

1. FMR - Functional Manual Reaction, is the use of functionally consistent drivers in order to produce the desired **Chain Reaction™** within the context of the function we desire.
2. The transverse plane is the most powerful and most critical plane . . . this is where the knee says it will really take the hit . . . the foot and the hip appreciate it.
3. The knee facilitates turning on all the deceleration locomotor muscles and creates the transformational power of stability and productive force.
4. We need to have the biomechanical understanding of the **Chain Reaction™** of the locomotor system to fully take advantage of FMR. The hip and the foot first of all have to be functionally cleared for three dimensional eccentric loading before we go to the knee.
5. With our FMR approach our hands become complements to the other drivers.
6. Understanding the "Goldilocks" concept . . . the knee is a sensitive creature . . . the knee needs to be just right in all three planes . . . in FMR we have to feel it.
7. We can use the tibia at the knee to functionally get the foot to do what we want. The femur at the knee creates a direct **Chain Reaction™** approach to the hip.
8. Looking at the patella and the femur with balance reach assessment and lunge assessment techniques.
9. Differentiating between medial and lateral patella femoral problems and the difference in our FMR technique.
10. Assess and treat all at the same time . . . go transverse plane, then subtly to the frontal plane, and then assess and facilitate the sagittal plane.
11. The FMR is the exercise and the exercise is the FMR.
12. Three dimensional hopping with overhead sagittal and frontal plane hand reaches and with shoulder height transverse plane reaches.
13. FMR allows us to use our direct strategy any where along the chain to get the joint or joints we want to load and unload in all three planes.



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v3.7 FUNCTIONAL MANUAL REACTION (FMR)

The Knee

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OBJECTIVES FOR THE FUNCTIONAL MANUAL REACTION OF THE KNEE FUNCTIONAL GUIDE

To assimilate up-to-date information and knowledge about functional manual reaction techniques for the knee. To learn how to apply effective functional techniques when testing, training and rehabilitating the knee.

To understand and appreciate the tri-plane **Chain Reaction™** principles as they apply to the knee.

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.



FUNCTIONAL
Video Digest Series

Three man football rotation circle drill

The knee takes the hit . . . it sets up the foot and the hip for good things.

The grace gifts of Brad and Doug . . . they take the hit for me . . . making my life easier, fun, productive and worth living.

STRATEGY 1

Strategically understanding how the knee takes the hit in all three planes to benefit the foot, the hip and the rest of the body

STRATEGY 2

Strategically realizing the intrinsic forces and the extrinsic forces the knee has to deal with.

STRATEGY 3

Strategically appreciating the feedback and the feed forward characteristics of the knee.

STRATEGY 4

Strategically revealing the FMR sequencing of the locomotor system.

STRATEGY 5

Strategically assessing the knee relative to its ability to effectively take the hit.



STRATEGY 6

Strategically feeling for and seeing relative rotation at the knee in all three planes.

STRATEGY 7

Strategically creating optimal three dimensional environments to facilitate FMR of the knee.

STRATEGY 8

Strategically utilizing the functional forces of function to be complimented by our hands for our FMR techniques.

STRATEGY 9


Strategically designing transformational drills and exercises to enhance function.

STRATEGY 10.

Strategically training and conditioning the knee to take the hit with multiple tweaks and Chain Reactions.

STRATEGY 11

Strategically taking advantage of MRI research to continue to prove, assess, rehab and train functionally.



We have people in our lives that take the hit for us . . . they buffer us on our behalf, they take the stress off of us, they absorb the shock . . . they take the hit.

The knee says "since I am caught in the middle with few places to go and no place to hide I am willing, and will take the hit".

Caleb Jones . . . a player I was privileged to coach, was willing to take the hit by constantly setting picks and enhancing his teammates.

Appreciating the hit takers because of our biomechanical understanding of the game of basketball.

In football, offensive linemen take the hit with very little credit in return.

In my life, my wife is a tremendous hit taker, along with my sons and my friends.

Those of you who are kind enough to watch the Functional Video Digest also are hit takers.

The knee is a three dimensional hit taker . . . it lets the other body parts do good and feel good.

FMR - Functional Manual Reaction, is the use of functionally consistent drivers in order to produce the desired **Chain Reaction™** within the context of the function we desire.

FMR utilizes what biomechanically hits the knee, and our hands simply become a compliment to the desired tri-plane motion.

The knee takes the hit and absorbs shock into flexion . . . this occurs with ankle dorsiflexion and hip flexion.

The foot looks for the knee to help take the hit in the sagittal plane. The hip looks for the same thing.

The hip says to the knee "most of my power is in the back of me, so if you facilitate my hip flexion by taking the sagittal plane hit, I can do what I do best".

The foot in the frontal plane goes through the frontal plane motion of eversion . . . the knee allows that to occur through frontal plane knee abduction. (If the knee doesn't effectively take the hit it ends up paying for it)

The hip says "I am going through hip adduction because of the knee taking the hit through the frontal plane".

If the knee can't take the hit in the frontal plane, problems occur at the knee but also in the hip and trunk.

The transverse plane is the most powerful and most critical plane . . . this is where the knee says it will really take the hit . . . the foot and hip appreciate it.



The foot and lower leg internally rotate and therefore tremendous transverse plane forces are transmitted to the knee. - - We get tibial internal rotation and femoral internal rotation, the tibia rotation is faster with the internal rotation of the femur significantly turning on the powerful posterior rotation muscles of the hip.

Upon initial ground contact, the knee takes the hit in all three planes eccentrically.

During mid stance this is transformed into the opposite three dimensional motion as the knee positions everyone else to be successful.

The knee is a transformer of ability.

The knee facilitates turning on all the deceleration locomotor muscles and creates the transformational power of stability and productive force.

Just prior to heel lift, the knee significantly takes the hit through its ability to extend, adduct and externally rotate . . . positioning the body for the success of propulsion.

How do we analyze the knee's ability to take the hit via gravity and ground reaction force in all three planes of motion? The knee is designed to take hits from its friends.

The knee deals with extrinsic forces as well.

The knee wants to be studied within the context of what it does.

We need to teach the knee to take the hit with the same forces that it has to deal with . . . the knee wants us to take advantage of plane tweaks, influence tweaks of speed and relative rotation, range tweaks, position tweaks, control tweaks, load tweaks, tool tweaks and feedback tweaks.

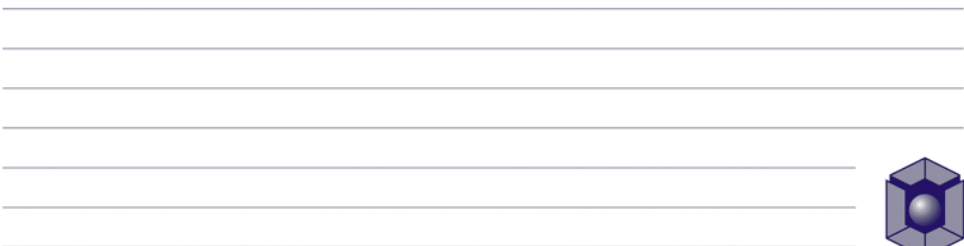
We need to have the biomechanical understanding of the **Chain Reaction™** of the locomotor system to fully take advantage of FMR. The hip and the foot first of all have to be functionally cleared for three dimensional eccentric loading before we go to the knee.

Our feedback analysis from the knee will give us the feedback we need to understand the rest of the body.

The feed forward analysis facilitates our understanding of the knee's capability to feed forward the right information to the hip and to the foot and to the rest of the body.

With our FMR approach our hands become complements to the other drivers.

Thanking the hit takers in our life.



Gary being thankful for David Tiberio as a tremendous friend and a hit taker.

Understanding the "Goldilocks" concept . . . the knee is a sensitive creature . . . the knee needs to be just right in all three planes . . . in FMR we have to feel it.

We need to assess the knee with our hands and our eyes.

Approaching the hip and the foot through our FMR prior to directing our efforts at the knee.

It is easy to feel the transverse plane motion at the knee.

Looking at the front leg loading in gait.

Anterior lunge assessment . . . feeling for and looking for the right knee reaction in all three planes - our suspicions drive us to take a closer look at the foot and the hip.

Anterior medial lunge to facilitate increased calcaneal eversion and frontal plane motion of the knee as allowed by the hip.

What other tests do we have to facilitate a knee reaction?

Assessing the relativeness of the knee reaction . . . femur relative to the tibia.

Assessment with shoe on and shoe off . . . look at the arch of the foot and the calcaneus relative to foot reaction. Assess knee reaction and hip reaction . . . "feel it" through the hit taker - the knee.

"What information am I getting out of the knee?" . . . looking at all three planes and the contribution of the femur and the contribution of the tibia.

We can use the tibia at the knee to functionally get the foot to do what we want. The femur at the knee creates a direct **Chain Reaction™** approach to the hip.

Using the hands to drive and assess frontal plane and transverse plane motion in getting the patella to go along for the ride.

The patella and the femur have to go together and therefore the femur and the tibia have to be in transverse plane sync.

Emphasis from the transverse plane into the frontal plane drive . . . "it gets down to the subtalar joint, midtarsal joint and the first ray".



Assessing back leg loading - as the knee goes into extension the pelvis rotates faster over the femur creating internal rotation of the hip with the femur itself externally rotating in space.

Focus on the pelvis moving over the femur - getting external rotation of the femur and the tibia with the heel inverting.

Looking at the "dilemmas".

Opposite leg anterior lunging - feeling for knee extension, tibia and femur external rotation and knee adduction.

Go to the transverse plane to get the relative external rotation of the femur and the tibia.

Create a manual reaction in the frontal plane to get the knee adducting. (varus)

Then drive the femur forward faster than the tibia, therefore getting extension.

Assessing the patella femoral joint of the back leg loading . . . bring the patella "out" with the femur in the transverse plane.

Are the patella and the femur getting along in the transverse plane?

Looking at the patella and the femur with balance reach assessment and lunge assessment techniques.

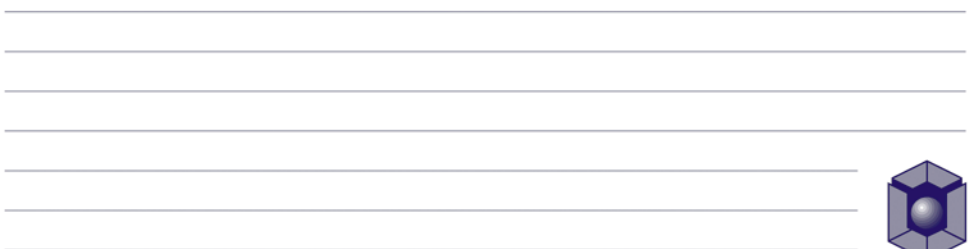
The patella will do what it needs to do, with our assessment focusing on the femur, either being in sync or out of sync with the patella.

Differentiating between medial and lateral patella femoral problems and the difference in our FMR technique.

The sequence of FMR is critical . . . we need a successful first load to get a successful unload that leads to a successful second load.

We need to know the sequence of function.

The paradox between the high arch limited everted foot not allowing the first load and the low arch excessive everted foot causing the same problem.



Creating optimal ground up and top down FMR environments in the TrueStretch™

Position foot on the opposite side with the foot back, and the opposite leg forward. Opposite arm at overhead posterior right lateral vector with same side arm driving in the opposite direction at shoulder height in the transverse plane.

Assess and treat all at the same time . . . go transverse plane, then subtly to the frontal plane, and then assess and facilitate the sagittal plane.

We need to combine knee flexion with heel inversion to duplicate a cross over step.

The frontal plane of the back leg load with the transverse plane of the front leg load and the knee flexion of the front leg load.

Assess the combination load with an opposite anterior lateral lunge with an opposite hand anterior reach at knee height.

Looking at how the knee unlocks and flexes with the femur externally rotating faster than the tibia.

Analyze and treat with the Biomechanical Ankle Platform System (BAPS) to get the crossover step knee reaction with a bottom up driver in the sagittal, frontal and transverse planes.

Tweaking with the BAPS

Assessing with our eyes closed, feeling knee motion, while the patient/client is on the BAPS

All of our FMR approaches are not specific joint mobs but are best described as **Chain Reaction™** mobs . . . understanding biomechanical Chain Reactions in all three dimensions allows us to approach the kinetic chain at all levels and in all planes.

Off weight bearing FMR of the knee

Side lying, hip extended, femur externally rotated, heel inverted, adduction of the knee, tibia externally rotated, faster than the external rotation of the femur with a subtle drive into knee extension.

Chain Reaction™ FMR mobs cause a biomechanical consistency.



The beauty of the homework is utilizing the same reaction exercises that we utilize with our FMR approach in simply tweaking it.

The FMR is the exercise and the exercise is the FMR.

The only thing our patients and clients don't have at home is our hands . . . they have all the other tools of FMR including gravity, ground reaction forces, momentum, other muscle forces, and body drivers.

Not only appreciating the friends who take hits for us, but fully appreciating that we need to take special care of our friends.

Debrief with Bob Wiersma, Executive Director, Functional Rehabilitation Network

- Getting inside your friends mind, as well as their heart and spirit
- Function is reaction therefore our manual techniques should be reactive . . . creating pure functional techniques to enhance function
- We would have to know what the joint does in real life
- Force, motion guidance, timely action, and feeling
- Our hand function is as minimal as possible . . . the feel is proportional to how well we know function, sensing what occurs in all three planes from the bottom up and top down
- Let the other drivers do all the work
- The powers in the body . . . the subtleties come from our hands
- Common foot and hip problems that cause knee dysfunctions
- Attacking the transverse plane to get more "bang for the buck"
- The knee gets its power through the frontal and transverse planes
- Go from the "read to the need"
- It is the tri-plane "magic" of the body
- FMR techniques work today . . . do your functional tests, do your FMR, and then repeat your functional test to determine if you are on the right road
- Key question . . . Am I getting the response I want?"
- We need to understand function first
- FMR not only replicates function . . . it is function
- Let the wisdom of the body allow us to become more wise
- Function is forgiving
- "Even us can do it"
- Touching is important



Training and conditioning the knee that takes the hit.

Teach the knee to progressively and logically take the hit.

Tweaking the foot, the hip and the super structure.

Surfaces are great bottom-up tweaks to teach the knee how to take the hit.

- Frontal plane everted angulation surface
- Sagittal plane up-hill surface
- Sagittal plane down-hill surface
- Sagittal plane inverted angulation surface
- Transverse plane toe-out with frontal and sagittal plane tweaks
- Transverse plane toe-in with frontal and sagittal plane tweaks

Frontal plane everted tweak facilitates the foot to evert, the hip to adduct, and the knee to abduct more than on a flat surface.

Bilateral alternate shoulder to overhead reaches with dumbbells (lifts) in all three planes.

Inverted tweak causes the foot to invert, the hip to abduct and the knee to adduct more than it does on a flat surface.

Bilateral alternate shoulder to overhead reaches with dumbbells (lifts) in all three planes.

Sagittal plane down-hill tweak with bilateral shoulder to overhead reaches with kettleball in all three planes.

Same strategy with sagittal plane up-hill, with toed-in tweak and toed-out tweak.

Sagittal plane up-hill tweak with overhead Body Blade drives in all three planes.

Same strategy with the Body Blade with frontal plane and transverse plane ground tweaks.



Tweaking with the Biomechanical Ankle Platform System (BAPS) . . . the BAPS should be called the Biomechanical Knee Platform System.

BAPS mobilizations with tweak from the top with shoulder to overhead alternate reaches with dumbbells (lifts). Same strategy with the kettleball and the Body Blade.

- BOSU Tweak . . . foot in the middle
- Use of opposite leg drivers
- Use of Body Blade drivers
- BOSU with the dumbbells, kettleball and bungee cord

Getting to the flat surface . . . in function we move over the fixed ground . . . the foot is fixed and the body is moving in all three planes over the fixed foot.

Three Dimensional Hopping Matrix
Three dimensional hopping with overhead sagittal and frontal plane hand reaches and with shoulder height transverse plane reaches.

Discussion and demonstration of in sync and out of sync hands relative to the feet in all three planes.

There are a lot of ways to feed the knee and to teach the knee to take the hit.

Two footed jumps across the floor in all three planes

The real question . . . “have we properly prepared the knee to take the hit safely?”

Drawing in the sagittal plane, frontal plane, and transverse plane with your foot . . . driving the opposite knee.

My note to simply say thank you.



We can watch the knees and analyze the golf swing

The right knee in a right handed golfer goes through flexion, abduction, and as much internal rotation as possible . . . keeping pressure on the inside condyle of the right heel and pressure on the inside of the right foot.

A varus knee and an inverted right foot is evidence of an “unloaded butt”.

The left knee goes through flexion, significant abduction and internal rotation, as allowed by the left hip and left foot.


The acceleration of the golf swing is initiated by the left knee “releasing”. . . not to be initiated with the hands.

Knowing what the knees are supposed to do can allow us to design effective range drills to create the appropriate **Chain Reaction™** throughout the entire body.

Stake Drill

The position of the right stake and the position of the left stake to facilitate the appropriate response

Not allowing the right knee to touch the right stake yet facilitating the left knee to touch the left stake.



Left Knee Bungee Drill

Making it tougher for the left knee to get to the point of transformation . . .
i.e., knee flexion, knee abduction and knee internal rotation.

Resist the left leg load with bungee assistance in the unload.

Making it easier for the left knee to load into the point of transformation
by facilitating with a bungee cord knee flexion, knee abduction, and knee
internal rotation.

Assist the left leg load with bungee resistance to the unload.

With any range or transformation drill or exercise the key question is
“does it make me better and more functional at what I want to get better
and more functional at?”

Can I make the game and my life even more fun than it is?



RESEARCH ROUNDTABLE WITH DR. DAVID TIBERIO

Patel VV, Hall K, Reis M, Lotz J, Ozhinsky E, Lindsey C, Lu Y, Majumdar S. A three-dimensional MRI analysis of knee kinematics. J Orthop. Research 22:283-292.

Knowing the three dimensional functional motions is the key to FMR.

FMR is more brain power than it is skillful hands

Evidence of tri-plane motions and loading of the knee through the foot

The tibia's relationship to the femoral internal rotation and evidence of frontal plane knee abduction

We have to get the "right" rotation occurring between the tibia and the femur.

The tibia influences the femur and the patella.

FMR allows us to use our direct strategy any where along the chain to get the joint or joints we want to load and unload in all three planes.

Side lying position . . . relative motion between the patella and the femur.

An explanation of the tri-plane loading in all three planes to describe the transverse plane response of the patella and the femur.

In the frontal plane there is a loading between the patella and the femur as predicted.



In FMR analysis you have to feel first . . . and then feed.

Increasing the contact area with knee flexion between the patella and the femur in squatting.

When you walk you squat.

The MRI will continue to demonstrate to us the miracle of the body.

There is a genius behind the design of the body.

We have to look at the knee as well as the knees friends.

Our Functional 3D Testing System can quickly document the success of our FMR techniques.

Function allows us to become more of a biomechanical detective.

An FMR approach truly is a functional "system".

There are a lot of exciting things yet to learn.

A special thanks once again to Dr. David Tiberio

