The New Language of Movement
Clinical Integration of Movement
Brandon Hetzler

Question 1

1. What is the problem?
   A. How do we fix it?
   B. Jump Math

.470 sec
@2.45 m/sec

Question 2

1. What is the protocol to restore a squat?
   A. why is teaching a squat so hard?
Question 3

1. Every patient - what is your #1 clinical priority. Every time.

17 yo Female Basketball Player; 8wks Post ACLR (BPB); Season starts in 8 weeks

- Full EXT, lacking 5 degrees FLX
- Trace Effusion
- 4/10 pain
- KOOS - 65% disability score
- Noticeable limp
- Puffy Dark Pink Keloid scar
- Posterior knee pain
- 22% strength asymmetry
- FMS - 7 (13 at risk factors)
- SFMA - All DN

Question 4

1. Que es esto?

A little about me.

- Manager for Mercy Sports Medicine
- Owner Movement Restoration, LLC. and Outlaw Movement Systems, LLC.
- Clinically practicing AT for 18 years.
- Former FMS Instructor
- Former Senior StrongFirst instructor
Mercy Sports Medicine

- Staff of 10 Clinicians (18 people)
- AVG: 110 ACLR, 95 Shoulder Surgeries, 10 Hip Scopes, 20 "Totals" / year
- AVG Return to Sport - 22 weeks
  - AVG return to ____ - 26 weeks
- ACL 5 year re-tear rate - 0.2%
- Anterior Knee pain - Only clinical site
- Infections 1%, Manipulations (.005%)

Our Process

Neurodevelopmental Continuum

- Movement is an expression of nature
- Nature Has Rules
- Creation of Symmetry
- Breaking Symmetry
Priorities
17 yo Female Basketball Player; 8wks Post ACL/R (BPB); Season starts in 8 weeks
• Full EXT, lacking 5 degrees FLX
• Trace Effusion
• 4/10 pain
• KOOS - 65% disability score
• Noticeable limp
• Puffy Dark Pink Keloid scar
• Posterior knee pain
• 22% strength asymmetry
• FMS - 7 (13 at risk factors)
• SFMA - All DN

PRIORITIES

☐ Effusion / edema
☐ Acute Pain
☐ ROM WNL
☐ Weight bearing
☐ Postures & Patterns
☐ Other Pain
☐ Strength / Capacity / Fitness

Tq

• JMD, TED, ROM restrictions, scar tissue, adhesions, capsular restrictions, trigger points, hypertonicity…
• Healthy tissue should accept pressure without pain/tension.
1. Mobility. 2. Stability

Input-output

input  feedback  output

Tq Goals:

• Break the cycle, open a window of opportunity?
• Joint mobilization
• Joint manipulation
• Neural glides
• ART
• PRT
• Graston
• Mulligan
• Cupping
• Trigger point work
• Massage
• Mobilization with Movement

Shoulder “Pinch”

Low back Pain

Strong Evidence:
SBL
B.FL
F.FL

Mod-Strong Evidence:
SPL
LL

No Evidence:
SFL
### POSTURES vs PATTERNS

<table>
<thead>
<tr>
<th>POSTURES</th>
<th>PATTERNS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPINE</td>
<td>DIAPHRAGMATIC BREATHING</td>
</tr>
<tr>
<td>PRONE</td>
<td>HEAD CONTROL</td>
</tr>
<tr>
<td>QUADRUPED</td>
<td>PUSHING DOWN</td>
</tr>
<tr>
<td>SITTING</td>
<td>WEIGHTSHIFTS</td>
</tr>
<tr>
<td>KNEELING</td>
<td>PERTURBATIONS</td>
</tr>
<tr>
<td>VERTICAL STANCE</td>
<td>DISSOCIATION</td>
</tr>
</tbody>
</table>

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The NDC
“Strength and movement Grow together”

• Movement is Complex, not complicated.
• The NDC is the roadmap to movement
• everything is integrated, isolation does not exist
• Repeating Series of patterns

Scapular Dyskinesis
• Where does scapular stability originate from?
Hidden patterns in the TGU

- Dissociation
- Perturbation
- Weight Shift
- Pushing down
- Breathing
- Head Control

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<table>
<thead>
<tr>
<th>LOWER BODY ARCHETYPES</th>
<th>UPPER BODY ARCHETYPES</th>
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</thead>
<tbody>
<tr>
<td>SQUAT</td>
<td>HANG</td>
</tr>
<tr>
<td>DEADLIFT</td>
<td>FRONT RACK 1</td>
</tr>
<tr>
<td>PISTOL</td>
<td>FRONT RACK 2</td>
</tr>
<tr>
<td>LUNGE</td>
<td>PRESS</td>
</tr>
<tr>
<td>SYMMETRICAL FINISH</td>
<td>OVERHEAD</td>
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<tr>
<td>ASYMMETRICAL FINISH</td>
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<tr>
<td>ASYMMETRICAL DEADLIFT</td>
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<tr>
<td>ASYMMETRICAL SQUAT</td>
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</table>

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C

7 Fundamental Patterns of Movement

STRATEGIES
- PUSH/PULL
- DEADLIFT
- SQUAT
- ASYMMETRICAL
- TRANSITIONS

What is the fundamental piece of a car?
Why does teaching the squat suck?

Ya'll should come up with some way to keep everyone consistent - like a pie chart or something.
What determines progression?

1. ROM
   - Effusion
2. Movement Profile
3. Tissue Physiology
4. Strength

Movement Profile

<table>
<thead>
<tr>
<th></th>
<th>End of Acute Rehab (8-10w)</th>
<th>End of Phase 2</th>
<th>Ready for Sport</th>
</tr>
</thead>
<tbody>
<tr>
<td>no pain</td>
<td>no pain</td>
<td>no pain</td>
<td>no pain</td>
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<tr>
<td>&lt; risk factors on</td>
<td>&lt; risk factors on</td>
<td>&lt;2 risk factors</td>
<td>&lt;2 risk factors</td>
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<tr>
<td>FMS</td>
<td>FMS</td>
<td>on FMS</td>
<td>on FMS</td>
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**Strength Profile**

<table>
<thead>
<tr>
<th></th>
<th>Deadlift</th>
<th>Squat</th>
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<tbody>
<tr>
<td>End of Acute Rehab (8-10w)</td>
<td>50% bw</td>
<td>25% bw</td>
</tr>
<tr>
<td>End of Phase 2 BW</td>
<td>BW</td>
<td>50% bw</td>
</tr>
<tr>
<td>Ready for Sport 150% bw</td>
<td>BW</td>
<td>BW</td>
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</table>

**Why BW??**

<table>
<thead>
<tr>
<th></th>
<th>forces</th>
<th>time</th>
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</thead>
<tbody>
<tr>
<td>Running</td>
<td>2-5x bw</td>
<td>.15 sec</td>
</tr>
<tr>
<td>Vertical Jump</td>
<td>3-9 x bw</td>
<td>.114 sec</td>
</tr>
<tr>
<td>KB Swing*</td>
<td>2-5 x bw</td>
<td>.175 sec</td>
</tr>
</tbody>
</table>

**KB Swing**

- Shoulders Back
- Hips Forward
- Knees Back
- Universal raise CoM
- Bell Forward
KB Snatch

The 4 Horsemen of Adaptation
Questions?
Melior Via: A Better Way to Integrate and Restore Movement into Orthopedic Rehabilitation

by Brandon Hetzler MS & Brian Mahaffey MD

We call our approach Movement Integration Theory. We have developed standardized nomenclature, raised the quality of care and defined and improved short- and long-term outcomes. We have lowered costs to health care insurance payers, patients, hospitals, clinics, and other rehabilitation venues.

Abstract

Movement develops uniformly and predictably in all normal newborns and infants. The genetic roadmap for every complex movement that will ever be performed is written into every infant’s nervous system and develops from these basic ingredients: unlimited mobility, an undeveloped nervous system, primal reflexes, and breathing. Following an injury, surgery or trauma, restoring movement is the same as learning movement only with slightly differing parameters. The principles, however, remain the same and can be used to improve orthopedic rehabilitation.

Introduction

Melior Via - “A Better Way”

Movement is universal. Unfortunately, our movement language and our clinical understanding of movement are not. In the profession of medicine, universal and standardized language is both required and expected. As health care providers, we demand and expect standardization in order to provide our patients the safest, most effective and highest level of care. In the rehabilitation (rehab) profession that universal standardized terminology is frequently absent. When we say “squat” to 20 rehab professionals (Certified Athletic Trainers “ATCs”, Physical Therapists “PTs”, Occupational Therapists “OTs”) there may be 20 different mental pictures of what a squat is; yet professionally we make broad generalizations for/against squat exercise (“Squats are bad for your knees”; “post op anterior cruciate ligament (ACL) patients shouldn’t do squats”; “the best quad activation exercise is the straight leg raise”).

The problem is we are viewing movement wrong. Movement is complex but not complicated. We as professionals have unnecessarily complicated things. For the past 25 years, we have looked at and described movement through the lens of exercises - squat, lunge, push, pull, crawl, etc. What is a squat from a movement perspective? If we asked physicians for the generic name of Vicodin most are able to recall hydrocodone-acetaminophen easily. Every licensed rehab professional has to have a minimal level of didactic education, pass national boards, and gone through the state’s licensure process. Yet asking a rehab professional “What is the generic form of a squat?” is like asking them to explain String Theory. Why is
a simple movement question so difficult? We believe the reason is for many years we have universally looked at movement from the wrong perspective.

If we reduce movement to its most basic generic form, we have a starting point. The nice thing is that we can do this and even better, it has been studied. Normal movement develops predictably for all normal humans. The Neurodevelopmental Sequence (NDS) is our blueprint for a universal movement language. The neurodevelopmental sequence is the development of movement behavior sequentially progressing according to movement principles. The primary problem with the NDS in the medical world is that often it is seen as a set of milestones. There are milestones, but the process of going from a generally immobile (unable to get from point A to point B), breathing, crying, eating and sleeping infant to a mobile, complex, functioning child in only two years is so much more than just developmental milestones.

The NDS is our first experience with developing independence. The newborn learns to move through somatic, visual, vestibular, and proprioceptive feedback. As a parent, our primary job in our children’s development is to keep them safe, feed them, and to provide a sensory rich environment - we don’t instruct or coach them. They learn to move through feel and by doing, not by instruction. If this is how we learn to move in the first place, then why wouldn’t we go back to this methodology to restore movement after an injury, trauma, or surgery? How is retraining someone to squat after an anterior cruciate ligament reconstruction (ACL) any different than a 10-month-old learning to squat? We have learned it’s not that much different.

The beauty of the NDS is that it is a sequential progression of the infant from being ‘ground bound’ to being vertical and upright. The only ingredients provided to make this occur are the ability to breath, unlimited mobility, an undeveloped nervous system (Sidenote: humans are the only species on the planet born with an undeveloped CNS), and a few survival reflexes (the rooting reflex, the palmar reflex, the Moro reflex, etc). Other than that, movement is learned by feel and error.

If we adjust our perspective to view movement through the lens of movement and not exercise, there are several repeating patterns within the NDS we can successfully use in the orthopedic and rehab world. Nature uses repeating patterns to add strength to her structures - a spider web, trees, shells, rock formations, snowflakes, bones, etc. The same happens with movement. We build every movement from a series of postures and patterns that are the root of all movements. These postures are, progressing from lowest level to highest complexity. (See Figure 1.)

- Supine - lying on the back.
- Prone - lying on the belly.
- Quadruped - suspended off the ground on the hands and knees or feet.
- Sitting - a vertical trunk position over the hips which maintain contact with the ground.
- Kneeling - a vertical trunk position over the hips when the hips are off of the ground; knees/shins/feet serve as the point of contact with the ground.
- Standing – the entire body is vertical and feet are the only contact point with the ground.
- There are also a series of repeating patterns, again progressing from the least complicated to the most complicated:
  - Breathing - the mechanics of breathing and ventilation utilizing the diaphragm for both the inhale and the exhale.
  - Head movement - controlling the head in response to the surrounding environment and visual as well as vestibular input in any posture.
  - Pushing down - taking advantage of the ground reactions forces from any posture by pushing down into the ground/implement.
• Weight shifting - shifting weight between varying points of contact with the supporting structures in all planes (anterior/posterior; medial/lateral, combined/coordinated).
• Perturbations - using the extremities independently or in combination to make a weight shift larger or more extreme; moving the hand/foot away from the body/midline.
• Dissociation - any position where the shoulders are not stacked on top of the hips or lined up with the hips; any position where there is rotation of the spine.

Every neonate is born in a universally flexed posture (supine) with only the ability to breath. As newborns get experience breathing, they gain head control. This in turn forces them to press down onto the ground to move their head which begins to elicit a weight shift within the body. Perturbations are controlled and conscious movements of the limbs that increase these initial small weight shifts. Initially, the limb movement in newborns is uncontrolled, spastic and without intent. Once these perturbations go far enough, the body begins to rotate and dissociations occur causing them to roll over. Dissociation is the final component of stability to develop because it puts the spinal cord into the most compromising position and is the greatest risk to the neonate’s survival. This same process occurs in each of the postures because the patterns are essentially how humans develop stability. Stability is rooted in the ability of the diaphragm to functional optimally. Essentially the building blocks for all movement are unlimited mobility, diaphragmatic breathing and a nervous system that is incomplete. The newborn uses only this to establish all of their future movements.

We stated earlier that we usually get several interpretations of what a ‘squat’ actually is. If we apply these developmental movements to create a consistent generic description of the squat what we get is symmetrical stance (the posture) coupled with two main patterns - pushing down and a coordination of three weight shifts (a posterior weight shift of the lower leg, an anterior weight shift of the pelvis, and a posterior weight shift of the trunk). With this description rehab professionals are on the same page in their ability to care for patients. Keep in mind that a squat is learned opposite of how we typically attempt to teach it; squatting begins form the ground, not from standing.

As we developed our book, Movement Restoration Project,1 (see book review sidebar), we have applied this process for the past five-plus years in a clinical setting to rehab patients from age 6 to 86 as well as in the realm of sports performance and fitness where literally thousands of active individuals have followed our approach.1 This is now our universal methodology for treating patients. Annually, we see 100+ posts-op ACLR patients. A graduate student from Missouri State University in the athletic training Master’s Degree program recently did her thesis on the re-tear rate of patients that have been released from our long-term ACLR program which is based on the NDS. What she found was that in five years, the re-tear rate was zero. The average return to sport participation was 21 weeks.2

Another interesting thesis study researched the prevalence of anterior knee pain in post op ACL patients and had some remarkable findings.3 The most constant predictor of the likelihood of anterior knee pain was the rehab facility location. Not graft type, not rehab type (accelerated vs. conservative), not age, not gender, but rehab location. The rehabilitation location with the fewest episodes of anterior knee pain and the fastest resolution of anterior knee pain applied the clinical principles from Movement Restoration Project.

Why is this important? In the ever restricting realities of health care, orthopedic patients are allowed fewer rehabilitation visits with greater co-pays. We as health care providers owe it to the patient to use the most efficient and effective techniques to get the best outcomes and keep their rehab costs down. We also wish to provide the best long term outcomes so that patients don’t suffer a re-injury or other problem that might be prevented by rehabilitation using Movement Restoration Project principles. Many conventionally treated post op knee patients (ACL, or total joints) again become patients three to five years later for “anterior knee pain.” We believe based on studies of our rehab techniques2,3 that more widespread application of our techniques is warranted.

Movement Restoration Project Principles

On intake, every non-acute patient is run through an SFMA (Selective Functional Movement Assessment) and every post op patient is run through an SFMA once they have full range of motion (ROM) and effusion is controlled. We don’t initiate any treatment without a movement assessment. The role of the movement assessment is to pinpoint areas of movement pattern limitation and asymmetry.4 Looking at patterns of movement allows us to get a better and more complete assessment as opposed to looking at a very specific area. If our global assessment directs us to focus on a specific joint (for example finding a hip joint mobility dysfunction on the SFMA) at that point we will begin
From the SFMA, in conjunction with the patient’s diagnosis and symptoms, a treatment plan is developed to address soft tissue quality, postures, patterns and loading. From the SFMA, we can accurately determine which posture we need to begin in and which pattern will have the most impact, based on Table 1. Based on this chart of the SFMA top tier, we can focus our interventions on the most influential posture and pattern for the individual’s complaint/diagnosis. If we follow the SFMA all the way through its breakouts, we can further narrow our interventions from the top-tier. For example, if the Multi-Segmental Rotation Breakout directs us to a tibial external rotation Stability Motor Control Dysfunction (SMCD), we know that based on NDS that our best results will be in the sitting postures, working on dissociation. Additionally, from both the SFMA and the FMS (Functional Movement Screen) we can apply this same approach towards soft tissue interventions. We favor the fascial lines laid out by Thomas Myers in Anatomy Trains. A recent systematic review by Wilke et al. looking into Myers fascial lines suggested that most of the skeletal muscles that Myers linked in his fascial lines actually are directly linked by connective tissue. By clinically mirroring our soft tissue strategy with our intervention strategy each works as a synergist for the other.

We base part of our discharge ‘release’ on each patient clearing an FMS. We don’t require a minimal score, but we expect to get our patients to being symmetrical on every test and to minimal standards (a 2 in FMS terms). We use this on each patient to make sure we are not missing anything important. Just like on the SFMA, if we identify an area on the FMS that is not symmetrical or that doesn’t meet minimal standards, we can use that to determine which postures/patterns need further attention, as seen in Table 2.

**Table 1**

<table>
<thead>
<tr>
<th>SFMA</th>
<th>Posture</th>
<th>Patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cervical Patterns</td>
<td>Sym. Stance</td>
<td>Head control</td>
</tr>
<tr>
<td>Shoulder Patterns</td>
<td>Sym. Stance</td>
<td>Perturbations</td>
</tr>
<tr>
<td>MSF</td>
<td>Sym. Stance</td>
<td>Weight shift (trunk-anterior/Pelvis-posterior)</td>
</tr>
<tr>
<td>MSE</td>
<td>Sym. Stance</td>
<td>Weight shift (Trunk-posterior/Pelvis-anterior)</td>
</tr>
<tr>
<td>MSR</td>
<td>Sym. Stance</td>
<td>Weight shift, Disassociation</td>
</tr>
<tr>
<td>SLS</td>
<td>Single Leg Stance</td>
<td>Weight Shift (Medial/Lateral), Perturbation</td>
</tr>
<tr>
<td>DS</td>
<td>Sym. Stance</td>
<td>Pushing down, Weight shift (trunk-anterior/Pelvis-posterior), perturbation</td>
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</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>FMS</th>
<th>Posture</th>
<th>Patterns</th>
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</thead>
<tbody>
<tr>
<td>ASLR</td>
<td>Supine</td>
<td>Weight shift, perturbation</td>
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<tr>
<td>SM</td>
<td>Sym. Stance</td>
<td>Perturbations</td>
</tr>
<tr>
<td>RS</td>
<td>Quadruped</td>
<td>ML Weight shift, perturbation, disassociation</td>
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<tr>
<td>TSPU</td>
<td>Prone</td>
<td>Weight shift, push down</td>
</tr>
<tr>
<td>DS</td>
<td>Sym. Stance</td>
<td>Push down, AP weight shift, perturbation</td>
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<tr>
<td>ILL</td>
<td>Asym. Stance</td>
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</tr>
<tr>
<td>HS</td>
<td>Single Leg Stance</td>
<td>ML Weight shift, perturbations</td>
</tr>
</tbody>
</table>

**BOLDED** are the dominate patterns of each test

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Case Presentation

We recently treated a 16-year-old baseball pitcher suffering from 10 months of right shoulder pain. He had no acute injury, X-rays were normal, and an MR Arthrogram showed no structural defects. Three steroid injections were ineffectual; traditional physical therapy targeted to strengthen his rotator cuff and stretch his posterior capsule had failed; chiropractic care had also failed. The most recent orthopedic recommendation was surgery. On intake into our department all special tests were normal, strength was normal, the only ROM deficit was in internal rotation, and multiple postural deficits were observed, along with a SFMA that directed us towards a
single leg stance dysfunction. After addressing this and progressing to the FMS (where he fell below minimum standards on the shoulder mobility and trunk stability push up tests) within three weeks he was pain free and returned to light hitting and throwing. At four weeks he was pain free with all activity and had made a full return to competitive pitching. The SFMA and FMS directed our clinicians to very specific postures, movement patterns, and trigger points to effectively and efficiently resolve problems that had not responded to many months of traditional treatment.

Conclusion

The techniques we have described above are based on how neonates and infants first begin to acquire movement. A common misconception is that our approach is to get people to move like babies. Our philosophy and clinical approach utilizes principles that infants use to learn movement and progress through the NDS. We have identified these root principles and effectively applied them to improve and hasten rehabilitation after various injuries and orthopedic procedures.

We call our approach Movement Integration Theory. It is not a system, which indicates exclusiveness, but a theory which can be successfully applied into any system. We have developed standardized nomenclature. We have developed a process where our large staff of rehabilitation healthcare professionals is interchangeable from patient to patient. We have raised the quality of care and defined and improved short and long term outcomes. We have lowered costs to health care insurance payers, patients, hospitals, clinics and other rehabilitation venues. We would encourage those interested in learning more about Movement Integration Theory to contact the authors.

References


Disclosures

None reported.

Source: Amazon.com