

Craniosacral therapy, it's neurological foundations, and implications for Joubert syndrome interventions.

Presented by Cathy Holway, PT, DPT

CranioSacral Therapy (CST) has its American roots in the founding of osteopathic medicine in the late 1800s. The more familiar form of this work was developed by Dr. John Upledger in the 1980s, and theorizes that the bones of the skull can be subtly mobilized, to provide better flow of the cerebrospinal fluid around the brain and spinal cord, thus enhancing neurological function. While the CST therapist trained in these methods seeks to restore this fluid flow, little attention is directed to helping the nervous system find better regulation and function within itself. Obstructions in the cranial bones or internal membranes may be mobilized, but how does the brain begin to reorganize after that? Where there has been confusion in brain structure or wiring, the brain needs some help to lay down new wiring for better function.

This is where a skilled pediatric therapist learns how to integrate those subtle techniques with developmental activities, to help re-wire and reorganize the child's brain and nervous system for better brain and body function.

This was my own personal experience with the mechanical cranial work. At age 34 I sought treatment for two brain injuries that had left me with seizures and other challenges. While the basic cranial techniques proved helpful in releasing the crater on the left side of my skull from forceps delivery, and resolving my seizure disorder, it left me on my own to re-wire my brain to recover cognitive and sensorimotor skills. The long journey of learning how to do this for myself led to the development of the cranial-based work that I developed, Neurovascular Integration. This work is based on the neuroscience of how our nervous systems are built to function. The emerging field of neuroscience is bringing hope to patients with neurological disorders. The old stories of "you'll never grow new brain cells" are patently untrue, and the wonders of our own neural plasticity bring limitless possibilities. Today we will learn how this information can help us, as parents, families, caregivers, as well as helping our kids.

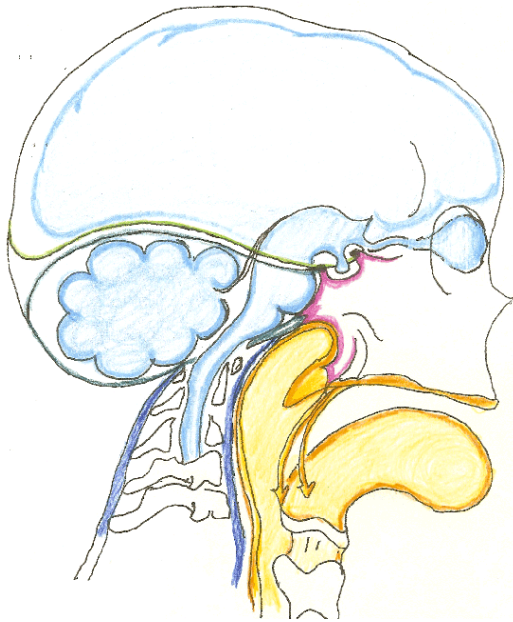
Let's look at where these stories and possibilities begin.

Your children with Joubert syndrome and related disorders are faced with a range of genetically-prompted internal wiring dysfunctions of the brainstem and cerebellum (together, the hindbrain), that then manifest in various visual, respiratory, sensorymotor, cognitive and visceral dysfunctions. The genetic coding for this wiring confusion occurs very early in gestation. The most critical week is from 4 to 5 weeks of gestation, but this very sensitive time extends through the 8th week. This is when the hindbrain is organizing itself for its functions throughout the brainstem and cerebellum. By 8 weeks, the "satellite dish" of this area closes, and basic structures move into position and continue their wiring activation.

What are the main segments of the brainstem/hindbrain?

1. The medulla. This is the "magic inch" at the base of the skull, where the spinal cord passes below the head. The medulla contains the control nuclei for our cardiac and respiratory function. It passes wiring for motor control for the body. It takes in sensory information from the body. It connects to the cerebellum and it also contains the cranial nerves that supply sensory and motor function for the mouth, tongue and throat. Its nuclei

control coughing, sneezing, hiccupping, swallowing, vomiting and sweating. The medulla also contains important nuclei for our parasympathetic, or peaceful, autonomic nervous system. We'll learn more about that shortly.



2. The pons. This is the next inch up from the medulla. It contains the nuclei for many of our important cranial nerves: for face and jaw motor function, for visceral and digestive function, for auditory and vestibular function, and for sensory processing. The pons also connects to the cerebellum, as many of their functions interrelate. The gray matter of the pons contains relay nuclei for signals from the cerebrum to cerebellum and nuclei for sleep, posture, respiration, swallowing and bladder control.

3. The cerebellum. The cerebellum was once the open lip of the “garage door” on the satellite dish. It is fairly small compared to the rest of the brain, about 10% of volume, but contains 50% of the neurons. The cerebellum is critical in coordinating our visual input with motor output. It connects via three pairs of cerebellar peduncles, to the

medulla, pons and midbrain. It modulates and coordinates voluntary movement of the limbs, maintains muscle tone and posture, coordinates eye movements with body movements and aids in the learning of motor skills.

The cerebellum influences movement even though it has few or no outputs of its own that reach the spinal cord. Therefore, damage to the cerebellum results in slow or uncoordinated movements, but weakness does not predominate.

4. Mid-brain. This is the short segment that connects the hindbrain and forebrain; acting as a relay station in several specific ways. Two important components are the colliculi:

The superior colliculi transmit visual attention, visual tracking and reflexes for turning the head in response to sound, sight or touch.

The inferior colliculi receive all afferent signals from the inner ear and relay them to other parts of the brain, especially the thalamus.

When there is wiring confusion at the colliculi, where one pathway may be strong and the other obstructed, we see cases where a child cannot look at you and hear you at the same time. Or they need vestibular input to find their speech. We refer to these behaviors as “wiring vs willfulness”

5. Hypothalamus. The hypothalamus is a critical integrative area of the midbrain. It interprets visual signals from the retinas to provoke hormonal production in our circadian rhythms. It contains the pituitary gland as well as the pineal gland. It is surrounded by the thalamic capsules, key tissues for sensory integration. Its center is the third ventricle, where CSF is generated and pulses to feed the brain tissue. It sprouts the eyeballs and routes incoming information to the visual cortex and the cerebellum.

It functions as a control center for hunger and appetite; for thermoregulation; for cardiovascular function (via relays to the medulla); sleep and waking and emotional behavior. It produces and secretes hormones that regulate the functions of the pituitary gland, kidneys and other organs.

It is a major control center for the autonomic nervous system, which helps us move safely in our environment while functioning smoothly in our bodies.

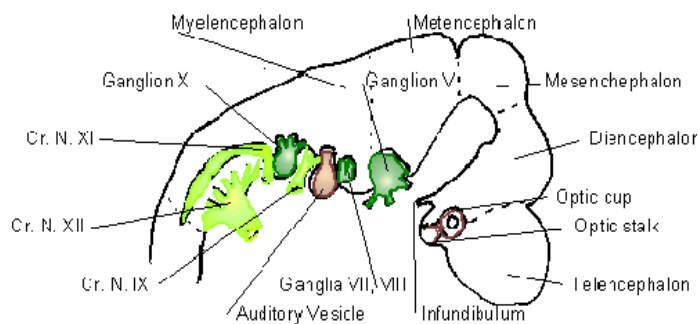
How are these segments meant to work together?

The brainstem, in its simplest form, has three main functions.

1. A conduit. Wiring that communicates information between brain and body passes through these magic few inches of tissue. If there is an obstruction or confusion in this area, brain and body have difficulty communicating. The child may not have a clear sense of where his arms or legs are, or may want to move them but the signal does not go through clearly. This is especially impacted between the eye-to-cerebellum wiring. Can we see what we want to do? And direct our bodies to move us there?

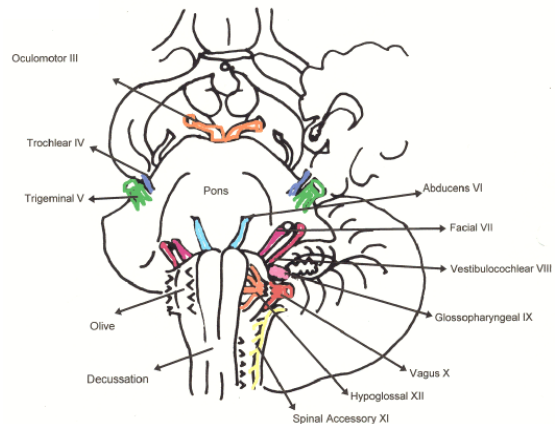
2. Home base for cranial nerves. The cranial nerves of the brain illuminate our sensory motor function of the face and throat. These nerves sprout off the belly of the brainstem as the satellite dish is programming its wiring, and are activated by the migrating neural crest cells and build our entire autonomic nervous system.

Cranial nerves help us process sensory information. Whether you enjoy light touch or deep pressure to your face; whether your mouth works properly to suck, chew and swallow, whether you can hear and smell and taste properly; these are just some of the functions of your cranial nerves that root in the brainstem.



<<<At six-seven weeks gestation, the cranial nuclei are already sprouting nerves from the brainstem.

This is how they are arranged in the adult brain (looking from the front) >>>

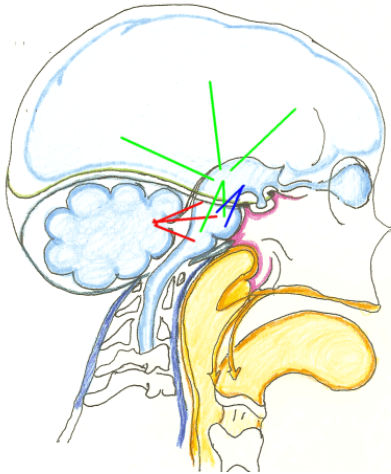


3. Sensory processing. As an integrative switchboard, the wiring through the brainstem facilitates communication between different key areas of the brain.

Wiring to the cerebellum allows us to move our bodies in a deliberate fashion. (Red)

Wiring to the thalamus allows us to filter out sensory input from the world to appropriate association (and action) centers in the brain. (Green)

Wiring to the hypothalamus allows smooth visceral functioning for the entire body. (Blue)



We can begin to appreciate the complexity of a small piece of brain tissue!

Proper brainstem functioning is also important for our nonconscious, or autonomic nervous system (ANS) function.

The more we know about the ANS, the better we can facilitate neural plasticity.

The ANS is nervous system wiring that goes to every tissue in our body. It is built to both protect us from danger in our external environment, and to keep us well-regulated in our internal (body) environment. It does this via three different branches (types of wiring)

Three branches of the ANS:

1. Sympathetic (Stressful!): this drives our “fight or flight” response to get us out of external danger. It triggers the production of cortisol, which fuels our flight response.
2. Parasympathetic (Peaceful! Powerful!): this runs our internal body systems, which rely on many other hormones. Sleep, digestion, cardiovascular and respiratory function all run off this system, as well as our immune function, memory and learning. (also called the autonomic craniosacral system, for its nuclei are in the medulla and the sacral plexus)
3. Gastroenteric: this is the “brain in your gut” and runs with the parasympathetics.

While we know how quickly our “fight or flight” system can jolt on, the truth is that our Peaceful! System is built to come on even quicker.

When we get stuck in stress-overdrive, our cortisol stays ON and our peaceful hormones get turned OFF. Cortisol overflow actually kills new brain cells in the learning and memory centers, and turns off our digestive and sleep hormones.

Fortunately, we are wired to be adaptive and curious about new experiences. This gives us a chance to reprogram our ANS and learn to function from a calmer place.

This helps us both for ourselves and our families and children.

Let’s do some breathing together and learn what this means.

First of all, let it all out! Go on! Grunt a big exhale, get that jaw bone buzzing with the outgoing breath!

Now that you've exhaled, let's inhale, all the way to your belly-button. When you inhale, your belly button expands out (let the gut roll, girls, no one is watching!).

When you exhale, your belly button softens back towards your waist. That's it. Keep going.

Nose or mouth breathing? Doesn't matter. What matters is that when you inhale, your belly button expands outward.

Follow your breath down to your belly. From inside this belly breath, notice how your butt is sitting on the chair, are you shifted onto one hip more than the other? Are you clenched through your bottom?

Let the deep belly breath help those tissues unclench and soften. All you have to do is focus on the belly and then observe what changes.

Now follow that belly breath up the body. When you inhale and the belly button expands, it pushes your ribcage up and open. Your lungs and heart get more room, your spine undulates with relief as it lengthens.

Your neck rolls and fidgets with your shoulders, then gets longer. Follow that belly breath all the way to your eyeballs, and imagine they get squishy and soft. Feel the belly breath soften your jaw. It's all good.

If you get lost or distracted, just go back to the belly. Your body knows what to do with that invitation.

Ok. Now are we all here?

You know what you just did?

You woke up your peaceful nervous system, made some new brain neurons, and made a great connection from breath to brain to body. Now let's make it real.

1. **Breathe it.** Go ahead, every breath counts as great practice.
2. **Feel it.** From the inside, really. Belly moving? Butt unclenched? Ribcage opening? Neck longer? Eyeballs softer? Feel whatever you notice.

Feel what your breath is illuminating within your own body.

3. **NAME IT.** "good" "juicy" "peaceful" "quiet" "UH huh" "yeah" "oh!" "ugh" "big sigh"

*** Breathe It * Feel It * Name It***

Your breathing body shows your brain it is safe and calm, your brain acknowledges that input and decides to make a nice output, which means that your hands get warm and your jaw gets soft and maybe you even stretch or move instinctually.

*** Breathe It * Feel It * Name It * And *Move It!***

“Naming It” is important, it kicks up the happy juice in your brain, that lets you grow stronger wiring to this new pattern of safe relaxation. “Naming It” leads to your True Story.

*** Breathe It * Feel It * Name It ***

You just grew some new brain cells.

Your memory and learning centers just woke up.

Your digestive hormones just reconnected to your gut.

Your cardiovascular system just rebooted and can run on slow and easy again.

Your sleep hormones will sing you lullabies tonight.

All because you took a good few belly breaths!

How can it be that easy, you wonder? Do just a few breaths count?

Yes, it IS that easy.

It's not only easy, it's contagious.

When you are breathing in your peaceful nervous system, it resonates to those around you. Holding a baby on your lap while you breathe this way will help them regulate their breathing to you.

Helping our children feel this in themselves is critical to neurological repair and integration. It is during the quiet times that new wiring integrates and begins to make sense.

Therapeutic Implications

When there is confusion or short-circuits in the brainstem wiring, we are unable to process information from our environment and make sense of it inside ourselves. We default into stress drive, which shuts down the tentative connections we've worked so hard to piece together. Children with wiring challenges do best with therapeutic interventions that come from the peaceful place. When the therapist is in their own peaceful calm state, the child relaxes. When the therapist understands how the child is trying to use the wiring they've got, a pattern for expanding on that basis emerges. Movement therapies like ABM engage the nervous system from the “outside in” via movement. Cranial therapies, when approached from the autonomic craniosacral system, engage the wiring from the “inside out” to promote new, meaningful wiring.

Research shows that the tenets of neural plasticity, or brain re-wiring, include focused attention, massed practice, and naming a good outcome. When we are breathing in our

parasympathetic state, it is easier to focus from inside your body, and exciting to practice new connections, which let you go out and have more fun playing.

As we can see from our discussion today, there's a whole lot more to "craniosacral" work than moving the bones of the head. The true, physiological craniosacral system is in the autonomic nervous system, and when we understand how that illuminates our brain and body conversations, we can't help but take a deep breath of relief.

You can do it for yourself, breathe it with your kids, and slowly but surely shift the flow of function for everyone.

So go ahead and...

* Breathe It * Feel It * Name It * Move It * Share It * ENJOY IT!*

Some final thoughts.

* **At first, practice when you are in a safe or quiet place.** As your peaceful nervous system gets stronger, it will be easier to continue breathing during more hectic times. I tell my patients to take a few breaths at every red light, or when they sit down to eat, or as they go to bed at night.

* **Every breath counts!** The principles of neural plasticity show us that we can re-wire our brains for better health and function, and with every belly breath we are doing just that.

* **You can't force someone else to relax** 😊 but you can MODEL that behavior and resonance takes over from there. If you have rocked a baby to sleep, you know how this works already.

* **Simply learning new coping skills** decreases cortisol and increases your brain cell growth.

* **There are many health benefits** to focused breathing skills like this, but of course, these strategies are not a substitute for proper medical attention for specific conditions.

So go ahead and...

* Breathe It * Feel It * Name It * Move It * Share It * ENJOY IT!*

If you have any particular questions, please feel free to contact me at drcathyholway@gmail.com. And visit my website, www.drcathyholway.com, for more stories and strategies.

Thanks for being here! Enjoy your juicy breath and flow!

Dr. Cathy