical leg posture often referred to as the frog position. When moved passively, the body feels heavy because it lacks coactivation around the joints. This condition limits early random-movement play. Without dynamic postural stability, the child will have difficulty with midline control in all movement planes.

   The child with hypotonicity lacks dynamic muscular control. When the child attempts to move, there is poor balance between flexors and extensors. In fact, the tendency is to use either total extensor or flexor patterns. Initiating, sustaining, and terminating functional movement requires graded control of muscle activity. The child with hypotonicity lacks graded control in all three phases. For example, the child may initiate a head lift with a spurt of extensor activity but may not be able to sustain it long enough to visually scan the environment. The head may suddenly drop forward without the controlled termination of the cervical muscles.

5. **Hypermobility:** The child's hypermobility indicates that there is a lack of ligament, muscle, and tissue resistance toward extreme movement ranges. Posturing in extreme joint ranges can cause immobility in the opposing joint range. For example, constant use of hip flexion, abduction, and external rotation can create a lack of joint range into hip adduction, extension, and neutral rotation. The shoulder girdles are also hypermobile with little scapular stability on the rib cage. The child may use extreme scapular adduction with humeral abduction in an effort to gain a feeling of stability in the upper body. This pattern

may eventually restrict movement of the arms in the forward plane and across the midline.

There may be significant hypermobility in the glenohumeral joints. Movement of the whole arm in space will be difficult with this instability and the child may limit upper extremity function to the lower arm. Instead of exploring the space around the body, the child may utilize forms of self-stimulation, such as hand mouthing and/or primitive banging motion on the body or on toys.

6. **Possible deformities:** Hip dislocation may occur when the frog-leg position is used. The child has a tendency to sleep with the legs abducted and externally rotated and with the knees flexed. The feet may be in extreme dorsiflexion and eversion. In standing and walking, the child may bear weight exclusively on the heels of the feet. In addition, scoliosis may develop as a result of the use of postural asymmetry. Pelvic torsion is often used as a source of postural fixation, and over time this rotation is generated throughout the spine.

7. **Respiration:** Respiration is usually insufficient for sustained vocalization. Breathing is often shallow and noisy. This is partially due to rib-cage instability. Inactive abdominal obliques fail to support the biomechanical development of a mature rib cage. The abdominal obliques are an important connection between the top and bottom of the body. They elongate the intercostals and provide a primary point of stability for efficient and deep respiration as well as whole-body motion. The child with hypotonicity may attempt to "hold" the top and bottom of the body together by using the rectus abdominis, a strong trunk flexor. This adapted pattern of trunk control can create excessive rib flaring and has a flattening effect on the lower rib cage. The child may seek further stability by "holding" the front and back of the body together with the diaphragm. This pattern not only reduces respiratory function but can restrict low thoracic spinal mobility as well.

8. **Oral-motor problems:** Sucking and chewing difficulties are due in part to inactive lips, cheeks, and tongue. The child's lack of early hand-to-mouth and toy-to-mouth play contributes further to sensory discrimination deficits. As a result of oral hyposensitivity, the child may not feel food and saliva in the mouth. The use of head and neck hyperextension with tongue retraction creates alignment problems that interfere with motor control and may lead to oral hypersensitivity. Due to the inactivity of the facial muscles, the child may have limited facial expressions, which reduce early nonverbal communication. At times this is mistaken as a low level of cognitive function.

9. **Personality characteristics:** The child with hypotonicity feels a great effort to move against gravity. The effort may be greater than the child's drive and curiosity about the world. Eventually, the child may become a passive onlooker.

Treatment Principles

The child with hypotonicity is usually affected throughout the body and noted to have very little active movement. Due to the effort it takes to move, the child usually is content to be static or passive in response to the world. Postural responses are either absent or very slow to develop. Consequently, treatment focuses on the facilitation of active motor responses on the part of the child. Treatment always includes functional activities such as play, eating, communicating, and exploring.

1. The child is encouraged to be an active participant in the treatment process. The child's own movements will arouse the central nervous system for further development of function. The therapist is aware of the degree of support, because the child will tend to use all the support that is offered. Consequently, light touch is often used.
2. It often takes the child some time to respond to sensory input. Allow ample time for the child to process sensory information and respond with a motor output.
3. Work on developing controlled movement in midranges, because the hypotonic child tends to passively hold selective positions. Transitional movements are a useful way to incorporate this into therapy. Work toward a variety of movement patterns that stimulate weight shifting around the body axis and across the midline.
4. The child needs to build up endurance and sustained muscle activity. The therapist works to gradually increase the amount of time that the child is able to maintain active movement.
5. Work on developing proximal control to support use of the limbs in space. Reaching in all spatial planes and hand-to-foot play are useful activities in therapy. Encourage the child to use active control off the base of support as a point of dynamic stability for posture and movement. As the child becomes more active, need for a wide base of support will decrease.
6. Graded sensory input is provided so that the child can begin to experience sensation in a pleasurable way. Deep pressure, brushing, and toweling over the cutaneous surfaces will help the child to develop awareness of self in relationship to the world. Well-defined body boundaries will support active movement and exploration.
7. Most children who end up with hypertonicity or fluctuating tone begin life with hypotonicity. Keep a watchful eye for the possible emergence of other types of tonal problems. This is particularly true of the younger child.

Sensory-Motor Input in Hypotonicity

We use touch concurrently with changes in the center of gravity to help the child achieve maximum function. Grading sensory and motor input between therapist and child is the gift and the challenge that Neuro-Developmental Treatment brings to our profession.

Each child responds in a unique manner to sensory-motor information. How the child responds depends on a long list of variables, including: (1) past sensory-motor experiences, (2) present motor skills, (3) mental judgments the child has made about the body, (4) emotions related to being touched and moved, (5) cognitive development and the degree of internal drive to move, and (6) the way in which the central nervous system processes new information. Remaining cognizant of all these variables may seem an impossible task, but the patient and the treatment goals will determine which concerns are currently a priority.

Specifically, the child with hypotonicity has limited sensory-motor information "on file" because of minimal movement. The child may have developed a few isolated motor skills, such as lifting the head in prone or mouthing the hands. Therapy focuses on increasing the sensory-motor repertoire. Increasing coactivation around the joints will lighten the body as it moves through gravity. As this occurs, and strength and endurance improve, the child may accept that controlled, voluntary movement is possible and useful. The child may experience fear or anger as this unfamiliar sensory-motor information is received by the body. The child's emotions may be expressed through crying, physical withdrawal, and/or sensory shut-down in which the child seems unaware of your input. Treatment focuses on acknowledging these feelings, supporting the child with verbal coaching and encouraging the child to stay aware during therapy. Provide cognitive stimulation with multisensory toys, such as those that are brightly colored, have moving parts, and make sounds. The verbal coaching and environmental stimulation will amplify the child's internal drive to move and interact with the environment. Generally, the central nervous system of the child with hypotonicity processes slowly. Consequently, the child needs ample time to receive, interpret, and respond to your input.

Many different types of sensory-motor stimulation are useful in the treatment of hypotonicity. We use trial and error to determine what types of input are working well for both the child and the therapist. The child's ability to receive can vary from session to session. Therefore, it becomes important to begin each session with an open mind and proprioceptively sensitive hands.

1. **Approximation:** Providing the child with light and gentle intermittent joint compression facilitates higher postural tone by activating muscles around the joints. Each input of compression builds on the previous one. Consequently, the input can summate, or add up, producing a stronger muscle response. Intermittent joint compression

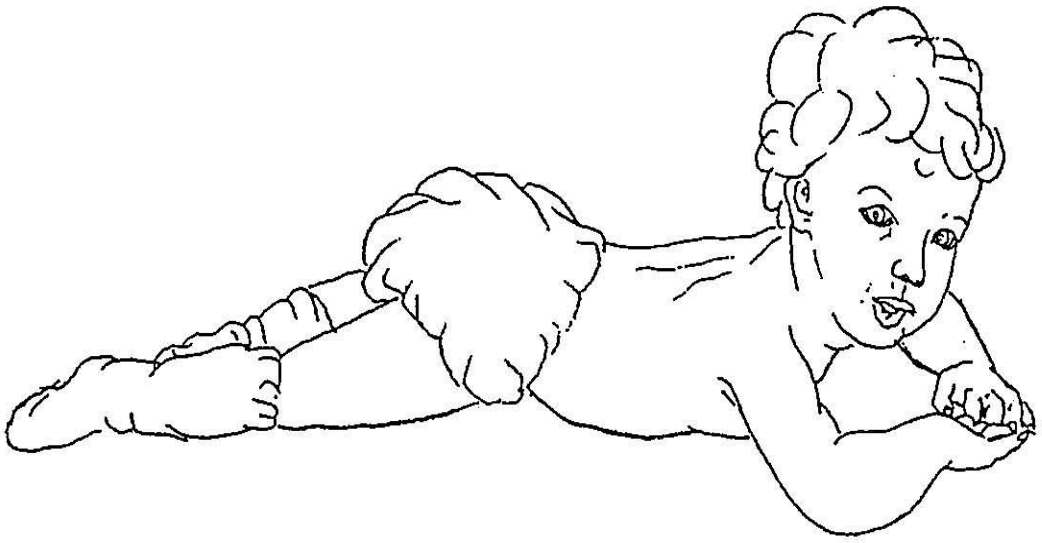

Figure 1

The child with hypotonicity tends to position arms and/or legs in abduction. From the child's point of view, maintaining the extremities away from the trunk will create stability, safety, and ease in the body. For example, abduction of the arms mechanically holds the scapulae close to the spine, giving the trunk a point of static stability for head lifting. Abduction, flexion, and external rotation at the hips holds the pelvis in an anterior tilt, giving the child a feeling of control of the low back as the head is lifted to view the world. Maintaining this abduction also prevents a lateral weight shift as the child turns the head or uses one hand in play. The child may view weight transfer as a threatening movement, leading to a fall.

The child, in the search for stability, safety, and ease, may stabilize distally. Fisting the hands or holding the hands together in midline may create the illusion of shoulder and upper trunk control. Dorsiflexion and eversion of the ankles and feet or stabilizing the feet by holding the soles together may create a feeling of control in the hips, pelvis, and lower trunk.

The compensatory patterns used by the child to gain static control of the body are the same patterns that interfere with the development of dynamic control in the body. The challenge to the therapist is to help the child develop dynamic postural control by letting go of the positional stability. Inhibit the static position as you facilitate or guide the child's creation of missing motor components.

Figure 2

Facilitation of head lifting with active spinal extension is obtained through light traction into humeral abduction with elbow extension. You may even lift the upper chest slightly to encourage spinal extension below the neck. Prone extension, in the form of this landau posture, is a natural part of the developmental experience in children at 5 months of age. It is viewed not merely as a motor milestone but rather is recognized for the component experiences that it offers the child proprioceptively and kinesthetically.

Kinesthetically, the child recruits active extension along the whole spine rather than localized muscle contraction solely in the cervical spine. As the spinal extensors activate, the child may either stack head on neck or let the head fall into flexion. Proprioceptively, the child experiences elongation of the pectoralis musculature. This expansion of the upper chest will encourage the child to generate a deeper inhalation into the upper lungs rather than limit the breath to the lower lungs and belly. The child also will experience elongation of the abdominals and hip flexors, encouraging low back and hip extension. All these components of movement will support the child in developing control in sitting, standing, and gait.

You may suggest that the family play "airplane" with the child. This activity should improve strength and endurance in the spinal extensors. The family may also use auditory and visual cues to encourage the child to access activity in the spine. This activity may appear as lifting of the head, neck, and trunk or rotation of the head. Massaging the hands and feet will proprioceptively stimulate distal activity rather than distal fixation.

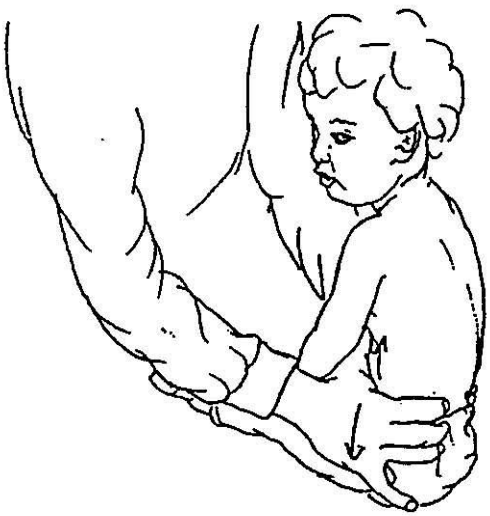

Figure 10

The use of sustained compression through the lumbar spine and pelvis, in the direction of the hips, helps the child feel a stable sitting base. Initially the child will learn to control the head, spine, and shoulder girdles using your hands solely as a point of stability for postural control. This postural activity in the upper portion of the body will generate activity into the hips. As you feel the hips activate, lighten your support on the low back and pelvis. Allow the child to control posture as much as possible. On the small child, you may use your thumbs to stabilize the rib cage and your forearms to encourage neutral alignment of the femurs. The goal is to access trunk control off a stable lower body and to allow this postural control to stimulate activity in the lower body.

As the child begins to activate the hips and control posture, lighten your support and allow the child to experience some anterior and posterior pelvic motion. If the child seems to be holding or bracing in the pelvic-femoral joints, feel free to facilitate active pelvic movement in both directions. As you slowly move the pelvis posteriorly, the child should respond by using flexors to return the pelvis and trunk to a neutral position. Conversely, as you slowly move the pelvis anteriorly, the child should use the extensors to return to the center. These postural responses will become stronger over time and will increase the strength of hip extensors and abdominal obliques, which are required for a dynamic sitting base. The child may react by pulling the pelvis into torsion or asymmetry since this will feel stable. The child may pull strongly enough to move into side sitting. It is necessary to block this tendency and continue to work on straight plane motions of the pelvis. In fact, once the child accepts anterior and posterior pelvic motion, provide the experience of lateral weight shifting through the pelvis. Work on rotational movements through the pelvis and trunk last.

Sitting with a stable base should be incorporated in the seating system that the child uses at home. Whether the child is positioned in a floor sitter, stroller, wheelchair, or high chair, the pelvis should be properly aligned and the low back supported. When the child is positioned in sitting at home the parents can take advantage of this stable sitting base by encouraging the child to use the arms in space to play. Vocalizations should come easier for the child because the attachment of the diaphragms on the lumbar spine is supported.

Figure 11

You can stimulate postural control in sitting by holding the arms in a position of humeral abduction. The 5-month-old uses this high-guard position naturally to help initiate an upright posture. Your hands will support the arms at 90 degrees, horizontal to the weight-bearing surface. This arm position will allow the scapulae to adduct toward the spine, stimulating trunk extensors. Lean the trunk slightly forward of the hips to create the desire to extend the full length of the spine. Utilize your body or a piece of equipment to encourage skeletal alignment by maintaining the pelvis perpendicular to the supporting surface. As the child initiates spinal extension, slowly lower the arms, since it is important to not rely on scapular adduction for sustained trunk control. As the child develops strength in trunk control, progress to sitting with arm support. The end result will be independent sitting with freedom to use the arms for functioning.

When tight hamstrings interfere with pelvic alignment, use bench sitting. The larger child might be handled more easily on the bench as well.

Figure 18

You can facilitate hand-to-foot play with active abdominals by gently and directly tapping the hip extensors on the surface. Hip extensors, abdominal obliques, and pectorals work synergistically to activate the trunk and stabilize the extremities. The femurs are held in neutral alignment with knees extended, elongating the hamstrings and low back. As flexor control is stimulated, the child will actively lift the pelvis. Initially you may sense a subtle holding of the pelvis, or you may feel the lower body get lighter. With repetition, the abdominals will become stronger. The angle of the hips should be comfortable for the child. Focus on postural activity, visual convergence, and hand-to-foot contact.