The Hruska Alternating Reciprocal Rotation Test

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Clinical Application Linked to Forward Locomotor Movement

**For the purposes of this discussion, it would be beneficial if the reader has attended Myokinematic Restoration, Pelvis Restoration, and Postural Respiration. Additionally, much of the information in this paper is found in the Cervical Revolution, Impingement and Instability, and Forward Locomotor Movement courses.*

This test is taught in the Cranial Resolution course. It is my opinion that appropriate application of this test requires attendance of Cranial Resolution due to the extent of neurology and neurophysiology encompassing that course and this test, which is intentionally not discussed in this paper. Please consider this paper as a bridge for those who have not attended Cranial Resolution, but still would like to learn about, and use, this test in their clinical practice.

This test allows the clinician to assess the patient's or client's ability to manage pressure in the cranium, thorax, and pelvis via alternating inhibition of the pelvis, thorax, and cervical spine without the benefit of the soles of the feet touching the floor. This test helps assess cervical position and activity because alternation requires cervical inhibition. **This is a highly integrative test for pelvis and thorax integration due to the required use of the IO/TA.** When paired with reference centers, this is an excellent assessment of one's ability to oscillate through their cerebral hemispheres, due to alternating axial rotation through the use of the hip flexors, IO/TA's, and hip extensors.

As this test challenges the patient's or client's functional cortical dominance, consider this test if they demonstrate "top-down" driven qualities such as a R cranial torsion, OA hypermobility, Superior T4 syndrome, R latissimus dorsi dominance, occlusion-driven patterning, or visual-driven patterning. There are several reasons to consider this test: if the patient or client consistently demonstrates 2/5 on the Hruska Abduction and Adduction Lift tests yet continues to demonstrate inconsistent symptom resolution; their R shoulder remains lower than the L while walking; they originally presented with Patho PEC testing and are now experiencing difficulty integrating the thoracic and pelvic diaphragms during upright tasks without femoral referencing; or they subjectively report difficulty utilizing L lateralization concepts during their everyday activities (sitting, walking, standing, etc…). **This test requires higher cortical and sensory processing**, so the low sensory processed reference centers of the L heel, R medial arch, and R great toe will not be available.

The Hruska Abduction and Adduction Lift Tests are excellent to assesses a patient's or client's ability to integrate the pelvis and femur in the frontal plane and provides evidence that they may be ready to entertain upright transverse plane activities. However, because of the non-upright nature of the HAbdLT and HAddLT, it is difficult to extrapolate those tests to assess dysfunction in the thorax above T8, cervical spine, or cranium. Because the Hruska Alternating Reciprocal Reach Test is upright, integration of the Cervical Ocular Reflex, somatosensory system, and respiratory system can be assessed. The interoceptive sense of pressure and how we use it during alternation is vital for Forward Locomotor Movement, eccentric control, cervical inhibition, and cranial integration, and is

unable to be assessed by the Hruska Abduction Lift Test, Hruska Adduction Lift Test, or the Squat Test. As a result, this test is better utilized if the patient or client demonstrates a 2/5 on the B Hruska Abduction Lift test, or B (-) PART and B (-) PADT, because these test results indicate their pelvic inlets and outlets are not limited in the frontal plane and are potentially ready for **integration of pressure management strategies with the thorax.**

Level 1– *Sit upright with the legs rotated inward and the toes pointing up.*

The patient shouldn't rock back onto the sacrum, or be sitting in excessive TL flexion or extension. If they can't get their knees straight or their legs to turn in, then the pelvis inlets are not adducting, and the outlets are not abducting enough just to sit in the position. However, the patient shouldn't be sitting in excessive TL flexion either, as that indicates the lack of basic alternation strategies of the rib cage. To sit in this position, the thorax must possess minimal alternation qualities of IR and ER. The patient or client should sit up without hip hinging or slouching backwards with their head and face looking straight ahead. They should feel weight on the back of their heels, **as they should be holding themselves in this position with their IO/TA, not the TFL.** Their eyes should stay parallel to the floor for the duration of the test to assist with promotion of alternation through the occiput, sphenoid, maxilla, mandible, extraocular muscles, and cervical spine.

The inability to perform Level 1 correctly indicates either a lack of inlet adduction or lack or rib cage IR, but usually both. This is the first level where pressure management becomes an issue because from this point on, alternating pressure management ***is*** the test. If they can't manage pressure bilaterally and breathe while in this position, they won't be able to do it in an alternating fashion.

Reference centers and corollaries include L ischial tuberosity (moderate), L cranial de-rotation (moderate), L IO/TA (high), L anterior hip capsule (high),

PRI Non-manual techniques to consider for improved performance of Level 1:

All 4 Belly Lift Walk

Stair Short Seated Balloon

Level 2 - *Lift the R leg up, advance it forward, and set it back down again.*

This promotes the R anterior inlet to work correctly and facilitates shifting onto the L ischial seat correctly by pushing the L leg/heel into the surface. It is not a requirement that they lift their R leg up before advancing it forward; sensing their center of mass shift to the L and load their L ischium by sliding their R leg forward rather than lifting it is acceptable. They should feel the L IC adductor as they should sense compression on the L ischium. At this stage, the L medial hamstring and R lateral hamstring are working together to help keep the center of mass shifted to the left. As a result, they should feel weight in their L heel on the surface, but not the R heel.

This position also promotes sternum and sacrum rotation to the left. At this point, L thorax compression, courtesy of the L IO/TA, and L inlet adduction allow ascension of the L diaphragm so it can become better leveraged for inhalation and the R diaphragm better leveraged for postural

stability. The neuro-compressive L scapular position allows compressive sense from the L scapula into the thorax, through the pelvic inlet, and towards the outlet (ischium). This position is deliberate as it sets the stage for proper L ZOA and PME acquisition and maintenance using the L IO/TA.

By keeping the eyes parallel to the floor, the occiput is rotated and laterally flexed to the right, which allows the L eye to move forward, facilitating activity from the superior oblique muscle and the potential for peripheral optic flow. This position promotes elevation of L transverse process of C1, which moves the occiput and promotes the L greater wing of the sphenoid to elevate. This facilitates the L temporal bone to IR and the mandible to orient to the R, which permits the mandible to have the freedom of movement to properly perform lateral trusion to the left correctly. This position compresses the anterior aspect of the L thorax through rib cage retraction.

One key to observe during this stage of the test is the patient or client should lean towards the left to help unweight the R leg so it can advance forward. However, **this trunk lean to the L should include L thoracic lateral flexion with the L IO/TA**, rather than merely falling to the L or achieving this position with thoracic extension or hip hinging. Additionally, as they set their R heel down to the table or floor, their center of mass should not shift back to the right as they should be able to maintain their lateralization to the left.

Inability to perform Level 2 indicates possible overactivity of R posterior pelvic inlet, weak L IC adductor, lack of L thoracic abduction, cervical muscle overactivity, or R QL/L psoas overactivity. Level 2 sets the body up for optimizing compressive strategies on the L and decompressive strategies on the R in Level 3. Reference centers and corollaries include R mandibular lateral trusion (low), L ischial tuberosity (moderate), R posterior hip (moderate), R canines/L molars (moderate), L vertical leg displacement (moderate), L cranial de-rotation (moderate), L IO/TA (high), and L anterior hip capsule (high).

PRI Non-manual techniques to consider for improved performance of Level 2:

Supine Supported R iliacus

Left Stance in L AF IR Position from the L AIC Pattern

Level 3 – *Maintain the position in Level 2 while reaching the L arm forward and R arm backward.*

While keeping the eyes parallel to the floor and the sternum and sacrum rotated to the L, the system is now in R AIC/L BC/L TMCC position with the L rib cage in relative IR and the R rib cage in relative ER. The eyes need to remain parallel to the floor during respiration to promote proper EOM and Vestibular Ocular Reflex activity, as well as cranial and cervical position as described in Level 2.

The L thumb should be up and the fingers open to promote wrist extension and supination to stay out of wrist flexion and pronation. The L long head of biceps and brachioradialis are required to pair with the L medial hamstring for humeral depression, a properly inhibited R latissimus dorsi, and R posterior deltoid to inhibit the L upper trap as a stabilizer of the upper trunk so the sensation of pressure can be appreciated on the L side of the body and R hemisphere of the brain.

Of particular interest is the R scapula and humerus. Provided the patient or client is able to maintain L ZOA and PME with the L IO/TA, the R scapula should move into ER without tipping anteriorly.

Many times, anterior tipping of the R scapula occurs as they perform only humeral extension without scapular ER. Additionally, the R humerus should be minimally abducted relative to the R side of the body, but not so much abduction that the shoulder is performing abduction and not extension. If the R scapula does not move into ER well, consider Sidelying R subscapularis #1. However, if the R scapula is moving into ER, but the R humerus is moving into abduction rather than extension, consider Seated R subscapularis #2 as humeral extension provides better leverage to the R low trap and triceps during this movement.

Like the Hruska Abduction and Adduction Lift Tests and the Squat Test, proper performance of Level 3 has particular significance. Proper R scapular ER and L scapular IR allows for proper compression of the L thorax onto the adducted L inlet. From the I&I course, "without compression of the L scapula on the L thorax, concomitant upward push from the L pelvis and ground would be reduced and difficult to sense." The key component is the downward compression of the L scapula onto the L thorax as it helps the L IO/TA to maintain a L ZOA and L PME. **The compressive sense of the L scapula towards the L ischial seat allows the R humerus to move more easily into extension and R scapula into ER due to R thoracic decompression.**

This position promotes L low trap/serratus anterior activity to assist the L IO/TA for maintenance of a L ZOA, which is the key to keeping the sacrum and sternum rotated to the L during R trunk rotation. The L medial hamstring is working with the L IO to assist in proper L pelvic inlet and outlet position for pressure management so the L thorax and diaphragm can descend onto a stable and cooperative pelvic floor during inhalation without spinal extension as a compensation strategy.

Reference centers and corollaries include those from Level 2 as well as R horizontal arm swing (low), R lateral rib cage and R scapula (moderate), L PME below T8 (high), R thoracic decompression (high), and L pelvis lateral displacement (high). Of the 13 potential reference centers and corollaries available during this test, Levels 3 and 5 provides the opportunity to sense all of them.

PRI Non-manual techniques to consider for improved performance of Level 3:

Standing Cervical-Cranial Repositioning

Standing Supported Passive L AF IR with Right Trunk Rotation

Standing Left Posterior Mediastinum Expansion with Resisted Right Diagonal Flexion

Level 4 – *Advance L LE forward and R UE towards the L foot and L UE backwards* ***simultaneously.***

At this level, the system is permitted to somewhat re-pattern into the functionally cortical dominant L AIC/R BC/R TMCC pattern, but with specific references designed to eventually inhibit the pattern.

The primary reference to sense is L ischium contact with floor. This is important because it promotes the integration of the R serratus anterior so it can assist in the patient or client in their return to the R AIC/L BC/L TMCC pattern in Level 5. The movement at Level 4 should be simultaneous with the L leg and R arm going forward **without losing sense of the L ischium** as an indication of the patient's ability to use the R serratus anterior to initiate the process of eventually returning to the left side.

This level is a fluid motion to help the R hemisphere of the brain link the compression of the L ischial tuberosity (moderate) with R horizontal arm swing (low) and R lateral rib cage and R scapula (moderate). They should sense simultaneous movement of the R scapula on the R thorax and the L ischium contacting the floor in preparation for Level 5. This is a feedforward activity using the R serratus anterior primarily, and the R low trap secondarily, to initiate sternum rotation to the L and to set the R triceps up for eventual R humeral extension and scapular ER.

If the patient or client is unable to maintain a sense of L ischium compression, they would probably benefit from a R serratus anterior integration program.

PRI Non-manual techniques to consider for improved performance of Level 4:

Left Stance in L AF IR Position from the L AIC Pattern with R Upper Extremity Resisted Reach (emphasize the L ischial seat, L IO/TA, and R thoracic decompression reference centers rather than the L calcaneus and R medial arch)

Standing Right Lunge with Bilateral Knee Flexion and Right Trunk Rotation

Scapular Compressive Locomotor Movement

Level 5 – *Advance R LE forward and L UE towards R foot and R UE backwards* ***simultaneously***.

While Levels 3 and 5 appear to be the same, there are several key differences. For example, Level 3 had the benefit of Level 2 helping set the L pelvis and thorax up for successful compressive sense. Level 3 is a deliberate, compressive moment of the L thorax with the L scapula onto a deliberately adducted L pelvic inlet. By contrast, Level 5 is a **flowing movement** coming immediately after the body was allowed to somewhat re-pattern into the L AIC/R BC/R TMCC pattern.

However, because the sense of the L ischial tuberosity was never lost in Level 4, and it was paired with the movement sense of the R scapula via the R serratus anterior, Level 5 is now assessing the compressive nature of the R scapula on the decompressed R thorax. The performance of the R scapula as it performs ER is the hallmark of this level. If they perform only humeral extension, or anterior tipping of the R scapula, or incomplete scapular ER, then compressive sense of the R scapula on a decompressed thorax becomes the treatment objective. Therefore, Level 5 can be viewed as an assessment of R subscapularis integration, which requires intentional integration of the L IO/TA, deliberate forward reaching of the R leg, and a clear sense of the L ischium.

From I&I: "The R scapula can begin simultaneously compressing the L thorax through contralateral downward force on the thorax, provided by the downward, internally rotating L scapula and externally rotating R scapula, and extending R humerus."

From I&I: "The right upper extremity and left lower extremity need to re-supinate during 'push back' of the right shoulder and elbow, and 'push down' of the left scapula as simultaneous 'ground push' is sensed by the left lateral ankle and forefoot." Level 5 is assessing if the R UE can perform this task so that when the patient or client does stand up, the pelvis, thorax, scapulae, neck, and cranium are able to interact with the L calcaneus and talus for destabilization of the over-supinated R foot.

A unifying concept between Levels 4 and 5 is the concept of flow. If they can flow from Level 3, through Level 4, and back to Level 5 properly, several key concepts of the Forward Locomotor Movement course are able to be achieved and integrated. The L arm is travelling through late reach into pull back as the R arm is moving from palm out into late rise. These phases are paired with the L hemi-chest's movement from anterior compression to late compression while the R hemi-chest is moving from mid decompression towards late decompression. Finally, the L visual system is moving from early to late peripheral propulsion while the R visual system is moving from mid to late divergence. If they were standing, the next phase in FLM would be the Double Support Phase. However, this test is assessing their ability to engage in "delay", which is novel experience for the somatosensory system and R cerebral hemisphere. Without this novel experience of delay, their ability to perform alternating and reciprocal tasks will be stunted because the foundational sensation of reciprocal alternation is that the body has two sides. The idea of needing to train the R side of the body becomes significantly easier and less relevant once the VOR, cranium, mandible, cervical spine, thorax, respiratory system, and pelvis have sensed and experienced alternating upright lateralized flow.

The reference centers and corollaries are the same as in Level 3. However, the primary areas of focus are the R horizontal arm swing (low), R lateral rib cage and R scapula (moderate), L cranial de-rotation (moderate), L PME below T8 (high), and R thoracic decompression (high).

The ancillary benefit of the flow from Level 4 to Level 5 is the alternating nature of the cervical spine and cranium. In Level 4, the R TMCC pattern should be present. During the transition to Level 5 and the focus on the R scapula in both levels, inhibition of the R TMCC pattern is possible. The elevation of the L transverse process of C1 in conjunction with R cervical lateral flexion helps facilitate occipital R rotation and elevation of the L wing of the sphenoid. This process promotes IR of the L temporal bone and ER of the R temporal bone, which is the hallmark of cranial decompression as well as alternation and oscillation of the maxilla, palatine bones, and mandible. The COR can be inhibited so the VOR is more available as a visual behavioral pattern, which can promote increased accessibility to L peripheral optic flow. This alternation reflects supra- and infrahyoid inhibition, voice box resonance, and cranial expansion.

Levels 4 and 5 asks the patient or client to lose all the elements they meticulously attained in Levels 1-3 by moving into Level 4; then re-attain all of those same elements they had at Level 3 as they flow from Level 4 to Level 5. Level 5 is the height of reciprocal alternation through the pelvic inlets and outlets, thoracic region, scapulae, cervical spine, and cranium, while integrating the VOR.

These elements are required for the body to understand how to perform, and benefit from, heel strike because (from the FLM course) "peripheral awareness at the time of heel strike associates cerebral and cerebellar understanding and behavior with 'initiation' of the gait cycle. Lack of peripheral visual awareness at heel contact result in calcaneus instability and promotes overuse of the rectus femoris for strategic proximal, compensatory control at the hip. This results in an increase in unwanted, poorly controlled acceleration of the trunk." Flow and anticipated alternation of hemi-chest and arm movement provides necessary information to the basal ganglia, which is necessary not only for movement generation, but for cessation of movement. This test provides a wealth of information required for FLM, despite not standing.

PRI Non-manual techniques to consider for improved performance of Level 5:

Scapular Compressive Overhead Locomotor Movement

Long Seated Integration Alternating Crossovers

Propulsive Stair Ascention

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