

Improving Athletic Performance in Youth and Young Adult Adaptive Sports Athletes through Somatic Movement Re-Education and Therapy

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Abstract

Objective: Our objective was to employ somatic movement re-education therapy with athletes under the age of 27 diagnosed with Cerebral Palsy or other forms of trauma-related motor impairment to effectively increase balance, strength, mobility and improve overall athletic coordination.

Methods: Each subject was initially observed and video-recorded performing movement gestures in order to establish a baseline and subjectively determine restriction in range of motion (ROM) and mobility. With subjects supported either on a massage table, seated, or on the floor, movement patterns and boundaries (e.g. ROM, subjective comfort level, mobility) were further explored by manual evaluative procedures. Verbal feedback of the subjects' sensory experience was invited throughout. Investigation was conducted of an array of characteristics of connective tissue including, but not limited to: weight, tonus, density, tension, among other variables. When restrictions to ROM and mobility were encountered, alternative avenues to limb mobilization were explored. Post-treatment video-recording provided visual feedback to subjects to assist them in integration and coordination of alternative movement patterns via sensory; visual; verbal; imagery pathways.

Results: Preliminary results indicated significantly greater, pain-free ROM; observable gait and posture changes; significantly greater reported limb and movement perception; significantly enhanced sports performance.

Conclusion: Feedback from touch, movement and sensation effectively offer alternatives to the treatment of motorically impaired athletes by providing enhanced awareness of their bodies. Somatic movement reeducation therapy can contribute a unique, harmless, and effective approach to enhanced sports performance in the special athlete.

Keywords: Neuroplasticity; Somatic Education; Disabled Athletes

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Introduction

Madelana and Richard are Somatic Therapists and Educators. We are trained in a variety of somatic modalities. This paper is primarily about our work with Trager Movement Therapy or Psychophysical Integration, as it was originally called. Part of our professional practice is to accompany our client as they learn to focus on their body's ability to receive sensory and motor information through touch and movement via the soft tissue and, we believe, effectively transmit new movement patterns and possibilities to their brain.

For the past 6 years we have been working with young athletes affected with cerebral palsy (CP) or similar neurological disorders categorized as traumatic brain injury (TBI) using Somatic Movement Therapy / Re Education. We have been assisting these young athletes with achieving noticeable improvements in balance, strength and range of motion, as well as reduced injury occurrence.

Our intention is to share a sample case report of one athlete with whom we've worked and discuss the principles of the therapeutic approach we use. Additionally, we would like to propose questions that,

if explored, could provide useful contributions to the growing research related to body, brain, movement, cognition, and neuroplasticity.

Case Report Sample

Shea

Client History

We first met Shea in June 2017 when he was 15 years old. A gifted athlete with tremendous drive, he was restricted by the limitations of Cerebral Palsy (CP) on his affected left side. Shea was a motivated athlete who he would push his body to extremes that often caused him injury. The impact of over-driving his non-impacted, right side to compensate for his weaker and functionally impaired left CP side was obvious when comparing the muscle strength and tone, particularly of his lower extremities.

Shea's goal was to play soccer at the highest level possible. He set his sights on becoming the youngest member of the US Para 7 Aside Men's Team. This is Soccer's equivalent of the Paralympics team,



culminating with International World Cup games. He trained as all world class athletes do: every day. He played on the local high school soccer team, but his inability to strike the ball effectively with his CP-affected left foot put him at a severe disadvantage, which limited his time on the field during games.

Subjective Information

Shea's body was out of balance. The strength and coordination on his CP side was noticeably different. The muscle mass of his right, non-affected thigh and calf were approximately 30% more than his CP leg. He was constantly experiencing pain in his left foot. Hamstrings in both legs were tight and leg cramps were common. His daily weight training focused on maximum weight, primarily on his non-affected side. His CP side was capable of lifting only half the weight of his non-affected side. His injuries were stressing his unbalanced body and taking a toll on his growing body and mind. Shea was ready for a change.

Objective Findings

Shea was fortunate to have had no structural surgical intervention, as this is a common medical procedure for CP children. Tendon and muscle lengthening is sometimes used to surgically increase the range of motion in an affected area. Shea had a knee injury in a high school soccer game the year prior to beginning our work together, that required surgical repair. This was on his non-CP-affected leg. Shea did have a minimal Botox treatment to soften his hamstrings prior

to our working together, but no casting. These are practices to which young, CP-children are often subjected. We are told that the effect of Botox usually wears off within 3 months. Besides that, there was no medical or structural intervention to his body when we started our work together.

Our objective was to focus on the functional aspects of his movement limitations. We did this by using some of the principles Dr Milton Trager taught, now known as the Trager Approach®. We focused on soft tissue, one of the body's largest receptors for feeding information to the brain.

Sessions began by using Shea's natural, unassisted movement range for specific movement sequences. By following his comfortable range, and introducing guidance and suggestion through touch, we were able to extend his range of motion (ROM) leading us to believe that new movement information and ROM possibilities were being fed through the neurological pathways to reduce muscle restriction and improve muscle tone.

This treatment protocol was accompanied by engaging the body's rhythm and amplifying that rhythm with a gentle rocking sensation applied by the practitioner. Shea's body responded to this intervention by showing signs of obvious relaxation including deepening breath patterns, relaxed muscle tension, heavier limbs, and decrease resistance to the movement.

With repetition of this type of movement therapy over a period of several weeks, Shea began to show signs of new motor skill abilities. Muscles and tendons that had limited ROM began to experience an increase in ROM. Once the increased range was experienced, a much greater sense of body awareness seemed to emerge. As his CP-limited muscle patterns were being called to action, his strength, muscle mass, and balance improved.

Treatment and Patient Response

Treatment Session 1

After evaluation, Shea was instructed to perform a variety of simple standing movement exercises to observe both the structural and functional capabilities on both the CP and non-CP affected sides of the lower body. These exercises were repeated before and after each session and were video recorded. A short summary video appears in the appendix of this report.

The session consisted of both table work (Trager work) and floor exercises (yoga poses and Mentastics®). Mentastics® is a word coined by Dr Trager; it combines the words 'mental' and 'gymnastics' and refers to a free-flowing movement exercise designed to help bring the client into their own body awareness. The Trager work is soft and gentle. The client is assisted in explorative movement to the edge of their no-pain-zone. Utilizing a rocking sensation, we softened the muscle tissue throughout Shea's body. Although initially skeptical, he reported feeling very relaxed after the session. In fact, he said he had never felt anything like this session before despite having had many PT sessions prior to our working together. There was noticeable ease in his movement.

Treatment Session 2

Sessions were scheduled approximately 5 days apart. The client reported feeling lighter on his feet when walking and running after Session 1. Being a dedicated athlete, Shea adheres to a training routine including weight training and field practice every day. We noticed a visual difference of muscle mass from one leg to the other. We estimated it to be approximately 25%. To bring this into balance, we instructed Shea to decrease the weight he was training with on his non-CP-side so it matched the weight he was using on the CP-side. Gradually, he was to increase the weight equally on both sides. This was a major shift for Shea, as he would often over-tax his non-CP-side, resulting in injury to his right, non-CP-side. The same Trager table work – Mentastics® and yoga poses -- were performed.

Treatment Session 3

Shea reported feeling a noticeable awareness and difference in his body. He showed more interest in participating in the session. He was more verbal in expressing what he was feeling in his body while on the table. We invited him to participate by directing his breath to the areas of his body we were working on. We use the phrase "meet our hands with your breath and softly touch us from the inside" in order to methodically slow down the brain and allow the client to engage on a nuanced level. Shea's increased body awareness and mental participation accelerated the changes that were happening in his body. His CP-side was catching up.

Treatment Session 4

Shea reported less pain while running. There was visual evidence that muscle mass was developing on Shea's entire CP-affected side. Compression work was introduced into the table work. Using both hands to apply very little pressure, we compressed the joints of Phalanges, Metatarsals and the Tarsals of each foot, which released tension. Along with introducing compression, we started to address the tensegrity of the fascia by lifting the muscle tissue and rocking specific locations where movement was limited. The results are visually evident in the exercises that were video recorded.



Treatment Session 5

This was the last session of Shea's introduction to somatic movement therapy. It was similar to the previous sessions, but with more emphasis on the integration of balance and attention to the longitudinal and spiral chains of stretch and recoil amplified through the Trager work used. The tensegrity in Shea's body shifted. The CP-affected side was now more actively participating in Shea's activities. He reported that his field injuries had decreased significantly. While participating in the series of 5 weekly sessions, the muscle tone and muscle mass on his affected C- left side improved visually by 10%. Shea reported that he was now confident to shoot soccer goals with his CP-affected left foot. This was a game changer for him as it improved his ability to be a formidable competitor on the playing field.

Follow-up Treatment Sessions

Shea continues a routine of 'Tune-up' sessions with us each year. He is off to college and maintains a very active practice and game schedule, playing for both the US Para 7 Aside Men's Soccer Team and the Clemson University soccer team. He is actively coaching young CP athletes in the national CP Soccer League he co-founded.

Discussion

Shea was the first of many CP-affected clients we've worked with at the MYB clinic. Together we explored the unknown impact somatic movement could have on a neurologically impaired body. Our work with this client offered the most profound, visible changes we'd seen so far. We believe his interest, and willingness to participate allowed us to reach the brain more effectively. It also led us to conclude that, based on the precepts of neuroplasticity – or the capacity of the brain to change - a skilled Practitioner can, through touch and movement, assist a CP-affected client with making noticeable improvement. We continue to observe how a newly learned movement pattern can teach a structurally sound body to function in ways it was previously not functioning.

Request for Support

We welcome your support in continuing this research. Please visit www.tragerfoundation.org The Trager Foundation is a 501-c-3 organization that has been set up to accept tax deductible donations to support this and other somatic movement research.

Appendix

This is a summary video of Shea's first group of sessions with Richard and Madelana. It includes before and after session videos that captured the changes that were taking place in Shea's lower extremities' movement, balance, and strength. It also features the restorative one of the yoga poses which helped Shea release the muscle tension in his lower back.

<https://vimeo.com/258662506>

Shea was invited to do a TED X talk in the Spring of 2022 about what it's like being a CP athlete. In this TED X Shea shares his story. The title of his TED X talk is called "Paralyzed to Paralympic"

<https://www.youtube.com/watch?v=-nXWYBVR-b4>

Foundations

In the earliest months of our work with this population, we learned how to approach the children and what exactly we were seeking to

impact with them through our work. Basic definitions and concepts became portals to deeper learning, starting with a basic understanding of what is CP? How is it commonly viewed? And how is it commonly treated? Given that the condition of CP is understood to be incurable, treatable primarily with surgical and pharmaceutical interventions, we wondered if our novel and, at this point experimental, somatic approach would be welcomed?

TBI: Let's start with some definitions. The NIH (National Institutes for Health) broadly and generally defines TBI as "a form of acquired brain injury, [which] occurs when a sudden trauma causes damage to the brain. [It] can result when the head suddenly and violently hits an object, or when an object pierces the skull and enters brain tissue. Symptoms of a TBI can be mild, moderate, or severe, depending on the extent of the damage to the brain."

CP: In their September 2011 article in *Lancet Neurology* [1], Aisen M, et al. (2011) [1], defined CP as motor impairment that limits activity, and is attributed to non-progressive disturbances during brain development in fetuses or infants.

Along with these motor disorders, they identified other accompanying complications such as: impaired cognition, communication, and sensory perception; behavioral abnormalities; seizure disorders; or a combination of these features with which CP-affected individuals frequently present.

Prevalence & Impact: Since CP is thought to affect three to four individuals per 1,000 (.4%) of the general population which is, itself, experiencing increased life expectancies, the authors appropriately recognize the importance of developing therapies to address the needs of CP-affected adults and children. Occurrences of TBI far exceed the CP levels at 30% in the populations of youth aged 0-25 [1].

Supportive and effective therapies for these populations can help them to live more personally satisfying and socially contributing lives as they advance in age.

Since, in our ongoing work, we met with, interacted with, and worked with children affected by both of these traumatic conditions and more, we have come to believe this to be a societally beneficial investigation warranting further study.

Treatment vs Rehab: A brief review of the literature supports our anecdotal conclusion that families with children who are CP-impacted turn most frequently and repeatedly to therapeutic treatments like constraint induced movement therapies and botulinum toxin injection.

As our work expanded, more children came to visit us in our clinic setting (as opposed to our volunteer work with them on the field and in their trainings). We began to observe some important and interesting behaviors which we hoped would work to our benefit. Families follow what other families do for treatment options and these medically accepted treatments do not score highly with the children who are being subjected to these treatments. With a basic goal to help them improve balance, strength and mobility using our somatic approach, we focused on addressing the functional limitations of these children.

Naturally, medical interventions are most necessary and also most relied upon particularly because they are financially supported by the current healthcare system. Families with such unexpected traumas do not typically have the funds for what is called "out of pocket" expenses, such as our somatic therapy work, regardless of their purported or suggested efficacy. This was the first hurdle we'd have to overcome.



Neuroplastic Advantage: Rehabilitative treatments for this and many other segments of the population have recently been focused on neurological interventions in response to the increasing evidence supporting neuroplasticity. In these treatment approaches, improvement is sought to be invoked by capitalizing on the brain's innate ability to change and adapt throughout life. With the recognition of neuroplastic potential, studies can turn to the investigation of optimal ways to access that developmental potential in the world of rehabilitation.

According to Damiano DL, et al. (2009) [2], there is growing recognition of the importance of motor activity for the development and maintenance of central nervous system pathways as well as for recovery of function when injury has been sustained. She indicates Physical Therapy being likely to play a prominent role in the creation of these neuroplastic changes where damage has occurred. We do not dispute that; however, we believe that there are other, less researched and academically studied modes that deserve to be explored for their potential as well as the ease of access and, eventually, the self-implementation that can be learned when taught as part of the protocol.

TRAGERWORK: What we do

TragerWork is a term that has evolved and been adopted by a growing body of Somatic Practitioners who have been trained by Dr. Milton Trager M.D. and his first generation of students, some of whom are still living and teaching today. Throughout his years of developing the modality that is his namesake, he always told his students that he was "just touching the surface of what was possible." He encouraged them to take what he taught and, as every great teacher has instructed their students, expand it through the lens of their own unique perspectives.

While a strict definition of Dr. Trager's work has never been codified and agreed to by his legacy, there are a series of principles which have been used as the basis for teaching and expanding this work. We will examine some of those principles here as a means for both describing our work with the youth and young adult population, as well as a means for connecting to the peer-reviewed research from other fields of study. It is our hope that this may be a jumping off point for future research and exploration.

We recognized the need for a much more thorough review of the literature, but our preparation for this Conference offered the incentive to delve into the literature, to offer some substance to you here, and to demonstrate our sincerity about conducting further investigation.

Before proceeding into the principles, we'd like to mention one shift we have employed in our evolution from our teacher's. We have adopted the insight of Thomas Hanna and his definition of sensory motor amnesia, as well as his steps to avoid and reverse it. As Practitioners of Tragerwork, we have noted that the principles we employ work exceptionally well when they are combined with an evolving state of self-awareness in the receiver. It is this self-awareness that we believe supports the client's educational (or re-educational) process alongside the principles employed by our Tragerwork treatment.

Principles That Work

Why We Work with Tissue

At Week 3 an embryo begins the earliest stages of its brain development with the thickening of the ectoderm and formation of the neural plate, which will eventually give rise to all the neural tissues. This ectoderm layer is also the very layer from which the epidermis and

the dermis develop [3]. Ergo, when we touch the skin, we are in fact, touching the brain.

Juhan D (2003) [4], points out that we "...learn about [our] body in exactly the same way that [we] learn about any other object, by feeling it." He goes on to say "Without this active and continual tactile exploration, the organism literally begins to fail to regulate appropriately its many complexly interwoven systems."

So, every touch of tissue that we offer sends a message to both the conscious and unconscious mind through the neurological archives of the ectoderm.

Why We Work with Movement

In *Thinking, Walking, talking: Integratory Motor and Cognitive Brain Function*, Leisman G, et al. (2016) [5], state that "Reduced postural activity in childhood harms natural exploration of the surrounding, thereby reducing the ability to learn from experiences, and leading to developmental delays." Further to that, they say "deviations from normal postural development or from normal levels of postural activity can disrupt or delay cerebellar and cortical maturation and may disrupt the underlying oscillatory timing mechanisms on which motor and cognitive binding is based." This proposed impact on the oscillatory timing mechanism will be revisited later in this paper. For now, it is sufficient to note the relationship between reduced postural activity and brain development and maturation as important reasons to include this population of CP athletes in any somatic therapy and education program that can support their growth, development and ultimate contribution to the society.

In that same article, Leisman G, et al. (2016) [5], state "Child development facilitates the creation of functional specialization in adulthood, the principal purpose of which is to facilitate optimized cognitive and motor functioning. The ability to dynamically alter these abilities renders them as a result, plastic. Movement facilitates brain plasticity and the development of interregional associational networks and therefore influences cognitive-motor interaction." We cite this to reinforce the importance of providing this kind of service to these young athletes with the motivation to perform to help them optimize their functional neurological development. With our work, we believe that the movement aspect capitalizes on the brain's plasticity and its ability to learn and grow.

We Find Their Rhythm

In Chapter 1 of *Movement 2018: Brain, Body and Cognition*, Merrick J, et al. (2018) [6], state that "Nervous system function can be changed by many manipulations, perturbations, and stressors that include enrichment, experience and learning, direct brain stimulation, hormones, stress, trauma and virtually any repetitive stimulus impinging upon the organism." They conclude this passage by saying "... movement facilitates cognition throughout the lifespan."

In our work, we endeavor to offer the young athletes not only increased range of motion (ROM), but more importantly, a sense of the increased ROM. We want to affect not only their movement, but their cognition of their movement. This is, we believe, where the greatest harvest is achieved. We are, therefore, encouraged by the remarks.

Llinás RR (2022) [7], describes the evolution of motricity as an internalized embedding of upward moving information. He says, "the system takes properties from the outside and pulls them immediately inside." He says, "Through intrinsic oscillatory properties and electrical coupling, these properties are pulled up the neuraxis and into the



encephalization of the brain.” Then he concludes: “ability to think arises from the internalization of movement.” It is the acquisition of this ability that he refers to as “mindness.” He refers to this acquisition as “mindness,” and we wonder if that is the matter of our work?

There’s a signature component of our therapy that exhibits great potential for deeper study. We call it “finding the rhythm.” It’s the underlying principle that informs every moment of the movement aspect of TragerWork. Introducing a repetitive, rocking motion, while in contact with the subject, invites their body into a state of rhythmic motricity [7]. Done properly, this process is effortless for the mover and feels soothing, hypnotic and deeply relaxing to the receiver. From our experience on the table and off, when that right rhythm is matched and sustained, a new way of thinking and feeling in the body becomes possible for the subject.

Another interesting question has arisen pursuant to this early exploration of the literature. That is the question of vestibular cognition which is raised by Harris LR (2020) [8]. in his Commentary in *Cognitive Neuropsychology*. He proposes that this newly emerging field may have “unexpected implications for our understanding of how the brain works and our ability to provide therapies when neural processes are disrupted.”

The vestibular system, defined Vasković J (2022) [9], is “a somatosensory portion of the nervous system that provides us with the awareness of the spatial position of our head and body (proprioception) and self-motion (kinesthesia).”

This is yet another area that we hope to demonstrate improvement in our young athletes and even potentially overwrite: their faulty sense of self-motion and orientation.

Harris identifies pioneering work done by Robert Bárány on the ability of the vestibular system alone to evoke those perceptions (for which Bárány was awarded the Nobel Prize in 1914). And he describes a nineteenth century medical protocol, centrifuging mental patients, and the calming effect it instilled, not unlike baby-rocking done by mothers of newborns. We have often referred to this natural, biological instinctive behavior to explain the positive effects of our rocking.

In the *Movement 2018* publication, Merrick J, et al. (2018) [6], cite Hebb’s 1949 postulate that one cell exciting another repeatedly produces a change in one or both and they say that this is “not only limited to a particular cell ... but to definable anatomical regions.”

Combining the concepts described by Harris in his review on the vestibular system, and Merrick J, et al. (2018) [6], cell excitation hypothesis, we can swiftly connect to our treatment protocol when we lift a limb, take a handle of some soft tissue, or sink into a pelvis, or a back, or a leg and then introduce rhythmic movement. As we move that limb, rock to and fro, or catch their rebound and play with it, we are finding their rhythm, just like a mother finds the right rhythm to soothe her newborn.

Repeated rocking, encourages this anatomical, regional ‘excitation’ and invokes feelings of deep relaxation, and activation of parasympathetic receptivity. Alternatively, this rhythmic, rocking invokes feelings of awareness, potentially engaging a sympathetic response. We utilize movement in sync with their rhythm to establish “excitation” that results in observable change, not only in cells or anatomical regions, but in the entire organism through that two-way street of its neurology.

(How) We Work with Resistance

In *Movement 2018 - Brain, Body and Cognition*, Merrick J, et al. (2018) [6], cite studies that support environmental enrichment and voluntary activity as consistently beneficial to cognitive abilities, learning, and memory including motor learning and executive function. They discuss findings that indicate the benefits of cognitive exercises and motor imagery on motor performance, as well as benefits of motor training’s positive impact on cognition. Neurological information travels a two-way street. We believe that our work with clients takes advantage of both of these “lanes” for the flow of sensory - motor information.

One of the distinctions of our work from other rehabilitative practices is in our response to resistance that shows up as movement limitations, holding, tension, or perceived tightness. The traditional CP treatment approaches such as constraint-induced movement therapies and botox injection may, in fact, create restriction in the mindness of the patient. Our anecdotal data from the children we’ve encountered has consistently reflected their dislike of these treatments. In most cases, their choice is directed by their parents, which is typically being directed by the professional opinion of their medical team and not by the child, themselves, the one undergoing the therapy. Given that they will ultimately have to surrender their own choice, any opposition they feel will have to be suppressed in order to submit to the protocols. It then succeeds that any results obtained will likely come through the filters of pain, restriction, or resistance.

We submit that physical limitation in a body’s movement or its ROM, may be the result of either structural or functional impairments. In this population, we are primarily focused on functional impairments to their movement. Unlike other modalities, when we encounter an area of limitation, we reduce any implied imposition of force. The remedy we are looking for with our movement is that threshold where a state of “voluntary-ness” is present in the nervous system.

Furthermore, we submit that physical limitation or resistance is an indication of an already present, underlying condition of pain, fear of pain, protection from pain, or the lack of mindness around the ability to conduct said movement. We, therefore, do not force through resistance but rather we look for that threshold where voluntary motricity can take place. We are looking to recruit the willingness of the nervous system to permit movement through a continuum of movement sensations. We do this by working under any resistance rather than through it.

Along the lines of environmental enrichment, we propose that this somatic approach offers the experience of physical / mental enrichment for these children.

And finally, let’s look at the potential role of brain wave states as a measure of the overall harmonics and the cross-neuronal network theory suggested by Leisman G, et al. (2016) [10], in the movement re-education process.

Tuning the Body by Tuning the Oscillatory Timing Mechanism: The Role of Rhythmic Rocking in Somatic Therapy and Re-Education

In *Introduction to EEG- and Speech-Based Emotion Recognition*, Abhang PA, et al. (2016) [11], define brain waves as “oscillating electrical voltages in the brain measuring just a few millionths of a volt.” They identify five presently recognized and relatively understood frequencies and they list them in their Table 1 which we have borrowed (and updated) to represent here:



Table 1: Characteristics of the five basic brain waves.

Frequency band	Frequency	Brain states
Gamma (γ)	Above 35 Hz	Concentration
Beta (β)	12-35 Hz	Anxiety dominant, active, external attention, relaxed
Alpha (α)	8-12 Hz	Very relaxed, passive attention
Theta (θ)	4-8 Hz	Deeply relaxed, inward focused
Delta (δ)	0.5-4 Hz	Sleep

In Chapter 3 of this same text, Abhang PA, et al. (2016) [11], identify delta waves as prominently occurring in brain injuries. Suppression of these delta waves, they say, “leads to an inability to rejuvenate the body and revitalize the brain... Adequate production of delta waves helps us feel completely rejuvenated and promotes the immune system [and] natural healing...”.

As long-time yogis and long-practicing meditators, we are especially curious about the relationship between our work with its signature rocking and the oscillatory timing mechanism (OTM). In particular, how might rocking affect OTM and neurological learning and re-education as part of our somatic movement therapy?

Emerging Questions for Future Study

- Can MYB’s Somatic Movement Re-education and Therapy Program help youth and young adult adaptive sports athletes
 - Reduce injury?
 - avoid surgical intervention?
 - improve sport performance?
- Does the rocking motion of our movement treatment have a direct effect on the vestibular system and what role does that play in improving the subject’s proprioceptive or kinesthetic awareness?
- Is consciousness of this awareness necessary for change to occur, or will the subject experience change regardless of whether they are consciously aware or mindful of what the body is experiencing?

- What role does our signature rocking play in producing ideal neural oscillations?
- Are they foundational to enabling change for the subject?
- When a Practitioner effectively taps that individual’s rhythm through the feeling in their own body and mind or sense of awareness, are they essentially tapping into something greater than just the physical body or the shared mindness that exists between the two?

References

1. Aisen ML, Kerkovich D, Mast J, Mulroy S, Wren TA, et al. (2011) Cerebral palsy: clinical care and neurological rehabilitation. *Lancet Neurol* 10: 844-852. [https://doi.org/10.1016/S1474-4422\(11\)70176-4](https://doi.org/10.1016/S1474-4422(11)70176-4)
2. Damiano DL (2009) Rehabilitative therapies in cerebral palsy: the good, the not as good, and the possible. *J Child Neurol* 24: 1200-1204. <https://doi.org/10.1177/0883073809337919>
3. Marieb EN, Hoehn K (2007) *Human anatomy & physiology*. Pearson Education, United States.
4. Juhan D (2003) *Job’s body: A handbook for bodywork*. Barrytown/Station Hill Press, United States.
5. Leisman G, Moustafa AA, Shafir T (2016) Thinking, walking, talking: integratory motor and cognitive brain function. *Front Public Health* 4: 94. <https://doi.org/10.3389/fpubh.2016.00094>
6. Merrick J, Leisman G (2018) *Movement 2018: brain, body and cognition*. Nova Science Publishers, United States.
7. Llinás RR (2022) *I of the vortex: From neurons to self*. MIT Press, United States.
8. Harris LR (2020) Does the vestibular system exert specific or general influences on cognitive processes?. *Cogn Neuropsychol* 37: 430-432. <https://doi.org/10.1080/02643294.2020.1785412>
9. Vasković J (2022) *Vestibular system*. Ken Hub.
10. Leisman G, Moustafa A, Shafir T (2016) Thinking, walking, talking: Integratory motor and cognitive brain function. *Front Public Health* 4: 6-7. <https://doi.org/10.3389/fpubh.2016.00094>
11. Abhang PA, Gawali BW, Mehrotra SC (2016) *Introduction to EEG- and speech-based emotion recognition, chapter 2 - technological basics of EEG recording and operation of apparatus*. Academic Press, United States.