Posture and Scoliosis- Flexibility and Function

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A New Perspective at Looking at Posture and Scoliosis-
Flexibility and Function
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Prior to Beginning

How’s the air temperature?
How are the chairs that you are sitting on?
Are you too close to your neighbor?
Did you have a good breakfast this morning?
How was traffic coming here?
Henry David Thoreau Once Wrote:

We are all Sculptors and painters, and our material is our own flesh and blood and bones.

For Every Pound You Loose, You Take 6 lbs Off Your Spine (Hey Clinic)

85 Percent of Americans Will Experience Low Back Pain sometime in their Lives (Mary Bond)

75 Percent of Americans spend most of their waking lives sitting behind a steering wheel or in front of their computer screen (Mary Bond)
Effects of Good Posture

Spine moves in three planes of movement
Determines Outcome of Performance
Good for Health- Keeps the organs in place and allows them to work efficiently- ex. rounded shoulders puts pressure on the chest and lungs
Effects how we walk, run, jump, lift weights, and execute other skills
Makes you feel alive and able to breath better
Maintains joint stability
Is essential to the development of coordinated, skilled movement, since antagonists control the speed, range and force of the action of the agonists.
Example- the hip lifting action of the quadratus lumborum and latissimus dorsi hold the leg on the same side up during the swing phase in walking while the rotation action of the internal and external obliques brings that side of the hip forward. The alternating action of the opposite oblique must relax to allow the serratus anterior and the shoulder girdle to be rotated backward.

Good Blood Circulation
30-40 degrees of spinal flexion/ 15 to 20 degrees of spinal extension

Hartfield, F.

Back Pain Facts

Low back pain affects nearly everyone at some stage of active adult life and is one of the most common ailments. Described as slipped disc, arthritis in the back, rheumatism, sciatica.
Research indicates that somewhere between 60 to 75 percent of the population who have back pain once will experience recurring or chronic back problems.
A study done by Croft (1985) in the United Kingdom found that one year following a first attack of acute back pain, 50 percent of patients were still complaining of intermittent or persistent pain interfering in normal daily activities or work.
In 2004, research was done and found 50 percent of patients had developed long-term problems of recurring and chronic back pain.
Take one to two days off after the onset of acute pain, but otherwise it is best to regain your mobility as soon as pain permits.
Spinal nerves allow us to move ourselves and feel temperature, pressure, and pain. The nerves are part of our alarm system.
Pain arising from prolonged stretching is called the postural syndrome- due to slouching or poor posture.
Derangement syndrome- is from pain from distortion or displacement of the disc. Soap example- Soap in middle of palm- soap moves away from the point of highest pressure and is displaced between your fingers.
Pain location- usually felt in center of back or near the beltline and will often move down the leg. The most common cause of low back pain is postural.

Mckenzie, R
Back Pain Facts

- Mechanical Pain - See Hand Example- occurs when the joint between the two bones has been placed in a position that overstretches the surrounding ligaments and other soft tissue. Pain is a warning sign telling you that to continue moving in that particular direction will cause pain.
- The purpose of the Mckenzie exercises is to abolish pain and to restore normal function- that is to regain full mobility in the low back or as much movement as possible.
- Centralization is the movement of the pain to a more central location, and centralization of pain that occurs as you exercise is a good sign. Extension exercises are the exercises of choice. The belief is that by doing these exercises, it will be a matter of 10-14 days before improvement begins.
- Osteoporosis- a mineral deficiency disorder can cause risks of fractures. Research at the Mayo clinic in the US has found that extension exercises regularly reduced the number of compression fractures.
- In 1995, The United States Federal Government Agency for Health Care Policy and Research published a list of recommendations to guide those health professionals involved in acute back pain. Massage, Ultrasound therapy, and passive treatments weren’t on the top of the list. Modern methods are moving away from these treatments, because they cause patient dependence. Exercise and activity allows patients to gain independence and to become self reliant.

Mckenzie, R.

Aging with Posture

Imagine yourself as a child playing in the park. There are no worries at all. Your body is free to express and move as it wants to move. You find yourself leaping, jumping, spinning, and enjoying life. Your body is flowing, and there is little trace of effort.

Now imagine yourself as that same child only ten years older. As a teenager, you find your body has a new way of maneuvering around the world. With shame, peer pressure, fashion, rebellion, intervening trauma, fear, guilt, and lack of physical education, you notice that your chest depresses, your shoulders round, your tail tucks under, and your head hangs.

Now about ten years later, you notice how your jaw hurts, your getting headaches, and experiencing neck and shoulder pain and even low back pain. But Life is fun. You are exercising and working at a job you enjoy but aren't necessarily being responsible for your bodies well being.

Now your ten to twenty years older, Long hours sitting at workstations and worse—fitting car seats take their toll. Not really taking care of your diet and not exercising has left you with sciatica, vision issues, bunions, a protruding abdomen, shoulder, neck, and back issues and even some jaw issues.

NOW WE ASK WHAT NOW AND WHY ME!!!!!!

Mary Bond
WHY?

• We were taught that posture is just body alignment and it is unrelated to how we feel. This new postural perspective applies to our own personal experience of living within our bodies, and how we move in relationship to the world around us. Posture is thus the expression of both our mind and body.

• Posture is indeed the relationship between our habits of movement, our pain, and our aging process.

• Posture is a dynamic activity created by our movement, and how we hold ourselves and proceed through life.

• How we present our body to the world evolved from how we were supported and regarded by other people from the time we were born and even in the womb.

• Posture is also shaped by cultural and religious standards, by geographics, by the weather, by fashion, by stress, by the media, and Most importantly by our RELATIONSHIP WITH GRAVITY!!!

• Moreover, we also hold our bodies in response to the dangers in our lives, or to insults or memories. When threats or memories of these threats are repeated our protective responses get held in our body and show up as chronic tensions. Leaving us with habitual patterns linked to our survival.

Mary Bond

The Ideal Figure or Shape

Healthy posture is no longer an ideal shape toward which you must strive or something you must do differently to your body.

Instead of focusing on what you look like on the outside, focus on what is occurring within.

It is how you feel. By looking at postural change from within, you can start to develop a new awareness for what feels balanced and stable. This will help bring your body into alignment with gravity. Your body may move forward over your feet and will also lengthen and be taller.

Mary Bond
Stability and Orientation

• Breathing
• The Abdomen
• Pelvic Floor
• Hands
• Feet
• Head

How does It FEEL to be out of Normal Anatomical Alignment and unable to perform functional activities?

• How Does It FEEL to be in pain and unable to communicate that you need help moving and getting rid of the pain?
• Is a tonal issue really just a postural issue?
• Are you seeing the world differently than most by the way you are holding your body?
• Are poor postural habits related to some sensory imbalance, i.e., vision, hearing, etc.?
Kinesiology and Biomechanics

Kinesiology is the science or study of movement, and the active and passive structures involved - examples - types of muscular contractions, planes of motion.

Biomechanics is the study of the mechanical aspects of physical movement, such as torque, drag, and posture, that is used to enhance athletic technique. It also involves factors like speed, mass, acceleration, levers, and force, and physical functions of movement.

Both together show you the way to do an exercise more effectively and tells you what muscles are involved in a particular movement.

Hartfield, F.

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Runners VS. the Clients We See
The Pose Technique

1. S-like body position with slightly bent knees and back straight - run 2-3 inches
2. Forward lean from the ankles to employ gravity and work with it not against it
3. Pulling or lifting feet up under the hip not behind the buttocks
4. Ball of foot landing under your body (your GCM - general center of mass)

Drills - Pulling, Use rubber bands on ankles, Falling (Manual resistance on Back)
Land on forefoot, not heel. Landing on the heel transmits maximum shock and has a momentum-killing braking effect.
Minimum leg turnover should be 180-190 strides per minute. Increases as you get fitter and want to go faster. The longer the foot is on the ground, the more momentum you loose.

Pose Running Technique

Pose Method of Running technique, aka POSE Running, is a better way to run.
Developed in the former Soviet Union in the 70's by Nicholas Romanov. His technique was included in the textbooks at the turn of the 21 century. Pose Running was published in America in the 90's and is now taught and practiced all over the world. It is used by athletes of all levels and non-athletes of all ages. The actually skill of running is taught based on the principle of gravity.

Nicholas Romanov was a PH.D., a Miami-based Russian sports scientists who trained world class athletes. He discovered the importance of running skill in 1976. To come up with his technique he looked at the form of ancient runners as depicted on museum murals and pottery. He even studied the running form of fast animals, greyhounds and cheetahs. His technique is used by the members of the National 4 countries - USA, Great Britain, Mexico, and Russia. Used in swimming, speed skating, and cycling. Swimming technique is taught to use awareness and perception. Speed skating is taught with body weight through balls of feet for better fall instead of aligning the body weight through the ankles.

Called Pose Technique - "Controlled Falling" - A good runner actually is letting gravity swing his lifted leg forward. Theoretically, legs should not play a major role in propulsion. Romanov explains the hardest part of this technique is to be able to flick the heel up toward the butt the second the forefoot touches the ground rather than pushing off the toes. Imagine you’re running barefoot on glass or stepping on something hot.
Pose Technique-The only scientifically proven technique to reduce impact on the knees by 50 percent and Uses Newton’s Third Law of Gravity

WHAT CAN IT DO?
Pose Running technique will dramatically change your entire perception of running. It makes running easier and better.

- Reduces impact on knees by 50% (scientifically proven)
- Dramatically improves training and racing
- Gives you a competitive edge
- Helps prevent injuries
- Helps you loose orthotics for good
- Helps you enjoy your running for the rest of your life!
- Transmits 30 percent less shock than normal running

Romanov’s Beliefs

The influence of gravity shapes and structures all living creatures including human anatomical and physiological structure, size, and weight. Before we can improve our sports technique and beat personal bests or world records, we must first acknowledge gravity and understand how it works on locomotion.

Breathing is a part of the interaction with the environment where the main stimulator of oxygen consumption is gravity or the rate of using it. When we run faster, or fall more, the use of oxygen increases.

Arms- Infants use their arms as perceptual mechanism- a tool to monitor their perception of falling. Arms help identify their movement. To prevent falling, arms are held stretched to the sides. Arms should work in sync with legs. Arms should not be held in a fixed position. Look at elderly people how they hold their arms. They usually are held rigid to avoid a fall. So tension, angle, and swing is all related to your speed of running or cadence. Greater angle when you run faster, lesser angle when running for distance. 65 percent of woman studied who had breast cancer had decreased arm swing on the side of their affected breast.

In the Extensor Paradox Experiment - McClay, Lake, and Cavanagh, 1990, Biomechanics of Distance Running, found that the electrical activity of the major extensor muscles (QUADS) of the legs are ceased after the body passes the midstance or vertical position of the body. At this point, which is called the propulsive push off phase, as shown by this research, our muscles do not work for this matter. It means we don’t push off as we used to think.
Whether it is a baby crawling, a runner running, or a geriatric woman walking with her walker are these individuals aware of their bodies?

• Body Awareness- implies the “precise subjective consciousness of body sensations arising from stimuli that originate both outside of and inside the body” Babette Rothschild

• Body awareness has to do with the awareness of cues from the sensory nervous system. Body awareness from exteroceptors originate from stimuli that have their origin outside of the body (touch, taste, smell, sound, sights). Body awareness from interoceptors consists of sensations that originate on the inside of the body (connective tissue, muscles, and viscera). Body awareness is not an emotion, such as I am afraid. Emotions are identified by a combination of distinct body sensations.

• Shallow breathing+ elevated heart rate+ cold sweat= AFRAID

• Some Examples of Terms that help to identify the various bodily sensations include:

<table>
<thead>
<tr>
<th>Breathing: location, speed, and depth</th>
<th>Tears, Crying</th>
<th>Balanced, Unsteady</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weak, Strong</td>
<td>Light, Heavy</td>
<td>Hot or Cold</td>
</tr>
<tr>
<td>Skin humidity: Dry or Moist</td>
<td>Tense or Relaxed</td>
<td>Tight, Loose</td>
</tr>
<tr>
<td>Soft, Hard</td>
<td>Restless, Calm</td>
<td>Movement, Still</td>
</tr>
<tr>
<td>Big, Small</td>
<td>Pressure, Pulling</td>
<td>Vibration, Shaking</td>
</tr>
<tr>
<td>Dizzy</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Babette Rothschild

Nervous System

Organization of the central nervous system.

CENTRAL NERVOUS SYSTEM
|
| ROBES AND SPINAL CORD               |
| PERIPHERAL NERVOUS SYSTEM           |
| SENSORY DIVISION                    |
| INTERCEPTIVE                        |
| "The Five Senses"                   |
| SOMATIC NERVOUS SYSTEM              |
| Autonomic Central                  |
| voluntary control                   |
| involuntary control                 |
| AUTONOMIC NERVOUS SYSTEM            |
| Sympathetic Branch                  |
| Parasympathetic Branch              |

Babette, R 2010
Breakdown of the Nervous System - Sensory Division

**Sensory System** - It is through the senses where we perceive the world.

**Exteroceptive** - Nerves that receive and transmit information from the environment outside of the body by way of the eyes, ears, tongue, nose, and skin. Responsible for small and large changes in the external environment. You compensate in one area if another area is affected. Example: Use more of your auditory system if your visual system is impaired.

**Interoceptors** - nerves that receive and transmit information from the inside of the body, from the viscera, muscles, and connective tissue.

Breakdown of the Nervous System – Interoceptive Sensory Division

**Proprioception and Vestibular sense**

**Proprioception** is further comprised of kinesthetic sense and internal sense.

**Kinesthetic sense** enables one to locate all the parts of his body in space. i.e. Enables you to touch the tip of your finger to your nose when your eyes are closed or also makes walking possible by indicating where your legs and feet are located at any given time.

**Internal sense** gives feedback on the body, such as heart rate, respiration, internal temperature, muscular temperature, and visceral discomfort. The internal sense also helps to identify and name our emotions. Each basic emotion, i.e. fear, sadness, or happiness, has an accompanying set of distinct body sensations stimulated by a pattern memory in the brain.

**Vestibular Sense** indicates when one is in an upright position to the earths gravity. It is centered in the inner ear. When it is disturbed, symptoms of dizziness or vertigo or even loss of balance may occur.

Our first expressions of an experience usually come from our senses, from both interoceptive and exteroceptive. These impressions are not encoded as words, but as the somatic senses they are: smells, sounds, tastes, movement, position, and behavioral sequences.

Babette, R
Breakdown of the Somatic Nervous System

• The Somatic Nervous System (SomNS) is responsible for voluntary movement executed through the contraction of skeletal muscles. Simple movements are made up of several muscle contractions. It is through the SomNS that behaviors, movements, and physical activities are performed, and it is through interoceptive proprioceptive nerves that they are perceived. The somatic nerves cause a movement and the interoceptive nerves give you the feeling of it.
• For a new activity, a new movement or a behavior to be maintained in our memory, proprioceptive nerves from muscles, tendons, and skeletal connective tissue, ligaments and fascia relay information on position, posture, and action through afferent nerves to the brain.

Developing Body Awareness

Some clients may have a good idea of what they sense in their bodies and will be able to communicate that to you. You could then use their body awareness as a resource.

Some clients may be unable to feel their body sensations at all or they may not have the vocabulary to describe the sensations. Others will have little contact with their bodies that when they are asked that same question, they respond to a totally different topic.

One way to encourage body awareness is by asking clients their opinion on room temperature, if they are thirsty and need a drink, or is the chair comfortable they are sitting in.

Another way is to encourage kinesthetic sense: Without looking, can you tell me where your elbow is positioned now?
Creating a New Framework

“Problems like obesity, psychosomatic distress, emotional deadness, chronic tension, headaches, sexual problems, lack of emotional expressiveness, and bodily violation (abuse) all involve the fundamental fact that our existence is in an embodied existence. What happens to us as persons happens to us in physical ways as much as in psychological ways. We live not only through our thinking and imagining, but also through moving, posturing, sensing, expressing”. How, then, as therapists can we ignore the fundamental psychological nature of the person where our job is to heal the self, the whole self? (Kepner,J)

The shift: To demonstrate a framework where practitioners can better appreciate body processes in the context of the whole person, rather than as isolated events.

“The Body is intrinsic to the self, and as such is significantly related to our emotional life and enduring life themes, and is the physical foundation of our existence in the world”. (Kepner,J)

Body and Self

“We normally consider “body” to be something other than “self”, and thus irrelevant to the “I” that is struggling with the problems of living a full and meaningful life” (Kepner,J).

“Those that seek our help are usually wanting to get rid of some uncomfortable body experience. They want the discomfort of tense muscles and the constant headaches to go away.

Oddly enough, clients are often at odds with their existence as human beings. They may feel that attending to their body experience is wrong or perhaps too sexual. To actually experience their bodies may have been associated with pain, sickness, or violation that their “bodies” have become something to avoid. Example of my wrist when it was broken

So to ask our clients to focus on this aspect of experience may seem counter to the problems for which they are seeking” (Kepner,J).
Self and Embodiment

We frequently feel the same discomfort with our body experience as do our clients. We are a part of a system where we barely breath, sit, or stand for long periods of time, and use our mind to solve our clients' problems. (Kepner, J)

Our language for one encourages the distinction between Body and I. We have no word that says I-Body. We may say My Body in much the same way we refer to MY BIKE. Thus, implying one's body as property, but certainly not self. Our language supports the idea that our body is like an object. Something that happens to me, rather than the Me that is happening. (Kepner, J) oneself and one’s body are two separate entities

There is also a tendency to organize one's perception of one's own body as though I, the perceiving self, am up here (in my head) while my own body, the thing perceived, is down there (with my foot being farther away from me than, say my shoulder). So, Saying, "I have a feeling of tightness in my body" places subject and object as two separate entities. When you say IT hurts, avoids completely referring to one's own body. When you say I have a pain in my left foot. The language distances you from your own foot. (Behnke, E.)

An Example of Self and Embodiment

A person who suffered a spinal injury could still feel her own body. She learned to control the spasms by internally moving herself in the direction the spasm was already taking her. She turned the spasm into an intention. The intention in this case did not produce movement but resulted in a rapid subsiding of the spasm. Matching, is a process in which she did. Matching is a way of reinterpreting what is happening to me or inside of me by experiencing whatever is going on as if it is something I myself am doing. Matching melts the boundary that the I- It paradigm imposes and begins to allow the me-ness to flow into the entirety of me. (Behnke, E.)
Body Based Psychology (Somatic)

- Based on the premise that the body cannot lie and that we can trust in the innate wisdom of the body
- All psychological processes occur within the body and psychological patterns have physical components.
- Psychological problems manifest in body fixations or maladaptive somatic patterns, making our bodies the most concrete proof we have of our psychological states.
- We can change body patterns rather than processing emotional or psychological issues.
- Monitors the relationships among body sensations, emotions, and thoughts
- Therapists observe whether their clients’ bodies are expanding or compressing, where there is movement or fixation in any part of the body, then therapists use the information to guide the clients’ processes.
- Therapists teach client’s to gain the same awareness in their own bodies.
- Clients learn to track physical sensations that accompany their psychological processes and to process these issues using body sensations, movements, and energetic patterns. (Foster, M.)

Theories- Body Based- Wilhelm Reich- Father of Somatic Psychology

Wilhelm Reich-1930 – “Father of somatic psychology” - Influenced by Freud and based his theories on muscular armor and character structure- First case in which he first touched a client, massaging the client’s jaw, after which the client experienced a release of suppressed rage- Reich at the time was the only psychotherapist in Norway. Today 40 percent of all psychotherapists specialize in body psychotherapy. Reich’s work formed the roots of body based psychotherapy and other systems of body work.

He believed Energy flows through the Body of healthy individuals and becomes blocked in neurotic and psychotic patients and that his clients must link mental, emotional, and psychological processes.(Foster, M.)

Reich had direct contact with his patients- observing their muscular armor- chronic muscular patterns of tension. “Muscular armor blocks the flow of energy from the core of the body to the periphery, thereby repressing unmanageable and uncomfortable emotions, particularly those that cause anxiety – creating a protective muscular rigidity, a psychological defense mechanism called character structure- His goal was to assist a client in surrendering to involuntary movements and spontaneous impulses, releasing muscular armor that maintains character structure and restores normal flow in the body- To do this required deep breathing exercises and deep tissue massage” (Foster, M.).
Releasing Character Structure

Reich observed his client’s posture, breathing, and movement habits.

Reich concluded that physical armor and psychological armor were two manifestations of the same pattern.

He asked client’s to go deeper into their patterns, to further tighten their chronically tightened muscles also adding deep pressure – This helped release the muscular armor which evoked a response- Thus considering his patients free of character fixations. (Foster, M.)

Bands of Armor

- Ocular
- Oral
- Neck
- Chest
- Diaphragmatic
- Abdominal
- Pelvic
### Examples Of Bands of Armor

**Ocular segment** - around the eyes relates to issues about metaphorical inability to see. Rolling the eyes and encouraging free movement of the eyes in the head can help dissolve ocular armor.

**Abdominal Segment** - manifests as a contraction in the middle of the abdomen and relates to issues of fear and digestion. Abdominal armor is easier to release than all segments and can be dissolved through belly breathing and abdominal massage.

Foster, M.

### Bonnie Bainbridge Cohen’s Work- OT

Each moment should be a dialogue of response and change.

"I see the body as being like sand. It is difficult to study the wind, but if you watch the way sand patterns form and disappear and re-emerge then you can follow the pattern of the wind or in this case, the mind." Cohen

Imbalances aren’t weaknesses but strengths. If there is a point of weakness don’t become trapped on that place of stress or problem. Example- knee problem- Instead of seeing the weakness see it as a result of forces that are converging on your knee from other places in the body and you look at everything else in relation to it, then the knee becomes a leverage to a kind of interpretation of the whole. If you don’t have a point of focus, you don’t have a place of entrance.

Have a kind of personal relationship to the inside of your body- Dance teachers felt that learning anatomy would be detrimental to the creative process, making movement mechanical. However, giving rise to ANS and connective tissues can allow a greater range of qualities of movement and mind. Example of Bonnie Cohen’s pregnancy – She patterned her baby into the birth canal by getting on her hands and knees and started initiating movement from the inside.
Connecting all the Systems-
Bonnie Bainbridge Cohen

An important aspect of our journey in Body-Mind Centering (1973) is discovering the relationship between the smallest level of activity within the body and the largest movement of the body -- aligning the inner cellular movement with the external expression of movement through space. This involves identifying, articulating, differentiating, and integrating the various tissues within the body, discovering the qualities they contribute to one’s movement, how they have evolved in one’s developmental process, and the role they play in the expression of mind.

The finer this alignment, the more efficiently we can function to accomplish our intentions. However, alignment itself is not a goal. It is a continual dialogue between awareness and action -- becoming aware of the relationships that exist throughout our body/mind and acting from that awareness. This alignment creates a state of knowing. There are many ways of working toward this alignment such as through touch, through movement, visualization, somatization, voice, art, music, meditation, through verbal dialogue, through open awareness, or by any other means.

Systems Model Approach

“Many factors contribute to variations in movement. Genetic inheritance, personal history, cultural background, nutrition, and environment are all involved. The circumstances of everyone’s life varies and how we respond varies more. Posture and movement are commonly understood to involve complex activities of our skeletal, muscular, and nervous systems. Recent research has found that connective tissue which binds all the other systems together is a system in its own way. Like the global internet, it is a communication network that can connect any parts to all the others”.

Bond, Mary
The Systems Model

- This model is what most therapists, clinicians/families would benefit from

- It allows us to look deeper into the cause of the problem without immediately making an assumption or judgment

Systems Model

(Jurgen Jora, 1991)
Systems Model and Posture

- Visual impairments and postural changes
- Psychological problems and postural changes
- Auditory impairments and posture
- Physical problems and posture i.e. heart, coldness
- Fear or Anger and postural changes

There is a complex functional relationship of the muscles and the joints

Poor posturing is linked to the following:
- Painful conditions of the extremities
- Balance disorders
- Poor endurance
- Decreased Eyesight
- Behavioral changes
- Headaches
- TMJ
Examples Of Systems Model

Simona

Gerald

Postural Models

- Traditional Approaches to Postural And Musculoskeletal Dysfunction

- Muscle testing and function
  "Posture is the composite of the positions of all the joints of the body at any given moment. If a position is habitual, there will be a correlation between alignment and muscle test findings. If a reasonable assessment of a joint position is made, then an assessment also can be made regarding muscles in elongated positions and that are in shortened positions. In faulty posture, those muscles in slightly shortened positions tend to be stronger, and those in slightly elongated positions tend to be weaker than the muscles that work in opposition to them."

- Sensory Awareness and Movement Modalities
  Thomas Hanna’s Somatics (1928-1990)
  "It is a memory loss of how certain muscle groups feel and how to control them. And, because this occurs within the central nervous system, we are not aware of it, yet it affects us to our very core. The reflexes that cause sensory-motor amnesia are very specific. There are three…named Red light reflex, Green light reflex, and Trauma reflex."
Red Light Reflex (Left)

Essentially Red Light reflex is associated with the abdominal muscles and what Hanna termed the Withdrawal Response. It is associated with distressful events. It is a protective response to negative events that threaten us.

From head to toe, the Red Light reflex involves the following movements:

- Closing the eyes, tensing the jaw and face, pulling forward of the neck, lifting of the shoulders, flexing the elbows, clenching the fists, flattening the chest, tightening abdominal muscles, contracting the diaphragm and holding the breath, contracting perineum including sphincters of the anus and urethra, contracting gluteus maximus muscles to rotate thighs inward, thus feet are pigeon toed, adduction of the thighs, contraction of the hamstrings to bend knees, flexing and supinating the feet. (Each foot lifts and inverts, lifting up the arch) the sensory feedback of all these movements constitutes the subjective feeling of the Red Light Reflex: Fear.

Green Light Reflex (Right)

From head to toe, the green Light Reflex involves the following movements:

- Opening the eyes, jaw and face, pulling backward of the neck, pulling downward of the shoulders, extending the elbows, opening of hands, lifting the chest, lengthening the abdominal, releasing the diaphragm and freeing breathing, relaxing pelvic and visceral sphincters in the perineum, contracting the gluteus medius muscle to rotate the thigh outward (legs are duck like), abduction of the thighs, contraction of the thigh extensor to straighten the knee to hyper-extension, extension and pronation of the foot. The sensory feedback of all these movements constitutes the subjective feeling of the Green Light Reflex: Effort.

Trauma Reflex

The trauma reflex according to Hanna is a reaction of the sensory-motor system in response to pain. It seemingly causes the body to tilt. Hanna viewed scoliosis, as a sideways twisting that was a result to some trauma that has occurred sometime in a person’s life. Triggered by an injury, a fall, severe damage to the body, surgery, and displacement all cause a protective pattern around the site of the injury.

Hanna went on to create a series of Somatic exercises whose primary task is to focus your attention on the internal sensations of movement. By paying attention, moving slowly and gently with the least possible effort, not forcing any movement, you can clear the brain to receive ancienatinal sensory feedback, thus aiding in alleviating a variety of postural and somatic dysfunctions.
Gravitational Postural Models

Ida Roth- Structural Integration

Believed there is a line that passes through the center of gravity of the body

The shoulder girdle and the pelvis must contain true balance to define vertical extension. The line goes through the top of the head and through the bottom of the feet to infinity. The line forms a relationship between the field, which is man, and the field, which is earth, the field of gravity.

Believed the basis of balance in the face of gravitational influence to be best interpreted through the soft tissue fabric that disperses it- Fascia

Fascia helps in the organization and maintenance of human uprightness.

Fascia is the ORGAN OF POSTURE!!!

The Organ of Posture

Connective tissue is a term for all the tissues that separate, contain, and connect everything else in the body. Connective tissue is made of a viscous matrix called ground substance that is either more fluid or more solid depending on the demands placed on it. Connective tissue has different names depending on its location and function. **Ligaments** are the fibrous connective tissue that connect bone to bone. **Tendons** connect muscle to bone. Bone is a highly mineralized form of connective tissue. The covering around our nerves and blood vessels is also made of connective tissue.

Most importantly, the sheaths around our organs and muscles are made up of connective tissue called Fascia. Our bodies contain a three dimensional web of fascia with pockets and tubes around many of our organs and muscles and around compartments of every cell. Connective tissue makes up 20% of the bodies weight.
Connective Tissue-Fascia

This connective tissue provides a communication network that is different from our bodies other ways of communication. The ground substance of connective tissue has a liquid crystalline structure, it conducts bioelectric energy. With compression and stretching, these currents signal changes in the fascia state. With poor posture, this signaling causes the fascia to produce more fiber resulting in chronic issues. The fascia of your diaphragm and lungs are connected with fascial sheets that lie along the inside of your spine and descend through your pelvis and groin. The fascia is also continuous with tracks that are in your inner legs to your feet. i.e. When inhaling, the dropping of your diaphragm pulls down on the fascia around your lungs sending bioelectric signals all the way to your ankles. Fascia shrinks and toughens in response to any kind of stress (muscle tightness). Fascia stabilizes your posture. Because the fascia connects all body regions, adhesion in one place can create strain in distant areas. i.e. A tight knee can cause adhesions around digestive organs or even from imbalanced head position due to hearing loss.

Hubert Godard’s Work

“The responsibility of these deep support muscles—transversus abdominis and lumbar multifidus—is not to move the spine, but to stabilize it so that other muscles can move the trunk without compromising the integrity of the joints. For the lumbar spine, transversus and lumbar multifidus are examples of local muscles, while rectus abdominis and the external obliques are examples of global muscles. Engagement of rectus abdominis or the external obliques is likely to pull the chest and pelvis together. The direction of transversus fibers, in contrast, is parallel to the vertebrae. Transversus thus will be able to act very precisely on each vertebra, one at a time.

The co-contraction of the transversus, in particular the sub-umbilical portion, and lumbar multifidus muscles on each side of the spine will be able to increase the stiffness of the lumbar segments without interfering with trunk movement. The result of their contraction does not interfere with rotation, mobility of the trunk in general, or with the freedom of motion of the limbs. In fact, it hardly moves the spine at all: it actually holds it in place. Several studies have shown that a contraction of transversus abdominis normally will precede the contraction of muscles producing movement of either arm or leg by around 110ms. A healthy body automatically uses transversus to stabilize the spine before initiating any movement of the limbs themselves. In patients with a history of back pain, the contraction of transversus abdominis was delayed from 50-450ms. Carolyn Richardson and her colleagues in Australia investigated the role of these muscles in back pain and healthy patients. In Richardson’s experiment, the researchers found that only 10% of those with a history of low back pain could activate the transversus abdominis, compared with 82% of the non-low-back-pain subjects. They found that patients who performed exercises that specifically targeted the transversus abdominis over the course of 10 weeks experienced a significant decrease in pain and an increase in functional ability compared to the control group which received conventional treatments such as swimming, workouts and sit-ups.

Sit-ups and lumbar extension exercises most often do not differentiate between global and local muscle involvement. Even programs calling themselves "core stabilization" may not make this distinction. This is problematic because too much development of global muscles was found actually to interfere with the action of the local stabilizer system.”

Newton, Aline, Core Stabilization
Hubert Godard’s Work

Along with the transversus system, the diaphragm and the pelvic floor are often included in the structures involved in core stabilization. Preliminary studies have revealed that, when a limb is moved, the contraction of the pubococcygeus occurs concurrently with that of the transversus abdominis. It appears that a link may exist between the pelvic floor is to imagine it as a diamond shape that can be separated into two triangles: either a front half and a back half, or a right side and a left side. It might be considered that the coccygeus muscle occupies the back half and the levator ani the front. When subjects performed shoulder flexion, we found that both portions of the diaphragm contracted 30ms prior to the deltoid, i.e. at exactly the same time as contraction of the transversus abdominis. The levator ani also participates in closure of the rectum two muscles. All the diaphrags of the body—respiratory and pelvic as well as the palate, and even in a sense the arches of the feet and hands—can be seen as part of a single functional system. While the transversus system is engaged to support the lumbers, longus coli is doing a similar job for the cervical vertebrae. Vastus medialis stabilizes the patella, while serratus anterior acts to stabilize the shoulder blade for the arms. The stabilization function is also taking place in relation to the overall maintenance of equilibrium in gravity.

Root of Posture

![Diagram of the pelvic floor](image1.png)

Fig. 3.3. The diamond-shaped female pelvic floor, showing the front and back triangles. Male pelvic floors also have this shape.
Healthy Sitting

In studies of present day societies in which people squat rather than sit on chairs, researchers have found lower rates of spinal disc degeneration than in societies in which people sit in chairs. In America, no one older than the age of four squats. Instead, Americans spend more time in chairs in poor posture.

Bond, Mary

Slouched Sitting

McKenzie, R. 2007
Diaphragm and Transversus Abdominis

Transversus Abdominis
Transversus Abdominis – Cues to Activate

- Drawing in
- Bring Navel to Spine
- Envision trying to zip up a tight pair of jeans
- Pull your bellybutton through to your back
- Tall and thin

Boyle, Mark

Transversus Abdominis Exercises

- Sitting- using string
- Supine- using hockey puck
- Hands and knees- Angry Cat
- Prone on elbows
- Plank position

Boyle, Mark
Summation of Hubert’s Work

By engaging sensation in the extremities—in relation to the world around us—we help the movement to trigger successively throughout the stabilizers: from the ground through the feet to transversus to the hands or from the hands through serratus anterior to transversus and back.

Newton, Aline, Core Stabilization

In breathing, the muscles of inhalation are tonic, postural muscles, while the muscles that can help exhalation are more phasic.

Bond, M.
The Muscular / Fascial Connection

Diaphragm
Perineum Muscles
Transversus Abdominus
Multifidi
Serratus Anterior
Upper Trapezius
Pectoralis Major
Suboccipital Muscles
Temporalis
Ocicular Muscles
Psoas Major
Hip Rotators
Soleus/ Gastrocnemius

Breath for healing: Breath into the muscles that are tight

Mary Bond

Muscles of Back
Superficial Layers
Muscular System

Our Bodies aren’t solid, our bodies’ composition is approximately 70 Percent Water! Chronic Muscular Tension destroys the bodies natural fluidness.

- Diaphragm- Major Respiratory Muscle
- Urogenital Triangle/ Anal Triangle- Core of Posture
- Transversus Abdominus and Multifidi- Inner Corset- Tonic or Endurance
- External Abdominal Obliques-Phasic- Speed and Strength-Attaches from breast bone to pubic bone – They bend the trunk forward and compress the chest. They draw the chest and pelvis together which flattens the lumbar spine.
- Upper Trapezius/ Lower Trapezius- Helps with reaching
- Serratus Anterior- Fascia pathway that runs from the side of the hand near the small finger to the inside of the scapula
- Power of small fingers-The muscle, bones, and fascia of the underside of the arm link the fourth and fifth fingers to the shoulder blade and spine.
- Scalene Muscles- The nerves to your hands weave through the scalene muscles on the sides of your neck and pass under your clavicles and down your arms-thoracic outlet- area between clavicles and ribs.

The Fascial Connection

Foot- 26 bones-32 joints, 56 ligaments, 38 muscles
- Three Arches
  - Tarsal Sinus – Marks front of heel bone-Dimple Exercise
- Calf Muscles- Tendons of calf muscles wrap under your foot to form a stirrup that supports the arches-the sole of the foot connects to the crown
- Orientation of the knees is determined by the rotation of the thighs and feet- example- If the pelvis is tilted extremely forward, the thighs, knees, and feet tend to turn in.
- Example- Stand on Right foot- SI moves back, Right hip IR, Right knee straightens, navel or intestines moves to right, breast bone or heart moves to left . If your belly button shifts five to ten degrees at most than your pelvis is moving correctly.
- The Sole of each foot has seven thousand nerve endings that work together with countless sensors in the ankle joint for assistance with balance.
- Suboccipital muscles can get immobilized if there is tension in the jaw, nose, or eyes.
- The Neck must hold the balancing of a 12 IB head
- Nose- Breathing through your nose can widen the palate
- Eyes, Inner Ear- Eyes reflect our culture and lifestyle- Asians- move eyes between foreground and background- Westerns focus on the most colorful or fast moving object. Keep eyes more peripheral for better balance and stability. Peripheral vision is linked to the subcortical brain. Tightly focused eyes uses more of the cortical brain and affects coordination. Vision is the primary orienting system. The inner ear rights our head relative to gravity’s pull. Information from the feet is combined in the brain with information from the inner ear. The nerves to the ear are present when we are born, an indication of the importance of balance.
Postural Exam

“The Gravity Line is an ever changing reference line that responds to the constantly altering position during upright posture. The closer a person’s postural alignment lies to the center of all axes, the less gravitational stress is placed on the soft tissue components of the support system. When a force couple is out of balance, the segment moves off its axis of rotation and there is poor joint motion”.

(Palmer, Lynn and Epler, Marcia)
Postural Reference Line

Palmer, Lynn and Epler, Maria

Postural Deviations

Harfield, F. 2003
Postural Deviations

<table>
<thead>
<tr>
<th>Malalignment</th>
<th>Possible Tight Muscles</th>
<th>Possible Weak Muscles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lordosis</td>
<td>Lower back (erectors), hip flexors</td>
<td>Abdominals (especially obliques), hip extensors</td>
</tr>
<tr>
<td>Flat-back</td>
<td>Upper abdominals, hip extensors</td>
<td>Lower back (erectors), hip flexors</td>
</tr>
<tr>
<td>Swayback</td>
<td>Upper abdominals, hip flexors</td>
<td>Oblique abdominals, hip extensors</td>
</tr>
<tr>
<td>Kyphosis</td>
<td>Internal oblique, shoulder adductors (pectoralis and latissimus), intercostals</td>
<td>Erector spinae of the thoracic spine, scapular adductors (mid and lower trapezius)</td>
</tr>
<tr>
<td>Forward Head</td>
<td>Cervical extensors, upper trapezius</td>
<td>Neck flexors</td>
</tr>
</tbody>
</table>

Hartfield, F. 2005

History Prior To Performing Postural Exam

- Surgeries - current or past and other past medical history
- Age
- Type of Work - Repetitive work activities
- Athletics
- Known Habitual patterns - i.e., smoking
- Current issues
- Trauma
- Psychological Issues
- How do you orient with the world? - spatial or earthly
- How do you feel today? (traffic, issues with smells, colors)
- Compensation for injury over time
- Breath patterns - life changes, divorce, drugs
- Congenital shortness of one leg
- Pelvic/abdominal tension - can be away to disguise our shape - teenagers
- Postural abnormalities - scoliosis/orthopedic/neurologic
- Shoulder tension - Reflects pain or instability in lower parts of body, lift shoulders to take pain off other areas, arms reflect how we connect to others
The brain is calling to the muscles to move – similar to a telephone conversation between the brain and muscles.

All of a sudden there is a disconnection whether the cord was cut or a signal dropped.

Since this disconnection has occurred, the muscles aren't able to move – however, with certain advances in medicine and unique techniques – we can learn to help the muscles and brain reconnect – visual, verbal, and tactile cuing will be of the utmost importance in this process of regeneration.

Types of Cuing

- Verbal meaning – constantly giving the brain verbal instruction to move
- Visual – having client constantly look at the muscle while performing the movement as extra input.
- Tactile – touching the muscle in such a way to get it to fire more
- Practice this Cuing when staff training and when writing Home Exercise Programs
Standing Postural Check

POSTURAL CORRECTIONS

Initiate Movement from an organ or muscle instead of bone

(Cohen, B)

Matching- the shape of stress in a client’s body and allowing the client to consciously match her own shape.

(Behnke, E)

When the two complete sides of the body are opposed, left and right is learned. The left is the one that is hidden, innocent, irrational, etc. In contrast, the right stands for conscious, familiar, controlled, active. They are physical and psychological opposites. Opposites mean more to us, individually, than mere physical conditions with which to work.

(Pallaro, P.)
This kind of Aware learning is complete when the new mode of action becomes automatic or even unconscious, as do all habits. Moshe Feldenkrais

---

THE SPINE

- Vertebrae- 7 cervical, 12 thoracic, 5 lumbar that rise from 5 sacral vertebrae and four coccyx vertebrae
- Disks-vertebrae in the spinal column are separated from each other by small cushions of cartilage known as intervertebral disks-shock absorbers
- Inside each disk is the nucleus pulposus surrounded by tough fibrous ring called the annulus fibrosis - 80% of disk is water
- The disks rely on nearby blood vessels to keep them nourished
- Processes- bony projections located on each vertebrae in the spine-the spinous and transverse processes attach to muscles in back allows spine to twist or bend
- Zygaphysial joints or z joints- form the joints between vertebrae themselves
- Spinal canal- encloses the spinal cord (central trunk of nerves that connects the brain with the rest of the body)
- Spinal nerves exit through holes in these bony vertebrae known as intervertebral foramen
- Problems with spine –herniated discs, facet joint arthritis, spinal stenosis

About Aadam- Scoliosis
Lehmann- www.scoliosis-assoc.org
Important Features of the Vertebrae and Joints of the Spine

- Provides a point of attachment for various muscles, thereby creating motion and flexibility to the back and torso.
- They support all the weight of the upper part of the body.
- They provide protection to the spinal cord, the main pathway travelled by nerve impulses on their way to or from the brain.

The spinal column must remain strong, flexible and durable.

Neuwirth, M., Osborn, K. 2001
Scoliosis Is Defined

As the presence of a lateral deviation of 10 degrees or more in the spine, often associated with rotation of the vertebrae.
### Scoliosis Facts

- 80% of cases are idiopathic
- Most of the curves are right thoracic between T-4 and T-12
- The incidence of adult scoliosis is estimated to be between 4% to 8%
- Scoliosis in adults may be a result of adolescent idiopathic scoliosis or arise in adult life secondary to osteoporosis, osteomalacia, spinal stenosis and degenerative changes
- Spirometric pulmonary tests are usually unaffected in the idiopathic scoliosis patients until the curve exceeds 60 to 65 degrees and the mortality is unaffected until the curve exceeds 90 to 100 degrees
- Respiratory distress is greater in the neuromuscular group of patients
- Pain is the most common reason for patients to seek medical treatment
- Affects 2-3 percent of population
- Commonly diagnosed in children 10-15 years, 10 percent have some degree of scoliosis, less than 1 percent actually need treatment
- Location of structural curve is defined by the location of apical vertebra
- May be evident in young athletes- 2-24 percent (loosening of joints, delay in puberty onset, uneven load on spine, stresses on growing spine)

### Scoliosis

- Lateral curvature of the spine
- Etiology, severity, age of onset, and progression vary
- Usually develops in childhood
- Can cause structural abnormalities of the pelvis, vertebrae, and thoracic cage
- Can occur in the cervical, thoracic or lumbar regions of the spine
- If untreated and undetected, can cause severe deformity, drastically affecting appearance, and possible shorten life expectancy
- Early identification and treatment are key to prevention of severe deformity

(Carolyn Kilner, 1990)
Types of Curves

Scoliotic curves are defined by location, shape, and magnitude, or the size of the angle.
A typical idiopathic thoracic curve will span 6 – 8 vertebrae. A typical lumbar curve will involve 4 vertebra.

1. Thoracic curves – 95% have a right convexity. Thoracic curves tend to progress more than lumbar curves.
2. Thoracolumbar – 80% have a left convexity.
3. Lumbar curves – 70% will exhibit a left convexity curving away from the spine to the left.
4. Double major curves – Most typically, the right curve occurs in the thoracic spine and the left in the lumbar region. Double curves have a higher risk of progression than do single curves.

Neuwirth, M., Osborn, K. 2001

Figure 2: The four common types of scoliotic curves

a. Right thoracic curve. It measures 70 degrees by the Cobb method.

b. Thoracolumbar curve. It measures 80 degrees by the Cobb method.

Neuwirth, M., Osborn, K. 2001
Scoliosis

- Scoliosis greater than 25 degrees has been reported in about 1.5/1000 persons
- 60% of curvatures in rapidly growing prepubertal children will progress
- If neglected, can progress dramatically, creating significant physical deformity and even cardiopulmonary problems
- Special braces, electrical stimulation surgery or any combination are used to currently treat
Why Perform School Screenings?

- Studies have found that the incidence of scoliosis in family members of patients with idiopathic scoliosis was 6 – 10 times higher than it was in the general population.
- The American Academy of Orthopedic Surgeons report that about 10% of the adolescent population has some form of scoliosis. Fewer than 1% of adolescents have curves exceeding 30 degrees.
- Girls have a higher incident of getting scoliosis than boys due to hormones. Girls tend to grow faster than boys.
- A child 10-12 years old who has a curve that measures between 20-29 degrees, has a 60% risk of curve progression.
- Asymmetry is the key to detecting scoliosis.
- The Scoliosis Research Society recommends that all children be screened annually from age 10-14. It is further recommended to screen girls at ages 11 and 13 and boys at age 13 or 14.
- The presence of pain is one of the most important indicators that scoliosis might have developed as a result of another medical problem. Idiopathic scoliosis is not typically associated with pain.
- The more mature a child is, the smaller the potential for the curve to progress. By the time a girl has had her first menstrual period or a boy shaves for the first time, approximately 2/3 of the growth spurt has passed.

Neuworth, M., Osborn, K. 2001

Clinical evaluation

- Horizontal plane- rotation of shoulders, rotation of thorax, rotation of pelvis
- Tilt in pelvis
- Frontal Plane-tilt of the shoulders, tilt of the thorax and tilt of the pelvis
- Prominence- levels and values
- Pain
- Scapula deformity
- Clinical Flat Back
- Rib asymmetry
- Heel lifts

Look for:

- A tilted head that does not line up with shoulders
- A protruding shoulder blade
- An uneven neckline
- Leaning more to one side than the other
- One hip or shoulder that is higher than the other

SpinCor System-Training manual
Screening programs can help to prevent many painful postural syndromes
Began in 1940 mandatory in most states

- ADAMS TEST – misses 15% of scoliosis patients
- RISSE TEST-determines end of growth -looking at growth plate 0,1,2,3,4,or 5
  5 = fusion  3=75% excursion
- Hand and wrist x-rays
- MOVEMENT TESTS-patient walks on toes, then the heels, and then jumps up and
don down on one foot
- LEG LENGTH TEST
- Neuromuscular impairment- reflexes, sensations, muscle function
- Pain
- Radicular pain
- History of bowel and bladder
- Respiratory issues
- Scoliometer-measures distortions of the pelvis- apex- highest point of the curve

About Adam- Scoliosis
apophysis definition - medical

a·poph·y·sis (ə-pōfˈī-sīs)

noun pl. a·poph·y·ses (-sēz)
An outgrowth or projection of an organ or part, especially an outgrowth from a bone that lacks an independent center of ossification.

Related Forms:

- ap·o·phys·i·al (ə-pōˈfīzə-l), a·poph·y·seal (-sēˈəl) adjective

The American Heritage® Medical Dictionary Copyright © 2009 by Houghton Mifflin Harcourt Publishing Company. Published by Houghton Mifflin Harcourt Publishing Company. All rights reserved.
Skeletal age - Risser's Sign

Department of Orthopaedic Surgery - University Stellenbosch, South Africa

Determination of Skeletal Age

Biax Apophysis - Risser's Sign

- Identification: The age at which the biax apophysis fuses can be determined from the age at which the third molar (wisdom) tooth erupts. The third molar typically erupts at age 15 to 19 years.
- Risser 1: The third molar has erupted in the lower jaw and the biax apophysis has not fused.
- Risser 2: The third molar has erupted in the upper jaw and the biax apophysis has not fused.
- Risser 3: The third molar has erupted in both jaws and the biax apophysis has not fused.
- Risser 4: The third molar has erupted in both jaws and the biax apophysis has fused.
- Risser 5: The third molar has erupted in both jaws and the biax apophysis has fused and the iliac crest has not yet fused.

Risser 1 to 5

- Risser 1: 100% ossification, with no fusion to iliac crest. Indicates slowing of growth.
- Risser 5: Iliac apophysis fuses to iliac crest. Indicates cessation of growth.

<table>
<thead>
<tr>
<th>Girls</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risser</td>
<td>Age</td>
</tr>
<tr>
<td>1</td>
<td>13.8</td>
</tr>
<tr>
<td>2</td>
<td>14.3</td>
</tr>
<tr>
<td>3</td>
<td>14.7</td>
</tr>
<tr>
<td>4</td>
<td>16.0</td>
</tr>
<tr>
<td>5</td>
<td>16.1</td>
</tr>
</tbody>
</table>

Age determination in other areas

Other age determination systems are of value to the criminologist and immigration officials. It is sometimes crucial to determine if the individual is over 18 or 21, or at whatever age defines adulthood, and its attendant less lenient judicial treatment.

The third molar roots appear on X-rays at age 18 years. The ossification of the epiphyses of the clavicles also occurs at age 18 years.

Reference

Measuring with a Scoliometer

Neuwirth, M., Osborn, K. 2001

GUIDELINES FOR USE IN SPINAL SCREENING PROGRAMS

The ODI-Scoliometer provides a way to measure the degree of rotation of a deformity of the back found on routine spinal examination. The information obtained can be used as a guideline in deciding which persons should be referred for further medical evaluation.

This booklet is NOT intended to be a description of how to perform spinal screening. Screening for spinal deformity should be carried out in exactly the same way as described in the guidelines provided by the Scottish Research Society and many state Departments of Health and Education. If a deformity of the spine is noted, the Scoliometer should be used as described in this manual.

ORTOPEDIC SYSTEMS, INC.
3011 Agene Avenue, Chula Vista, CA 91913

INSTRUCTIONS FOR USE

1. View the person from behind, standing erect. (See Figure 1)

2. Ask the person to bend his arms forward and place hands together with palms flat against each other, as if to dive into water. (See Figure 2)

3. Ask the person to bend forward while he stands on the floor. (See Figure 3)

4. Palpate posterior spinous processes to determine the angles of the thoracic and lumbar spines as follows: (See Figure 4)

5. Lay the scoliometer across the shoulders at right angles to the body, with the "O" mark over center of the scapula. (See Figures 4b and 5b). Left the scoliometer not going on the spinia, do not push down. Read the number of degrees of rotation. (See Figure 5)

6. Note: If there is asymmetry in both the upper and lower back, two scoliometer readings will be necessary. The curves will usually reverse in opposite directions with the one in the thoracic spine usually to the right and the other in the lumbar spine usually to the left. (See Figures 5a and 5b)

7. The screening examination is considered positive if the reading on the scoliometer is 7 degrees or more at any level of the spine. Persons in this category should be referred immediately for further medical evaluation. Lesser degrees of rotation may or may not indicate a mild degree of scoliosis. Immediate referral is not necessary; however, in such cases re-screening is recommended within three to six months. Consult your local medical advisor to the program for details.

8. Record findings on the Spinal Screening Program Form which is available from the Scoliosis Research Society.

9. The scoliometer can be used in the practitioner's office when following patients with scoliosis. A change of 3 degrees or more of a scoliometer measurement indicates possible curve progression. A change of 2 degrees or less usually indicates only minor variation in posture. It should be noted that in some patients, curve progression may occasionally occur without a change in the clinical measurement.
OUTCOME OF SPINAL SCREENING
William E. Frey, M.D.
Loma Linda, California 92354

NOTE: Additional research has endorsed that degrees of ATN should be used as a criterion for spinal cord injury in the future.

The National Research Council currently recommends spinal screening for the 3-10 year-old students in the USA. The outcome of such screening is presented in this study.

METHODS: One thousand students are screened by both the author and a school nurse using a 0.7 meter to measure the angle of spinal curvature (ATN) at the level of the spine. The degree of three measurements is measured to determine the presence of spinal deformity and the degree of concurrence between examiners.

The children were evaluated with data on 1.5 meters of ATN and the radiographic degree of concurrence in the x-ray of the spine.

FINDINGS: Complete concurrence of measurement between examiners was present in 95% of cases and was two degrees or less in 99% of cases. Only 0.6% of students had definite evidence of spinal curvature with 99.4% of students having 0% or non-existing curvature. The grade distribution of curvature was shown for each age group. The results were calculated between concurrence and measurement and compared. The result was determined by the ATN curves at the level of the spine.

An inverse relationship exists between the percentage of students referred and the percentage within the eligible universe reviewed for any given 0.05 x-ray to the graph below.

PRESCRIBED OUTCOMES: Normal history. Data for pediatric patients with age/0.7 meters of ATN in non-sagittal data. The use of x-ray is recommended to rule out the possibility of a developmental origin of deformity. A repeat examination at 6-12 month intervals is recommended for all patients with non-existing curvature at the level of the spine.

RECOMMENDATIONS: The ideal screening criteria must estimate both the number of referrals and the number of non-existing children who are eligible for screening. This study suggests that 0 degrees ATN at any level of the spine is the best criterion for referral. Spinal screening programs are included in this figure. If the patient has a negative x-ray, the criteria must be only slightly higher than that of the erupted spine.

REGARDING: SPINAL SCREENING

Name of Student
School
Grade
Room

The following observations were made when your child was screened in our spinal screening program. It is important to watch for any progression of these findings.

OBSERVATIONS

1. Shoulder higher
curvature
3. Prominent scapular blades
4. Greater arm to body space
5. Weakness causing weakness
6. One hip higher
7. Prominence on side of upper
back when bending over
8. Prominence on side of lesser
back when bending over
9. Increased round back
10. Increased swayback

1. ________
2. ________
3. ________
4. ________

Our records show similar findings during previous screenings.

1. We suggest bringing these findings to the doctor's attention at the time of your next visit (within six months).
2. Consult your family physician for further evaluation. This follow-up with a physician is extremely important. If you have had a recent evaluation, please send this form to your physician and ask that it be completed and forwarded to the school nurse. (Please sign the Release of Information section.) It was noted in our health records that your child has been seen by your health care provider for this condition. We would appreciate having the most recent report from your physician to help us in planning for your child. Please call your school nurse if you have questions or if you do not have a family physician.

Following an examination, please have your physician complete this form and return it to our office.

Missouri Dept of Health and Senior Services 2004
Scoliosis Screening Positions

**Position 1**
After introductions, the student stands facing the screener. The student should be relaxed, have feet together, weight even. The hands should hang loosely at the side with the student looking straight ahead. Telling the student to “drop your shoulders” rather than “relax” can be more effective in getting the atadann into proper position. Hair should be pulled back and out of the way to expose the shoulders and thoracic area. While the student is in this position, carefully observe their posture and look for any asymmetry. Experience will enable the screener to do this in seconds.

**Posture checklist:**
- **Point A**: Head centered (over pelvic).  
- **Point B**: Symmetry of waist creases.  
- **Point C**: Arm to body spaces.  
- **Point D**: Arm length.  
- **Point E**: Shoulder elevation.

Factors that alter posture should be taken into account during the screening. These include weight distribution, pelvic tilt and lateral flexion in the spine. When the weight is taken off one leg, a resultant “wobbiness” appears. Similarly, some curvatures are due to a leg-length inequality. The screener might check these students in a sitting position. These curves can be often be corrected with a lift in the shoe worn on the shorter leg. Tilting the pelvis changes the posture by increasing or decreasing lumbar lordosis. The kyphosis normally seen in the thoracic spine may also be affected by this pelvic tilt. Abdominal tone will affect pelvic tilt.

**Position 2**
After observing the student standing from the front view, ask the student to extend arms in front, with elbows straight and palms facing, took the chin to the chest and slowly bend at the waist. Stop the bend when the upper back is visible. Observe the thoracic area for symmetry on both sides. Ask the student to slowly bend lower until the lumbar area is visible. The arms should be hanging down.

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Scoliosis Screening Positions

**Position 3**
Next, ask the student to turn around so that the back is to the examiner. The student should be relaxed, feet together, arms at the side. The back should be straight and not interrupted. Observe the upper back. Again, observe the shoulder elevation, shoulder prominence, asymmetrical waist creases, and upper body spaces. Mark the record for any specific observations.

**Position 4**
Now the student bends forward, look at the hip. Observe the pelvic area, observe posture; note asymmetry, pelvic away, or the total area. Observe the hip joint. The observer should observe the hip joint for a symmetrical one. Ask the student to slowly move toward the observer and observe the position of the hip joint. Mark the record for any specific observations.

**Position 5**
Now the student bends over, head on the examiner. Check for an asymmetric head or bend. From this view, the normal spine tag is an “S” curve.

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Classification of Scoliosis

- Nonstructural scoliosis - curve does not twist usually a side to side curve
- Structural scoliosis
- Idiopathic (70 – 80 % of all cases) possible bone malformation, asymmetric muscle weakness
- Congenital
- Neuromuscular
  - Poliomyelitis
  - Cerebral palsy
  - Syringomyelia
  - Muscular dystrophy
  - Amyotonia congenital
  - Frederick's ataxia
- Neurofibromatosis
- Mesenchymal disorders
  - Marfan's syndrome
  - Rheumatoid arthritis
  - Osteogenesis imperfects
  - Certain dwarves
- Trauma
  - Fractures
  - Irradiation
  - surgery

(Michael Richardson, 2000)
Idiopathic Scoliosis-Possible Causes

- Dietary issues - calcium is lacking causing softening of the bones
- Nerve and muscle abnormalities
- Central mechanisms of the ear
- Fluid around the spinal cord flows asymmetrically (Cedars-Sinai Institute for Spinal Disorders - Los Angeles)
- Abnormalities in collagen - high level of enzymes in the disks, enzymes repair and remodel collagen
- High arches

Idiopathic Scoliosis

Classified based on age presentation

- Infantile: Up to 3 years old
- Juvenile: Up to 10 years old - greater risk of curve progression
- Adolescent: Ten years old through teen years - Most common type of scoliosis, ages ten and thirteen, with no significant pain during childhood
- Adult: Curve progression following the completion of skeletal maturity. May have been undiagnosed during childhood.
Congenital Scoliosis

- Caused by inborn spinal deformities that may result in absent fused vertebrae
- Kidney problems—especially one kidney usually coincide with problem
- Evident age 2 or at ages 8-13 as the spine begins to grow quickly
- Early surgical treatment before age 5 may be important
- Bracing is rarely used for either type of congenital curves

Schremmer, National Scoliosis Foundation
About Adam - Scoliosis

Neuromuscular Scoliosis

Caused by one or more neuromuscular diseases that result in inadequate functioning of the nerves or muscles around the spine. Polio, a virus that causes inflammation in the spinal cord, accounts for most cases of neuromuscular scoliosis. Most of these cases today result from cerebral palsy, a disability that results from damage to the brain's motor centers or from muscular dystrophy, a disease marked by progressive wasting of muscles throughout the body.

Neuwirth, M., Osborn, K. 2001
Degenerative Scoliosis

Forms during adult life previously in a straight spine that is resulted in degeneration of the discs arthritis in the facet joints and/or loss of support in the spinal column. Degenerative curves tend to be smaller than those resulting from idiopathic scoliosis. Degenerative scoliosis is more commonly associated with pain and discomfort than idiopathic scoliosis.

Neuwirth, M. , Osborn, K. 2001

Nonstructural Scoliosis

- Unequal leg length
- Muscle spasms

About Adam-Scoliosis
Nonstructural (functional) Scoliosis

Correction of the lateral curve is possible by
- Forward or side bending
- Positional changes and alignment
- Muscle contraction

Characterized by
- Asymmetric shoulder level
- Prominence of the scapula on the side of the convexity
- Protrusion of the hip on one side
- Pelvic obliquity
- Increased lumbar lordosis

New Research

- First gene related to idiopathic scoliosis was found in a study published in 2007 - variations in gene CHD7

- A new bone morphogenetic protein BMP - helping to achieve spinal fusion with more success and less complications

- Vertical Expandable Prosthetic Titanium Rib (VEPTR) expansion thoracoplasty for thoracic insufficiency

- Wang: BMP improves Spinal Fusion results
- About Adams: Scoliosis
- Scoliosis Research Society 2009
Studies


Conclusion- marked asymmetry was seen in the transverse plane, denoted as a torsional offset of the upper trunk in relation to the symmetrically rotating pelvis

Asymmetric Pronation Patterns Linked to Thoracic Curves

Rotharts study in 2003 to determine if a correlation exists between abnormal foot motion (foot pronation) and the development of scoliotic curves. The study looked at 25 Mexican Indians with assymetrical abnormal pronation patterns and a positive Adams Tests. A positive statistical correlation was found between the pronation pattern and the pelvic distortion pattern and the pattern of frontal plane deviation within the thoracic spine.

The study suggested that assymetrical pronation patterns may be a critical factor in the development of scoliotic curves.

Discussion- An Unleveled pelvis is one factor that makes an individual more prone to develop scoliosis.
Structural Scoliosis

• Irreversible lateral curvature of the spine with fixed rotation of the vertebrae
  – Vertebral bodies rotate toward the convex side of the curve
  – Spinous processes rotate away from the convex side
  – Curve increases, amount of rotation increases
• A rib hump occurs on the convex side of the curve caused by the rotation of the vertebrae and the rib cage
  – Compression of the ribs on the concave side
  – Separation of the ribs on the convex side
  – Prominence of the ribs and scapula posteriorly on the convex side

As Scoliosis Progresses

• The vertebrae and spinous processes around the major curve rotate toward the concavity of the curve
• On concave side, the ribs are close together – on convex side the ribs are widely spread
Severity of Scoliosis

Severity of the lateral curve determines the rotation of the vertebrae more severe = greater rotation
Severity of the curve, the greater the impact and secondary changes in the cardiopulmonary systems
- Decreased vital capacity and total lung capacity
- Hypertrophy of the right ventricle and atrium from pulmonary hypertension

Facts About Scoliosis

- Think – severe scoliosis can lead to contractures and severe body deformity
- Our body is a connective chain of muscles
- With scoliosis, the spine will rotate causing the muscles to shorten and tighten
- This will in turn change posture and body alignment causing other muscles in other parts of the body to shorten or get tight
- Legs may be windswept – always classify windswept to where knees are pointing (ex. knees are pointing to the right, state legs are windswept right)
Classification of Scoliosis

• S-Curve – most common curve seen in idiopathic scoliosis
  – Right thoracic left lumbar curve
  – Structural changes in the vertebrae of the major curve
• Description of curves – direction of the curve identified by the convexity (ex. right thoracic scoliosis = convexity of the curve on client’s right concavity on the client’s left)
• Apex of curve – vertebra that is the greatest distance from the midline of the spine = apical vertebra

Radiographic examination

X-rays- in standing-gravity of spine- PA and lateral views reveals degree and severity of curve, determines whether skeletal growth has reached maturity, differentiates between structural and nonstructural

MRI’s – identify spinal cord and brain stem abnormalities, helpful in planning fusion levels, will show degenerative disc disease

Ero and Blessey: Adult Scoliosis: Evaluation and Treatment
Classification of Scoliosis

- The Cobb method of measurement of scoliosis.
- Line drawn perpendicular to the upper margin of the vertebra that inclines most toward the concavity.

Neuwirth, M., Osborn, K. 2001

Classification of Severity of the Curvature

- Mild scoliosis
  - Curves of less than 20 degrees
- Moderate scoliosis
  - Curves from 20 to 40 or 50 degrees
  - Associated with early structural changes in the vertebrae and rib cage
- Severe scoliosis
  - Curves of 40 to 50 degrees or greater
  - Involves significant rotational deformity of the vertebrae and ribs
  - Curves of 40 degrees or more can cause pain and degenerative joint disease (DJD) of the spine
  - Curves of 60 to 70 degrees or more can cause significant cardiopulmonary changes and decreased life expectancy

(Carolyn Kiser, 1990)
Decision to Treat or Wait

- Monitor the curve if less than 20 degrees
- Curves greater than 25 degrees or those that progress while being monitored may require treatment
- The older the child, the less likely it is the curve will progress
- Girls have higher risk than boys
- Thoracic curves progress more than thoracolumbar
- Children in poor health may suffer more from stressful scoliosis than other children

Bracing

- Pads placed in a brace apply external pressure below the apex of the curve. These pads push on the spine forcing it into a straighter position.
- People are candidates for bracing only if they still have at least 18 months of growth remaining.
- Bracing is intended to halt curve progression during growth spurts. Teenagers whose growth has already begun to slow would derive little benefit from a brace.
- Contraindications for bracing:
  1. Skeletal maturity (Risser 4 or 5)
  2. Curve size (Less than 25 degrees or greater than 40 degrees)
  3. Curve location (High thoracic or cervical thoracic)
  4. Certain types of neuromuscular scoliosis should not be braced. Studies now suggest that bracing for this disorder accomplishes little due to irritation causing skin problems.
- Successful correction is between 80-85 % of patients who have curves measuring between 25-40 degrees. Curves that exceed 40 degrees have a 50% chance. Neuwirth, M. and Osborn, K.
Treatment of Scoliosis

- Correction of curves greater that 40 or 50 degrees are usually corrected by surgical intervention.
- Electrical stimulation of the trunk muscles on the convex side of the curve have recently become treatments that are used for mild and moderate scoliosis.
- Bracing, traction, and exercise are other methods that have shown to benefit individuals with scoliosis.

The Effectiveness of Braces

- Does not mean complete correction, only about 50%.
- After wearing the brace, a curve will result to its former size, but it will not have increased in size.
- Only 15% of patients are highly compliant with treatment protocol and that there is no significant difference in results between those who wear braces 16 hours a day and those who wear them full time.
BRACING and Research

- Clinical research presented during the last ten years shows
- 1. Bracing is the only proven non-surgical method of potentially successful treatment of adolescent idiopathic scoliosis
- 2. Bracing is most effective for curves between 20 and 40 degrees in growing children with Risser signs of 0, 1, 2 or 3
- 3. Bracing should apply forces to the spine such that significant curve correction (30%) occurs in the brace
- 4. Brace wearing time should be approximately 20 hours plus per day for maximum benefit
- 5. The brace program should continue with intensity until growth has ceased as indicated by no further height increase and a Risser 4 status

Any current statements about the effects of brace compliance on outcome of treatment are purely speculative

For optimal performance, bracing needs to be started early (>25 degrees and progressive) and must reduce the curves and maintain curve reduction (>50 percent) throughout the duration of wear

Role of bracing for idiopathic scoliosis is to arrest curve progression and yield a post brace curve that is of magnitude that will not progress as an adult

SOSORT

Society of the International Society on Scoliosis Orthopedic and Rehabilitation Treatment

- The studies reveal that among participating SOSORT specialists there continues to be a strongly held and conflicting if not a contentious opinion regarding brace design and treatment.
- All agree that bracing should unload the growth plates of the apical vertebral bodies on the concavity
- Many clinicians seem to fit braces empirically rather than using "curve-specific" biomechanical 3D models

Rigo, Xirau, Givais, Maruyama, Kotwicki, and SOSORT members- SOSORT Consensus paper on Brace Action: TLSO Biomechanics of Correction
WHAT BRACES ARE ON THE MARKET

The Milwaukee Brace- first modern brace designed for scoliosis -1975-Wisconsin
  • cervico-thoraco-lumbo-sacral-orthosis
  • Prescribed for curves high in the spine
  • Everything works together to keep the body straight and to prevent progression of the curve while the patient is growing

TLSO Braces- low profile –made of plastic and are contoured to conform to patient’s body
Boston Brace- Boston-1970 works by applying three-point pressure to the curve to prevent its progression.
Forces lumbar area to flex, which pushes in the abdomen and flattens the posterior lumbar curve- pads place pressure on the curve and relief voids are located opposite the areas of pressure

Charleston Bending Brace- 1979- worn at night – is molded to conform to the patient’s body while he or she is bent towards the convexity of the curve- over correcting the curve during 8 hours the brace is worn- recommended for curves of 20-35 degrees with the apex of the curve below the level of the shoulder blade-studies show no evidence of improved compliance the potential for a patient to wear a part time brace, especially while sleeping, rather than the usual full- time 22-23 hour regimen
SPINECOR Brace

• First and only truly dynamic brace, which provides a progressive correction of idiopathic scoliosis
• Preserves normal body movement and growth and allows normal activities of daily living
• Can be worn under clothes
• Shown to be effective at 2 year follow up with 450 plus patient pool- 7% of those patients maintained their stabilization of correction, which far exceeds rigid bracing
• X-rays done every six months on clients
• Uses adjustable bands and a cotton vest that allows flexibility

Correct Scoliosis- Spinecor- www.correctscoliosis.com
Scoliospecialists- www.scoliosisspecialists.com
Interview with Dr. Anthony Pivonka- Gilbert, Arizona

• Designed by pediatric orthopedic surgeons- in Quebec Canada over the last 20 years
• Shown to be as effective or if not more as rigid braces in curves between 20 and 50 degrees
• Fitted on anyone over 5 years old
• FDA approved and is covered for reimbursement by most insurance companies
• Don’t need to be referred to orthotist can see chiropractor for fitting
• Used for adults to help improve posture and decrease pain
• "Due to the elastic nature of the brace, there is a struggle between the patients interpretation of normal posture and where the brace wants to keep the patients correct posture. This struggle promotes activation of the muscular system to keep it strong, it promotes neuromuscular re-education of the patient’s posture and it stresses the osseous system helping to stop the progression of bone deformity. This allows the patient to finish with a neuromuscular skeletal system that is retained and strong to allow the patient to maintain the correction”

Drawbacks of TLSO Braces

• Don’t provide a lot of flexibility
• Hot to wear
• Hard to Hide under clothing
• Produce atrophy of spinal muscles
• Result in the spine returning back to the pre-treatment state and beyond

• Flattens ribs
• Doesn’t help well with breathing- reduce lung capacity by 20 percent
• Cause, mild, temporary changes in kidney function
SURGERY

- Based on Medical Criteria includes the degree of curvature, the skeletal maturity of the patient, and the progression of the curvature. Example: A 12 year old with a 50 degree curve - who had her first menstrual period.

- Can be corrected to 40% of the original size.

- Surgical goal: Stabilize the spine and produce a fused spine that leaves the patient balanced.

- For Adults: To stop progression and to improve quality of life without pain.

Surgery

- Specific indications for surgery depend on the age of the patient, and the location of the curve.

- Surgery is warranted for the following:
  1. If the curve measures more than 40 or 45 degrees prior to skeletal maturity.
  2. If the adult curve exceeds 50 degrees and demonstrates continued progression.
  3. If there is severe back pain associated with the scoliosis.

- The goals of surgery are to provide a good degree of correction, stabilize the spine in a segmented fashion, relieve pain, and return the patient to a normal level of function.

- Among adults, complication rate for scoliosis surgery ranges from 35 to 70 percent.

  Neuwirth, M and Osborn, K.
Surgery

Brace treatment that fails if the curve progresses more than 5 degrees during the course of treatment - ex. Thirteen year old girl with a 43 degree curve that progressed to 48 degrees - surgery is recommended

Back pain of adults with scoliosis tends to be less responsive to medical management.

No one has to have an operation for scoliosis, it is merely a treatment.

Surgery provides pain relief to only 65 to 75 percent of the patients who complained of significant back pain prior to surgery.

Appearance is not a motivating factor for children and adults to seek treatment.

Thoracoplasty, the removal of some ribs, is done to reduce the rib hump in an attempt to improve the quality of cosmetic results.

Spinal-cord monitoring technicians rather than the anesthesiologist should operate the monitor.

Spinal fusion is like a surgical fracture - surgeons strip the muscle away from the vertebrae of the spinal column and cause the bone to bleed to lay down new bone.

Bone Grafting

Strengthens the healing of the spinal column in its fixed position. Bone chips are fused within the spinal segment.

Allograft - Bone taken from a human cadaver, via bone bank - Done more with Anterior approach surgery.

Autograft - Bone taken from the patient’s own bone, usually from the back of the pelvis or from one or more of the ribs - Done more with posterior approach surgery.

Bone expanders, artificial substances, such as coral or bone morphogenic protein, used to expand - but not completely replace - the allograft or autograft.
Surgery

• Internal fixation involves the insertion of metal hardware around the spinal column to support it and keep it in place until the bone has completely fused. The long term success of this operation depends not on the instrumentation, but on the healing of the bone.

• Spinal fusion always results in a loss of mobility. In thoracic – fusion cases, the surgeon will avoid fusing the lumbar spine because it is the most important part of the spine for normal motion function. Surgeons advise patients to wait 6 months before doing any kind of activity that has a strong impact on the spine. Surgeons avoid striving for 100% correction because of the possibility of overcorrection.

• A patient may become what is called ‘decompensated’ in which any degree in imbalance in the spine can result in the head not being centered over the pelvis. The ultimate goal of surgery is to achieve compensation in which there is overall balance throughout the length of the spine so that the head lengthens over the pelvis.

Neuwirth, M., Osborn, K. 2001

Surgical Treatment in Adult Scoliosis

Surgery recommended for the following:

1. Curvatures over 50 degrees with persistent pain
2. Curvatures over 60 degrees- surgery is almost always recommended
3. Progressive mid and low back curve or low back curve with persistent pain
4. Reduced heart and lung function- not severe lung function or heart failure

• Prefer to operate on adults under 50 years
• Adults at higher risk than children for nerve damage, complications like pneumonia, infection, poor wound healing, and persistent pain

Surgical Approaches

- **Posterior Approach**
  - Opening back of patient
  - Harrington Rod Surgery
  - Advantages - fewer complications, good correction, fusion rates are good, more right thoracic curves or double major curves
  - Disadvantages - crankshaft phenomenon (front of the fused spine continues to grow after the procedure. The spine cannot grow longer, so it twists and develops a curvature).

- **Anterior Approach**
  - Performs operation through chest wall
  - Incision in the chest, deflates the lung, and removes a rib to reach the spine, more with lumbar and thoracolumbar curves with apex on thoracolumbar junction - incision is done on patients side, rib removed used as material for bone graft, surgeon takes out discs through length of spine that will be fused, places bone on bone where disc was removed, facilitates compression on convex side of curve
  - Advantage - low risk for lower-back injury because avoids fusion of L2 or L3, shorter fusions allows surgeon to preserve more motion segments, better curve correction and cosmetic results, less blood loss
  - Disadvantage - Poor lung function
  - Hardware problems

Combined Anterior and Posterior Approaches

Large rigid curves more than 75 or 80 degrees.
Additional flexibility with better correction and a higher rate of fusion.
Over 55 years of age
Done more with Neuromuscular scoliosis cases
Fusion to the sacrum and pelvis is required
Helps with crankshaft phenomenon - where fusion from the back only can cause the front of the spine to continue to grow as the child matures.
Surgery takes 8, 10, or 12 hours in operation
Some surgeons may only remove disc from front and place instrumentation in back.
**Instrumentation**

- **Harrington rod surgery** – Corrects curves through distraction, no longer the most common surgical treatment.
- **Drummond** – Modifications of the Harrington rod system in which the Harrington rod is secured to the spinal column through a series of wires that pass through the base of the spinous process of each vertebra in the fusion. Good for treating thoracic curves and provides better correction and more stability than do Harrington rods. This treatment eliminates the need for post operative bracing.
- **Segmental Systems** – uses a combination of forces; distraction, rod rotation, and apical translation. Isolates each segment of the spine and then appropriately compresses, distracts, or rotates each segment individually. Employs rods that the surgeon can contour to the spine. Works best with fusions in the lumbar spine and has designed screws or rods that permit better anchorage to the pelvis. 98% of surgeons use the segmental system. Hooks may be attached to the lamina, then the surgeon will attach a rod to a hook on the concave side of a curve. The surgeon will make sure to bend and contour the rod to it’s desired degree of correction. 

Neuwirth, M., Osborn, K. 2001

**Instrumentation Systems**

- **Luque** – uses two contoured ‘L’ shaped’ rods attached to each vertebra involved in the fusion by sublaminar wires. Neurological damage is a risk.
- **Cotrel-Dubousset** – first appeared in the 1980’s. Uses hooks and rods in a cross linked pattern to re-align the spine and redistribute the biomechanical stress. Patients may have to wear a cast or brace after surgery.
- **Pedicle Screw** – the most recent device approved by the FDA used to secure instrumentation to the spine. Instrumentation is anchored to the pedicle, a pillar that connect the front and back of the spine from the lamina down to the vertebral body. The screw passes through the pedicle and into the vertebral body.
- **Spinal Cages** – used to support bone grafts, an arrangements of metal wires mostly titanium that forms a metal basket. Made in a variety of sizes, works no better than a large block of bone graft. Used as adjuncts to internal fixation devices.
- **In the future** – shape-memory metal, more thoracoscopy procedures.

Neuwirth, M., Osborn, K. 2001
Spinal Instrumentation

Serves three purposes:

1. Provides a stable, rigid column that encourages bones to fuse after spinal-fusion surgery
2. Redirects stresses over wider area
3. Restores spine to its proper alignment

- Harrington Rods—simplest instrumentation to install—achieves 50 percent correction—loss of 10-25 percent of correction over time
- Cotrel-Dubousset instrumentation is the most complex and risky
- Patients after surgery remain in body casts for about six months, and then wear a brace for another three to six months while the bone fusion solidifies
- Bone is removed from the hip and placed along side the area to be fused
- Crankshaft phenomenon— is a continued growth in the anterior front of the spine after a posterior fusion is performed in a young growing patient
Neuwirth, M., Osborn, K. 2001

Figure 7: Posterior segmental spinal instrumentation

Figure 8: Anterior segmental spinal instrumentation

A rod is placed between the screws on each side of the vertebrae, to stabilize the spine. Bone graft is placed between and/or along the sides of the vertebrae.

www.augustaortho.com
Pedicle Screws

Screws are placed in the vertebrae above and below the damaged disc. Often, a stabilizing device, made from bone or metal, is placed between the vertebrae to stabilize the spine.

Spinal Cages

Bone healing to restore when the cages, packed with bone graft, are inserted into the gaps between the two vertebrae. Usually what happens is the bone graft, which has been mostly packed into the cage, begins to grow through the perforated walls of the cage, eventually forming a solid bone mass that holds the vertebrae together. This process is known as interbody fusion. You can literally see cages is building bone and bone grafts the matrix that binds the structure together. The end result is fusion, a strong and stable construct.

Example of an LT Cage™

K-ray Illustrating LT Cage™

Painful or degenerative disc diseases, disk herniation or low grade foraminal stenosis may necessitate surgical intervention during their medical procedures. These conditions can cause vertebral bodies to press against each other during motion and cause severe cognitive when a disc is damaged. A solid fusion will help eliminate the tension, increase the space for the nerve roots, stabilize the spine, restore spine alignment, and relieve pain.
Complications of all Procedures

- Bleeding
- Postoperative pain
- Infection
- Nerve damage
- Lung Function
- Disk Degeneration
- Gallstones
- Intestinal obstruction

Spine Problems in Previously Treated Scoliosis Patients

- Spinal Fusion Disease
- Disk Degeneration and low back pain
- Height loss- growth takes place in long bones
- Lumbar flatback
- Rotational trunk shift
Therapeutic Treatment Plan

GOALS

Greater FUNCTION
Independence and Safety
Life Expectancy
Diminished Pain
Better Breathing

SCHROTH METHOD

• In a typical scoliotic curve, back musculature pulls lower ribs so that the lumbar abdominal region rotates laterally, downwards, and backwards
• Schroth method aims to reverse all the abdominal curvatures—addressing all three planes—sagittal, frontal, and transverse—“three dimensional” therapy
• Addresses the patient’s pelvis position, spinal elongation, and vertebral derotation in all three planes
• Focuses on strengthening exercises tailored to the individual patient, breathing exercises, focuses on vertebral derotation, and increasing the patient’s vital capacity
• Deviations of the trunk to the side or backwards can only develop if the corresponding supportive muscles give way and become elongated
• Treatment must improve posture so that the body can regain its original vertical axis. This can happen by developing and training the corresponding muscle groups responsible for upright posture
• To restore muscular balance, those muscles that have grown longer must be shortened and those that have become shorter must be lengthened

• 1930 developed by Katherine Schroth
• Schroth increases vital capacity
• Reduces abnormal curves by over 30% and increases lung capacity

Shevchuk-The Schroth Method
Physical Therapy

- Decrease Pain
- Improve the patients’ strength, flexibility, and Fitness
- Education on posture-practicing in front of mirror
- Stretch tight structures on the concave side of the curve
- Strengthen weak structures on the convex side of the curve
- Breathing exercises/yoga breath of fire
- PT usually begins 3 months after surgery or when the fusion starts to consolidate
- After 12 months if fusion heals normal activities can start up again

When the spine is curved, other parts of the body compensate in order to keep the head straight and the eyes-exercises should work on locating areas that are compromised and compensating and build up these muscles.

Handling the Client

- Our bodies reflect postural habits, physical demands, and injuries
- Our bodies adjust to problems
- Improper body alignment can cause progressive damage to muscles, bones, joints, and nerves
- Problems that are neglected can affect more body parts and increase pain
- To provide effective therapeutic intervention, body symmetry and functional mechanics must be considered

(Michele Nicosia, 2004)
Palpation

- Similar to principles designed by Cranial Sacral therapy
- Lighter forces produce better results when using Cranial Sacral Therapy
- Palpation – the art of using touch to examine the body
  - Explore structures beneath the skin
  - Body fluids can be sensed
  - Motion of one bone in relation to another

(Candice Strack, 2000)

Palpation

- Heavy palpatory force results in tightening of muscles and initiates pain reflexes and body defends against palpator’s hands more
  Provides more information about defense mechanisms than underlying condition
- Nonintrusive palpation permits examination without evoking resistance
  - Allows the client and therapist to experience “melding”
  - Allows the therapist to absorb information through the practitioner’s hand
  - Therapist accept any information that is received
  - Accept your experience as true
  - Goal of palpation – unobtrusive
  - Therapist must use lightest force possible in for palpation and treatment

(Candice Strack, 2000)
Handling the Client

• When placing hands on client palpation should be similar to
  – The force needed to raise a nickel with one finger
  – The force used when you comfortably place pressure on closed eye-lids

Positioning

• Thorough evaluations start with the feet and end with the head considering alignment and body mechanics
• Pelvic obliquities produce knee and hip stresses
  – Functional scoliosis
  – Paraspinal muscle imbalance
  – Stress headaches
Positioning

– Weak abdominal muscles, pelvic obliquities, and sacroiliac dysfunctions contribute to multiple painful conditions such as osteoarthritis
– Dysfunctional mechanics cause wear and tear and improper alignment
– Prolonged sitting -> forward head and shoulders, tight cervical thoracic muscles

(Michele Nicosia, 2004)

Types of Equipment
Positioning

Information needed prior to equipment use
- Diagnosis
- Orthopedic information
- Muscle tone
- Abnormal patterns
- Contractures or potential deformities
- Asymmetry
- Sensory abnormalities
- Purpose of position or equipment
- Consistency of treatment goals with purpose of position or equipment

(Guidance Cech, 1993)

Guidelines for Positioning

Guideline for position
1. Posture is number 1 - always make sure head, shoulders, hips, knees, and feet are in correct alignment – should be able to draw a straight line from these points
2. If the client has scoliosis, one side shortened, position in sideline to opposite side of tight side *Example – right side tight – position in left sideline to open right side – work on opening curve, manual stretching
3. Position and allow client to experience a functional activity while in this position
4. Use pillows, sandbags, etc. to get body in proper alignment
Guidelines for Positioning

5. Make sure arms are in front of body and hands are weight bearing
6. Try to get tight hands to open using towel rolls or pipe cleaners
7. Break up tonal patterns *Example – increased extensor tone in legs – position supine with legs over bolster
8. Incorporate range of motion, acupressure, and sensory integration while positioned
9. Positions can include
   • Supine
   • Prone
   • Sideline
   • Standing
   • Supine – knees flexed over bolster
   • Hands/knees over bolster
   • New positioning equipment available
   • Now made
     – Adaptable
     – Can clean
     – Comfortable
     – Many parts to create different positions depending on clients disability

Guidelines for Positioning

10. Also think functional movement
    – Positioning equipment
    – Scooter board
    – Rolling doughnut
    – Rocking chair

11. No more than 45 – 60 minutes in one position.
    Check client regularly – too long will lead to fatigue/pressure build up
Benefits of Good Positioning

12. Will improve breathing
   – Benefits of breathing
     • Releases stress/tension – relaxed breathing – diaphragmic breathing
     • Builds energy and endurance
     • Contributes to emotional mastery
     • Prevents and heals physical problems
     • Contributes to graceful aging
     • Manage pain
     • Enhance mental concentration and physical performance
     • *Breathing is the path to the most essential of human experience leading to love

(Gary Hendricks, 1995)
Benefits of Good Positioning

Each position provides the same sort of benefit
*Example – SUPINE –
work on midline orientation
Benefits of Good Positioning

Side-lying
- If client has tight right side because of scoliosis, position them in left side-lying position to open right side

Benefits of Good Positioning

Prone benefits
- Promote shoulder girdle stability
- Trunk extension
- Good head control
- Can stretch hamstrings
- Weight bearing through arms
- Able to extend neck
Handling the Client

• Standing - will discuss benefits later

Benefits of Good Positioning

• Sitting – fitting a wheelchair
  – Entire length of the femur should be supported up to ½ inch behind the knee
  – Seat belt should be at a 45° angle to the chair – promotes hip flexion and a slight anterior tilt
  – Feet must be supported and the ankles kept in a neutral or a dorsiflexion position
  – Arms should have opportunity for support and weight bearing provided by lap tray
  – Position as upright and symmetrical as possible
  – Chair tilt may be added to help with poor head control
  – *Always make sure client is seated correctly prior to making any other adjustments in wheelchair – always use lap tray
HOW TO KEEP THESE POSITIONING PROGRAMS RUNNING SMOOTHLY

• Visual Aids
• Take pictures before and after correction
• Use the number and color system
• Make charts to record data and keep data posted on wall
• Continual Staff training

Incorporating positioning into assessment and treatment

• Make sure you always place client prior to working with them in good anatomical alignment
• Remember positioning prior to function
• Watch and record if change in position will cause greater functionality
Breathing

Everyday we take up to 20,000 breaths and at least 10,000 steps. In normal breathing, your belly moves out when you inhale and pulls in when you exhale. This happens because of your diaphragm, your primary muscle of breathing. The diaphragm is a sheet of muscle that is about an 1/8 of an inch thick that is the roof of your abdomen and the floor of your ribcage. The outside of the diaphragm attaches all the way around the lower border of your ribs from your spine in back to the lower end of your breast bone in front. The top of it’s domed surface lies about half way between the lower front ribs and the nipple line. Your lungs and heart rest above the diaphragm and your liver, stomach and intestines lie below it. The diaphragm is attached to the connective tissue that surrounds our lungs, it is called pleura. When your diaphragm contracts flattening it’s dome onto your abdomen, it’s motion pulls down on your lungs. The stretching of the lungs creates a vacuum within the tiny air sacks that compose your lung tissue. Air rushes in through your breathing passages to fill the vacuum. Exhalation occurs when your diaphragm relaxes pushing the air out of your lungs by resuming it’s dome shape.
Breathing

The diaphragm has an important influence on posture. When you inhale, the atmospheric pressure in your ribcage raises your chest. When you exhale, the action of your rising diaphragm helps keep your chest from collapsing. Breathing contributes to a lift in your posture. We breathe under all sorts of circumstances and in many types of body positions. Therefore we need a variety of ways to make the air chambers enlarge. i.e. We breathe differently at sea level than we do at 7,000 feet. Our bodies must constantly change in relationship to gravity.

The diaphragm does 70-80% of the work of breathing. With both the contraction of the crura and scalenes, the spine is pulled forward. To stop this motion, our back muscles become engaged when we inhale. This means that the motion of breathing creates a minimal backward stretch of the spine with inhalation. When we exhale, the spine moves back into its neutral position. Extension of the spine also allows space for the pivoting of the ribs, which in turn contributes to the lift of the ribcage. If your spine is stiff, your breathing must work harder to raise your ribs and open your chest.

Breathing

- The abdominal muscles assist in exhalation. The best muscle for this purpose is the transversusabdominous, which surrounds the abdomen similar to a corset. i.e. Like a cough.
- Your nasal passages also assist in the breathing process. Your nasal passages condition the air, yet their resistance to air flow accelerates the efficiency of oxygen delivery to your bloodstream. Nose breathing engages your diaphragm and lower ribs and draws the air deeper into your lower lungs, where oxygen absorption is most efficient. Mouth breathing activates your upper chest and draws the air into your upper lungs. Upper chest breathing is linked to the SNS, whereas nose breathing is linked to the PNS. Nose breathing also improves your posture.
- Fact: Research has found that through chanting or humming one can clear your sinuses and eliminate nasal congestion. Learning how to breathe through your nose can assist in decreasing nasal congestion. Breathing, our main habit, takes time to change. Five minutes of twice daily practice for 3-6 months can help change this habit.

Bond, Mary
Breathing

• Normal resting respiration should occur at a rate of 10-14 breaths per minute. Men tend to breathe more slowly than women.
• The pause that occurs in breathing is the completion of the exhalation before beginning the next breathing cycle. This gives your diaphragm a rest and because your heart rate automatically slows down during exhalation, the pause also rests your heart. The pause lets your blood chemistry start the respiratory center in your brain to inhale again.

• Bond, M.

Breathing LAB

No Full stomach
Sit comfortably

When you inhale- diaphragm moves down, navel goes out, ribs expand, clavicles comes up, chest opens, scalenes get tight
When you exhale- diaphragm moves up, navel goes in, ribs collapse, clavicles move down, chest drops, scalenes expand.
Breath pumps liver, stomach, digestive organs
Good long deep breaths oxygenate the body reducing anxiety, calms the mind, and helps with focusing
Shallow breathing uses only 1/3 of our lungs so does not stimulate the capillaries, allowing little oxygen to lungs.
Prana- energetic force that comes as a result of breath. It carries life energy.
Breath more oxygen Prana – life force

Khalsa, Devta
Breath of Fire-Rapid Breathing through the Nose

Blood tests after 31 minutes or less reveal a stable co2 level with the oxygen content slightly raised.

Benefits
- Stress Release
- Expanded lung capacity and vital breath
- Expelled toxins from the lung tissues
- Cleared mucous membranes
- Alertness, energy, and strength
- Balanced ANS
- Loss of addictive impulses

Place hands on navel center – panting like dog with mouth open- then just breathing through nose – Keep inhale/exhale balanced- Power comes from navel

Bensen, H

Alternate Nasal Breathing

- Three channels from spine comes to nostrils
- Right side- heating, energy, yang or fire, connected to sun
- Left side- water energy, connected to moon, cooling or soothing

- To Calm Down- Cool Emotions -HOLD Right Nostril- Breathe out of Left side
- If Low in Energy- Need Energy- HOLD Left nostril -Breathe out of Right side

- Start with one minute on each side.

Khalsa, Devta
Segmented Breathing

Means dividing each inhalation and exhalation.
When you lower your frequency of breath, you alert your body and brain to adjust to the change and to open your lungs as you relax the body. You begin to feel less stressed and more aware. The movement from normal breathing to a lower frequency has altered the brain and started a gradual healing process. You may note that your skin and body feel different. Your eyes may be more clear.

Normal man breaths at a rate of 16-18 cycles per minute, women 18-20 cycles, and children 20-26. Infants normally breathe much faster 30-35 cycles per minute.

Just as the rhythm of your legs when walking work as a vibrating pendulum, so does your breathing. Both breathing and walking work like a musical metronome that your mind and body follow. When you emphasize inhaling more than exhalation, the SNS boosts your heart rate and blood pressure. When you emphasize exhalation over inhalation, the PNS slows your heart rate and relaxes your body. The SNS and PNS work together.

Benson, H.

Health Technique:
Alternate Nostril Breathing

The mind regulates the body's temperature by shifting breath emphasis from one nostril to the other about every 2-12 to 3 hours. By doing so, your temperature remains constant.

Each side brings some specific benefits which you can harness to meet your needs at any given time.

The right nostril warms and powers up the body, so if you are tired or listless in the middle of the day and need a lift or if you need greater energy for some task, breathe through your right nostril.

The left nostril cools and calms, so if you are feeling anxious or edgy, breathe through your left nostril.

How to do it

To Energize
1. Sit in a deep pose or in a chair with a straight spine. Block off your left nostril with your left thumb, fingers pointed straight up. Do lung deep breathing through the right nostril - or breath of Lee, 3 minutes.

2. End by resting both hands on knees in Gyan Mudra, doing 3 lung deep inhales and exhales through both nostrils. Sit quietly for a moment.

To Relax, Sleep

1. Sit in a deep pose or in a chair with a straight spine. Block off your right nostril with your right thumb, fingers pointed straight up. Do lung deep breathing through left nostril 3 minutes.

3. End by resting both hands in Gyan Mudra, doing 3 lung deep inhales and exhales through both nostrils. Sit quietly for a four minutes.

Sangeet Kaur Khalsa 1990
Body consciousness helps you remember that life is experienced through your body. When you stabilize and orient your body, the quality of your daily life changes and so does your expression of well being.

Transforming your posture may involve making adjustments in your relationships with others.

We are constantly discovering new information about our bodies.

Maintaining healthy posture requires a lifelong commitment to your relationship to gravity. It may require a few years of attention to evolve new ways of being in our bodies.

Treat your body as I and not as an it. Become More Aware with greater Perception.

Healing your posture is a process of self discovery!!!

Bond, Mary
Conclusion

Include both strength building and stretching exercises.
Focus on your diaphragm, pelvic region, and tranversus abdominus when it comes to movement and exercise.
Stay aware of your body while you are working out.
The more you move your body in different contexts, the more agile you become.
Nasal breathing slows your respiration and heart rate and stimulates full use of the diaphragm.
Stay present in your body while you exercise.
Have pleasurable experiences with exercise so you can use the reptilian brain and can have flow of movement.
Don’t constrict your visual field.
Keep your eyes wide open and experience life.

Bond, Mary

“An Ounce of Prevention is Worth a Pound of Cure.”
"The long span of the bridge of your life is supported by countless cables called habits, attitudes, and desires. What you do in life depends upon what you are and what you want. What you get from life depends upon how much you want it — how much you are willing to work and plan and cooperate and use your resources. The long span of the bridge of your life is supported by countless cables that you are spinning now, and that is why today is such an important day. Make the cables strong!"

L.G. Elliott

How to Form Good Habits: Do Them for 21 Days

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Latest References

Michelle Lindsey, PT, MBA, CPT is a physical therapist and the owner of Rising Star Therapy Specialist, LLC. Michelle Lindsey received her undergraduate degree in Kinesiology at Indiana University. She then attended The Finch University of Health Sciences: Chicago Medical School in Chicago, Illinois where she received her bachelor’s degree in Physical Therapy. She also received her Masters in Business Administration Health Care Management at University of Phoenix. Michelle has been practicing physical therapy for twelve years. Michelle also has experience in many facets of the fitness profession. She was a competitive gold medal figure skater for 16 years, an elite marathon runner where she was in the 1997 United States Maccabiah Open Track and Field Team, a triathlete, a professional speed skater and has also competed as a figure model in many competitions. She has received a special recognition award from the United States Tennis Association in 2001 for coaching and directing a team for the Special Olympics. Additionally Michelle has delivered many inservices to school; day programs, group homes, and state operate services on the topic she will be speaking about.

Michelle views her clients as unique individuals with varied skills and abilities. Her goal is to encourage them to develop to their fullest potential in a comfortable, compassionate, and respectful environment that promotes and maintains their health, fitness, and quality of life. By putting faith in her client’s abilities, she strives to help them believe in themselves, inspires them to extend beyond their best efforts, and teaches them how to remain motivated and focused. She stresses these and other key lessons to ensure that her clients have a lifetime of success and happiness.

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