1. The patella femoral joint is a tri-plane joint with the trough being biomechanically designed for effective three dimensional function.

2. The goal is to get the patella and the femur biomechanically moving in sync during tri-plane loading.

3. The 22 muscle attachments to the femur are designed to decelerate tri-plane loading and accelerate tri-plane unloading.

4. The function and dysfunction of the patella femoral joint is highly complex.

5. Analysis starts with tweaking the gait and looking specifically at the foot, hip and trunk influence on the femur.

6. Are you a good foot or a bad foot and how do you influence the knee?

7. We are trained to watch the train yet our emphasis now is on the track.

8. Using the patellar treatment as a compliment to treating the causes and the compensations elsewhere.

9. Targeted treatment of the VMO requires an understanding of the function of the VMO and treating it in an isolated integrated way.

10. Make sure the patella and the femur move together in all three planes.

11. Facilitating keeping our knees more athletic . . . allowing the patella to load effectively in order to positively impact the contribution to the quadriceps and the rest of the chain to a powerful golf swing.

12. Understanding the tremendous influence of the transverse plane on the knee.

13. Functional manual therapy is designed to analyze and promote the synchronicity of the entire Chain Reaction to benefit the patella femoral joint.
OBJECTIVES FOR THE PATELLA FEMORAL FUNCTIONAL GUIDE

To assimilate up-to-date information and knowledge of the patella femoral. To learn how to apply effective functional techniques when testing and training the patella femoral.

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

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.
STRATEGY 1
Strategically taking advantage of our approach to assessing the hip, foot and trunk to treat patella femoral dysfunction in biking.

STRATEGY 2
Strategically appreciating the patella femoral joint as the patella femoral joint.

STRATEGY 3
Strategically understanding the patella femoral joint as a train and a track.

STRATEGY 4
Strategically realizing the tri-plane function of the patella femoral joint.
STRATEGY 5
Strategically realizing the multiple Chain Reaction causes of patella femoral pain.

STRATEGY 6
Strategically analyzing the entire body to reveal the causes and compensations of patella femoral dysfunction.

STRATEGY 7
Strategically designing a patella femoral specific training and conditioning program.

STRATEGY 8
Strategically gleaning functional information from research studies.
With patella femoral dysfunction our eyes are driven to the knee cap.

We need to think of the patella femoral joint as the femoral patella joint.

The patella is a “dumb bone”.

Introducing the train and the track analogy . . . the train is the patella and the track is the femur.

A train wobbling on the track can not be effectively treated through the train . . . it has to be treated through the cause, through the track.

The patella femoral joint is a tri-plane joint with the trough being biomechanically designed for effective three dimensional function.

In function, the patella moves as the femur moves. Many studies have looked at just one dimensional patella function with the lower leg moving in the sagittal plane with a fixed femur as the knee extends and flexes.

The patella serves as a lever and as a mechanical advantage for the quadriceps as it moves in sync with the femur.

The goal is to get the patella and the femur biomechanically moving in sync during tri-plane loading, during transformation, and during tri-plane unloading.

The patella has only one muscle attachment (ie; the quads) with the femur having 22 muscle attachments.

The 22 muscle attachments to the femur are designed to decelerate tri-plane loading and to accelerate into tri-plane unloading during all forms of function.
The **Chain Reaction** wisdom of looking at the joints above and below the hip and knee.

The patella femoral joint is a reactor joint, reacting to gravity, ground reaction force, momentum, other muscle forces, the foot and tibia, the hip and pelvis, and the rest of the body, especially the trunk.

With walking and running, the foot goes through pronation or a tri-plane collapsing or loading with associated calcaneal eversion which directly facilitates knee abduction and knee internal rotation along with knee flexion . . . the components of tri-plane loading at the knee.

With knee flexion, knee abduction, and knee internal rotation the patella needs to be moving together with the femur in all three planes of motion.

The patella femoral joint gets out of sync when there is too much femoral motion, not enough femoral motion, femoral motion at the wrong time, the inability to transform the femoral motion, and the inability to complete tri-plane unloading of the femur.

The function and dysfunction of the patella femoral joint is highly complex.

Example of an opposite side type calf group affecting the patella femoral joint.

To fully understand the patella femoral joint we need to fully understand our functional biomechanics from “the nose to the toes”.

The femur has to give us hints as to what’s going on.
CASE PRESENTATION -
A special thanks to Lindsay Krusich for her valuable assistance as a patient and also as a student.

Describing the responsibility and privilege of getting rid of knee pain and essentially changing lives.

Trying to get zeroed in on where the pain is in the patella femoral joint . . . whether it is more medial, more lateral, more superior or more inferior, if at all possible to determine.

Key questions include: When does it hurt? How long does it last? How sharp is the pain? Does it bother you during warm-up? During activity? Following activity? With sitting? With other postures? What makes it better? What makes it worse? Significant questions include: What other problems, pains, or dysfunction have you had anywhere throughout your body?

Analysis starts with tweaking the gait and looking specifically at the foot, hip and trunk influence on the femur.

Analysis from the ground
• Weight shift (gumby)
• Analysis of foot type
• Full trunk rotation to determine foot function
• Looking at foot function in all three planes
• Inversion and eversion of feet
• Stride stance inversion and eversion of feet
• Hip and knee flexion excursion bilateral stance and unilateral stance
• Ankle dorsiflexion excursion bilateral stance and unilateral stance
• Unilateral squat with upper extremity transverse plane driver
• Ankle dorsiflexion with foot supinated (inverted)

Description of lack of functional dorsiflexion prior to heel lift in ambulation with the foot inverting causing patella femoral pain.

Analyzing foot biomechanics
“Are you a good foot or a bad foot and how do you influence the knee?”
- G. Gray
Description of hallux limnatis causing medial patella femoral pain
• Evaluation of leg length

Description of long leg patella femoral problems and short leg patella femoral problems
• Analysis of the powerful hips
• Unilateral balance with upper extremity anterior reach at waist height with upper extremity overhead posterior reach
• Hip excursion extension analysis
• Unilateral leg balance with bilateral upper extremity overhead posterior reach with bilateral upper extremity overhead posterior lateral and posterior medial reach

Description of the function of the iliopsoas and its dysfunction contributing to patella femoral pain
• Analysis of hip internal and external rotation with and without stability

“Do you have effective transverse plane hip swivel?” - G. Gray

Description of patella femoral dysfunction and pain secondary to ineffective hip rotation.
• Frontal plane hip adduction excursion

Description of frontal plane hip function to control frontal and transverse plane as well as sagittal plane knee function.

Description of the tensor fascia eulatae and the iliotibial band relative to its biomechanical function and its potential contribution to patella femoral pain.

Description of the relationship of the function of the hamstrings and the patella femoral joint
• Biomechanical Ankle Platform System squats with foot everted and inverted.

Description of the gastrocnemius and its relationship to the patella femoral joint.

Fully understand the VMO comparing traditional VMO stimulation to functional VMO stimulation and understanding the cause of the need to stimulate the VMO.

Our patients say make me better today, tomorrow and forever . . . that requires treating the cause and the compensations of patella femoral pain as well as the symptom itself.
ANALYSIS AND REHABILITATION DEBRIEF WITH BOB WIERSMA, EXECUTIVE DIRECTOR, ACCELERATED FUNCTIONAL REHABILITATION NETWORK.

• We are trained to watch the train yet our emphasis now is on the track.

• Understanding who controls the track and whether or not I can do anything about it.

• Evaluate the controllers of the track and determine who is influencing any of those 22 muscles.

• Description of a direct patellar approach versus an indirect patellar approach.

• Using patellar treatment as a compliment to treating the causes and the compensations elsewhere.
• Description of a functional tight piriformis causing patella femoral pain.

• Relationship between the tibia and the femur relative to tri-plane in-sync versus any one of the planes out of sync.

• Targeted treatment of the VMO requires an understanding of the function of the VMO and treating it in an isolated integration way.

• Function of the VMO is to decelerate tri-plane loading of the knee including flexion abduction and internal rotation.

• The wisdom of initially ignoring the patella and going after the femur.
PATELLA FEMORAL WORKOUT AND TRAINING SESSION

The strategy of getting the femur moving in all three planes.

Making sure the patella and the femur move together in all three planes.

Understanding the biomechanics of going up and down steps and its direct relationship to the patella femoral joint.

• Anterior step-up
• Lateral step-up
• Rotational step-up

• Anterior lunge step-up
• Lateral lunge step-up
• Rotational lunge step-up

• Anterior step-up fast
• Lateral step-up fast
• Rotational step-up fast

• Anterior step-up with same side rotational reach with dumbbell
• Anterior step-up with opposite side rotational reach with dumbbell
• Lateral step-up with same side rotational reach with dumbbell
• Lateral step-up with opposite side rotational reach with dumbbell
• Rotational step-up with same side rotational reach with dumbbell
• Rotational step-up with opposite side rotational reach with dumbbell
• Anterior step-up fast with left and right rotational reach with dumbbell
• Lateral step-up fast with left and right rotational reach with dumbbell
• Rotational step-up fast with left and right rotational reach with dumbbell

• Anterior jump step-ups with trunk extension
• Anterior jump step-ups with trunk flexion

• Lateral jump step-ups
• Posterior jump step-ups

• Anterior jump step-ups with overhead sagittal plane dumbbell press
• Lateral jump step-ups with overhead sagittal plane dumbbell press
• Rotational jump step-ups with overhead sagittal plane dumbbell press

We can go tweak crazy with changing the distance, height of the boxes, amount of weight, speed variations, bungee drivers and various feedback tweaks.
Having more fun with the transformation of our biomechanical understanding of function into golf drills.

Understanding the patella femoral joint relative to the golf swing.

Facilitating keeping our knees more athletic . . . allowing the patella to load effectively in order to positively impact the contribution to the quadriceps and the rest of the chain to a powerful golf swing.

In the golf swing the knee is loaded by what the trunk does above it.

Going through a lunge matrix with the ankle to ankle bungee cord.
Performing the lunge step drill with the ankle to ankle bungee cord.
• Frontal plane
• Sagittal plane
• Transverse plane

Understanding a gimmick tweak is only a valuable tweak if it enhances the actual golf swing.

Utilizing the bungee cord to get the legs more active in the golf swing so that when the feet are stable, the legs, through the trunk and hips are more reactive.
RESEARCH ROUNDTABLE WITH DR. DAVID TIBERIO

Understanding the tremendous influence of the transverse plane on the knee.

Understanding the foot and the hip in the transverse plane.

Discussion of research article


Rotation of the tibia has a tremendous effect on the articulation between the patella and the femur.

Correlation to a dysfunctional hip that therefore decreases the femoral rotation during function causing patella femoral pain.

• Description of medial patella femoral pain


Correlations to femoral dysfunction with patella femoral pain.

• Description of patella femoral pain with rigid foot type with inhibition of tibial motion with femoral motion occurring.

Concept of artificially training the VMO.
• Getting the VMO to functionally strengthen itself.

We have to have strategies to understand the synchronicity between the tibia, the femur, and the patella.

“Life is balance, but balance is timing.” - G. Gray

Functional manual therapy is designed to analyze and promote the synchronicity of the entire Chain Reaction to benefit the patella femoral joint and the tri-plane loading and unloading of the knee in all forms of function.

Understanding driving from the top and/or from the bottom during patella femoral rehabilitation is dependent upon where the greatest success and influence is relative to the cause, the compensation and the patella femoral pain.

A special thanks to Dave for his ongoing exceptional efforts in bringing pertinent research articles to the table.