1. The lumbar spine is Main Street at the crossroads of the body, reacting and transmitting everything that is happening above it and below it.

2. Three Dimensional Spinal Coupling is movement in any one plane of the vertebral column accomplished by movement in the other two planes.

3. Transverse plane motion can be effectively transmitted through the lumbar spine, both upward and downward, when other appropriate tri-plane motions are occurring in the segment above and the segment below.

4. Balance reach tests are an effective evaluative process to determine what forces and what motions are contributing to the lumbar pain and dysfunction.

5. Lunge testing combined with upper extremity reaches create an opportunity to assess how the lumbar spine is dealing with motions and forces from below and from above.

6. Functional manual therapy techniques are a critical component of lumbar rehabilitation.

7. Three Dimensional Coupling must be constantly appreciated and taken advantage of with all functional rehabilitative techniques.

8. Training and conditioning the lumbar spine requires that the lumbar spine progressively be allowed to react at both ends and in all three planes of motion.

9. Three Dimensional Coupling loading can be accomplished with lunging combined with upper extremity reaching with tweaking with the use of free weights.

10. Biomechanically understanding what the lumbar spine does during the golf swing allows us to realize our need to understand what the lumbar spine does in all forms of function.

11. The hamstrings are powerful three dimensional decelerators and accelerators of motion in the golf swing as well as in all forms of function.

12. Functional Chain Reaction concepts clearly describe what we really see and identify the causes of what motions and reactions are occurring.

13. Research studies are reinforcing our observation and description of three dimensional function including reaction before action and loading before unloading . . . proving Chain Reaction.
OBJECTIVES FOR THE LUMBAR SPINE

FUNCTIONAL GUIDE

To assimilate up-to-date information and knowledge about the lumbar spine and its dependencies on the rest of the body.

To learn how to apply effective functional techniques when testing, training and rehabilitating the lumbar spine.

To understand and appreciate the tri-plane Chain Reaction principles as they apply to the lumbar spine.

HOW TO USE THIS FUNCTIONAL GUIDE

This functional guide can be used as a convenient summary of the program's contents to take with you after viewing. You can also use this guide as a notebook; space has been provided so that you can make notes on relevant tracts as you watch them.
The blessing of playing ball with your kids

Strategy 1
Strategically understanding that most function, including cutting wood, is a “lumbar sport”

Strategy 2
Strategically realizing that the lumbar spine potentially has the opportunity to be the strongest link in the body

Strategy 3
Strategically allowing the lumbar spine the opportunity to do what it likes to do . . . and that is to react in all three planes

Strategy 4
Strategically taking advantage of all other body parts and links in order to fully understand the **Chain Reaction** and the role of the lumbar spine

Strategy 5
Strategically appreciating that the lumbar spine is truly the transmitter of transverse plane forces and needs to be fed the right transverse plane information so it can transmit that information
Strategy 6
Strategically taking advantage of what the rest of the body does to and for the lumbar spine and taking advantage of what the lumbar spine does to and for the rest of the body

Strategy 7
Strategically understanding relative versus real motion in spinal mechanics

Strategy 8
Strategically applying the understanding of Three Dimensional Coupling

Strategy 9
Strategically analyzing, rehabilitating, training and conditioning the causes, as well as the compensations, as well as the symptoms

Strategy 10
Strategically realizing the power of the feet, hands, and eyes as drivers of the lumbar spine
The lumbar spine is as fascinating as it is complex

The lumbar spine doesn't act upon itself, it is a reactor

The lumbar spine lives at the crossroads of the body . . . it is Main Street

In order to prevent, analyze, rehab, train and condition the lumbar spine, we must appreciate who is picking on the lumbar spine

The tell me why questions

The lumbar spine is begging us to look at other parts of the body when it begins to complain of pain and demonstrates dysfunction

We no longer can afford to take an isolated look at the lumbar spine

The biomechanics of the lumbar spine become complex when we appreciate that in function both bones are moving in three planes of motion and many times in the same direction

The design of the lumbar spine is truly a miracle. If we understand the wisdom of looking at the entire Chain Reaction, this wonderful design is fully appreciated.

**Spinal Coupling** - Movement of the vertebral column in one plane of motion associated with automatic movement in another plane.

**Three Dimensional Spinal Coupling** - Functionally understanding that movement in any one plane of the vertebral column is accompanied by movement in the other two planes.

**Example of 3D Coupling**

**Segments S1 and L5 During Gait**

*With the right foot entering into the ground, undergoing tri-plane loading at the beginning of stance phase, and the left foot undergoing tri-plane loading at the end of stance phase in order to assist in propulsion, the following motions occur concurrently (3D Coupling)*
S1 & L5 flexing in the sagittal plane (L5 slower) producing extension

S1 & L5 laterally flexing in the frontal plane to the left (L5 slower) producing lateral flexion to the right.

S1 & L5 rotating in the transverse plane to the left (L5 slower) producing rotation to the right

Gait is moving our center of gravity in the frontal plane from side to side in order to load the transverse plane effectively so we can actually progress in the sagittal plane

Because there is not a lot of transverse plane motion available in the lumbar spine . . . it may therefore be the most important to consider

The lumbar spine is the transverse plane force transmitter

In gait, most of the motion in the lumbar spine is driven from below. Examples are also given with motion predominantly driven from above. No matter where it is driven from, motions occur as a result of reactions above and below the lumbar spine

If we fully understand what our feet, hands and our eyes want our body to do then we can begin to fully understand what the lumbar spine is doing. Upon initial shock absorption during gait, which is during propulsion on the side, tri-plane loading occurs with the muscles being lengthened eccentrically

Getting at the root of the cause of lumbar pain is looking at the Chain Reaction. The lumbar spine shock absorption abilities and movement in the sagittal plane creating frontal plane and transverse plane capabilities is analogous to the mid-tarsal joint and the foot

We need to appreciate what the lumbar spine is doing, why it is doing it, and what we can do about it. If we can turn the powerful hip and trunk muscles on eccentrically, then we can begin to cause and control more appropriate lumbar spine mechanics

If transverse plane motion is occurring when and where it should occur in the body, then the lumbar spine can effectively transmit the forces.
Case Presentation - Gary’s opportunity to evaluate and assess Brad

History - Brad is a 22 year old active male complaining of intermittent right low back pain. He has no history of a single episode of injury to the back. He has a past history of right ankle injury.

Gait Analysis - Findings include right pelvis relatively retracting upon propulsion as well as demonstrating early right heel lift.

Standing Excursion Evaluation
- Bilateral foot inversion/eversion
- Left foot inversion/eversion
- Right foot inversion/eversion
- Left ankle dorsiflexion with knee flexion
- Left ankle dorsiflexion with knee flexion with minimal subtalar inversion
- Right ankle dorsiflexion with knee flexion
- Right ankle dorsiflexion with knee flexion with minimal subtalar inversion
- Side to side (ski-like) ankle dorsiflexion and subtalar inversion/eversion
- Frontal plane pelvis translation
- Feet inverted - leg length check with frontal plane pelvis translation

Balance Reach Testing
- Left leg balance, bilateral arm overhead posterior reach
- Right leg balance, bilateral arm overhead posterior reach (recheck of palpation exam)
- Left leg balance, bilateral arm overhead side to side reach
- Right leg balance, bilateral arm overhead side to side reach
- Left leg balance, left hip internal rotation
- Right leg balance, right hip internal rotation
- Left leg balance, right leg toe touch, left hip internal rotation with bilateral arm overhead posterior reach
- Right leg balance, left leg toe touch, right hip internal rotation with bilateral arm overhead posterior reach
- Left leg balance, right leg toe touch, left hip external rotation with bilateral arm overhead posterior reach (recheck of symptoms)

Lunge Testing
- Right lateral lunge with bilateral arm anterior reach
- Right lateral lunge with bilateral arm overhead posterior reach
- Left lateral lunge with bilateral arm anterior reach
- Left lateral lunge with bilateral arm overhead posterior reach
- Right anterior lunge with bilateral arm anterior reach
- Right anterior lunge with bilateral arm overhead reach
- Left anterior lunge with bilateral arm anterior reach
- Left anterior/lateral rotational lunge with bilateral arm overhead posterior reach
- Left anterior/medial rotational lunge with bilateral arm overhead posterior reach
- Right anterior/lateral rotational lunge with bilateral arm overhead posterior reach
- Right anterior/medial rotational lunge with bilateral arm overhead posterior reach

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Standing Overhead Reach Testing In All Three Planes

Supine Exam
• Subtalar eversion
• Right subtalar eversion end feel
• Recheck of leg length

Gary sharing his findings with Brad
• Right ankle stiff (lacking ankle dorsiflexion and subtalar joint eversion)
• “Whopper-jawed” . . . “my back hurts”
• The drivers of pain
• Pain at the right lumbosacral junction
• Gait analysis related to the right low back pain
• Pain with rotation and extension
• Treating the foot, hip flexor and lumbar spine
• Treating the cause, compensations, as well as the symptoms

Analysis Debrief with Bob Wiersma, PT
• Analysis with and without shoes and in shorts
• Other aspects of lumbar spine evaluation include full gait assessment, 3D functional hip evaluation, appropriate balance reach tests, specific prone/supine/side lying joint evaluations, comprehensive palpation examination and a neurological exam
• Part of a great evaluation is to know when it is completed for today . . . the evaluation never ends
• Discussion of one leg dominant testing
• Creating asymmetrical three dimensional reactions
• The acute lumbar spine . . . what do I need to know to get rid of the pain and spasm and to restore normal function
• Strategy of taking advantage of building on success
• Initial bottom up approach for low back pain
• How do modalities fit in? As environmental compliments
• The best modality for pain and swelling and dysfunction is proper exercise
• Importance of rotation and its relation to the sagittal and frontal planes
• What planes are being affected the most and why
• The discussion of the drivers to evaluate
• Blending of isolated and integrated evaluative techniques
Right subtalar joint eversion manual therapy

Presentation of the foot to the hip to the back approach of treatment

**Functional Manual Therapy on the TrueStretchTM**
- Right ankle dorsiflexion with calcaneal eversion with trunk left lateral flexion
- Right ankle dorsiflexion with calcaneal inversion with trunk left lateral flexion
- Right hip extension with right hip internal rotation with ankle dorsiflexion and subtalar joint eversion with trunk flexion and trunk left lateral flexion
- Right hip extension with right hip internal rotation with ankle dorsiflexion and subtalar joint eversion with right trunk rotation

**Homeworkable Exercises**
- Right ankle dorsiflexion with left leg driving for left pelvis rotation, and calcaneal eversion
- Right ankle dorsiflexion and right hip extension with left leg driving with trunk right rotated

**Submaximal Self Test of Motion With Symptoms**
- Left leg balance, right leg toe touch for left hip internal rotation with bilateral arm overhead posterior reach
- Right leg balance, left leg toe touch for right hip internal rotation with bilateral arm overhead posterior reach
- Right leg balance, left leg toe touch for right hip internal rotation with bilateral arm overhead posterior/lateral reach

**Teaching Self Test Balance Overhead Posterior Reach Wall Touches**
Rehabilitation Debrief with Bob Wiersma, PT

- Thought process of evaluation and treatment program
- Identifying the “big rocks” that we can treat
- Understanding that the evaluation must continue
- Strategy of next week’s recheck evaluation
- With a comprehensive evaluation the patient quickly appreciates a total body Chain Reaction approach to analysis and treatment
- Always uplifting the patient
- Documentation of treating the forces into the back, the motions of the back, the reactions in the back and the muscles that support the back
- Document the functional outcome via the functional treatment via the functional test . . . tying together the cause, compensations and symptoms
- Getting into extension by gapping the transverse plane from the bottom up and top down
- Understanding the “chicken and the egg” analysis
This is Gary’s opportunity to train with Heather

Low Back (Lumbar Workout)
- Rotation is vitally important if it is happening at the right places at the right time
- If we stimulate all of the powerful muscles that surround the entire core we can make the lumbar spine the strongest link in the body

3D Stretch Matrix
- Anterior lunge right and left
- Lateral lunge right and left
- Posterior/lateral rotational lunge right and left
- Anterior lunge right and left with bilateral arm anterior reach
- Lateral lunge right and left with bilateral arm anterior reach
- Posterior/lateral rotational lunge right and left with bilateral arm anterior reach
- Anterior lunge right and left with bilateral arm overhead posterior reach
- Lateral lunge right and left with bilateral arm overhead posterior reach
- Posterior/lateral rotational lunge right and left with bilateral arm overhead posterior reach
- Anterior lunge right and left with bilateral arm overhead lateral reach to same side
- Lateral lunge right and left with bilateral arm overhead lateral reach to same side
- Posterior/lateral rotational lunge right and left with bilateral arm overhead lateral reach to same side
- Anterior lunge right and left with bilateral arm overhead lateral reach to opposite side
- Lateral lunge right and left with bilateral arm overhead lateral reach to opposite side
- Posterior/lateral rotational lunge right and left with bilateral arm overhead lateral reach to opposite side
• Anterior lunge right and left with bilateral arm same side rotational reach at shoulder height
• Lateral lunge right and left with bilateral arm same side rotational reach at shoulder height
• Posterior/lateral rotational lunge right and left with bilateral arm same side rotational reach at shoulder height

• Anterior lunge right and left with bilateral arm rotational reach to opposite side at shoulder height
• Lateral lunge right and left with bilateral arm rotational reach to opposite side at shoulder height
• Posterior/lateral rotational lunge right and left with bilateral arm rotational reach to opposite side at shoulder height

3D Coupling Load
• Right anterior lunge with right 5 lb dumbbell anterior reach and left 5 lb dumbbell overhead medial reach
• Right lateral lunge with left 5 lb dumbbell anterior reach and right 5 lb dumbbell right rotational reach at shoulder height
• Right posterior lateral rotational lunge with right 5 lb dumbbell overhead posterior reach and left 5 lb dumbbell right rotational reach at shoulder height

“Lumbar stability is the 3D motion that the lumbar spine was designed to configure with the strength to effectively control that motion.” - G. Gary
“The golf swing is one of the activities where we can demonstrate how well the lumbar spine can transmit the transverse plane forces in order that we can have a powerful golf swing.” - G. Gray

• We need to appreciate what needs to be occurring from the bottom up as well as from the top down in order to satisfy the lumbar spine with any type of function.

• In the golf swing the thoracic spine must rotate more and faster than the lumbar spine and the pelvis in order to create an appropriate load during the back swing.

• We get lumbar spine rotation to the right because the thoracic spine is moving faster than the lumbar spine and faster than what is happening below.

• During the backswing we get relative transverse plane compression at the left lumbar and lumbosacral facets as the transverse plane component of the tri-plane load (with right handed golfer)

• Transverse plane loading is accompanied by sagittal plane as well as frontal plane loading in order to accomplish an effective and powerful golf swing.

• Description of typical setup compressions secondary to tight hamstrings

• Description of the hamstrings importance relative to the lumbar spine in transverse, frontal and sagittal planes.

• If a dork drill is a fun drill that enhances function, then it is a good dork drill
Golf Hamstring Drills
• Properly stretch hamstrings in all three planes
• Right foot on bucket with internal rotation
• Right foot on bucket with external rotation
• Left foot on bucket with internal rotation
• Left foot on bucket with external rotation

The key question . . . Did the drill help me? The answer is the question . . . Is there now a better Chain Reaction throughout the entire body to enhance the desired function?

As much wisdom as there is in performing three dimensional golf stretches before the activity of golf, there is just as much wisdom in performing the stretches after golf training and golf playing

Please refer to Golf Gazebo stretches under the golfgazebo link at functionaldesign.com. Also reference QUEST 3 pack of golf videos:

1. Golf Enhancements
2. Enhancement Stretches
3. Golf Swing Faults/Body Fixes
• Overview of research articles that support Chain Reaction functional principles

• Our Chain Reaction functional concepts are simply clean descriptions of what we are really seeing as well as a description of what is causing it.

• Our three dimensional research capabilities still have certain inherent limitations

Research Roundtable with Dr. David Tiberio


Investigating what happens to the spine and the abdominal musculature when we raise an arm.

Understanding the general concepts of what was found in the three dimensional preparatory trunk motions.

A reinforcement that function is:
• 3 dimensional
• Reaction before action
• Loading before unloading
• Truly a Chain Reaction
The study found an initial motion and then an opposite motion . . . we would term that the loading and then the unloading, or the reaction followed by the action

Appreciating that motion occurs in all three planes of motion simultaneously

Discussion of rigidification

Team Reaction realized many years ago that the functionality of the balance reach test that they developed reflected the actual function of the lumbar spine

In normalized functioning, if there is sequencing of the core musculature, and with functional testing that sequencing is not demonstrated, the goal is to find out the cause of what is inhibiting the normal sequencing as opposed to trying to consciously restore the normal sequencing artificially

Discussion of sagittal plane shock absorbing extension as a facilitator of the frontal and transverse plane motions and reactions in order to create a healthy spine

Analogy of sagittal plane extension being similar to subtalar joint eversion

**Thanking Dave for his insights into the pertinent research and especially for his friendship**