

1. The hips allow the trunk, the shoulders and the legs to be powerful and successful in all forms of function.
2. There is really no such thing as an agonist and antagonist with respect to muscle function in functional activities, and especially with the hips.
3. The hip gets loaded and unloaded in the sagittal plane with flexion as well as extension.
4. The hip gets loaded predominantly in the frontal plane through adduction and unloading into abduction.
5. Transverse plane loading of the hip is internal rotation with unloading into external rotation.
6. In function, it is the hips that allow the ability to turn the abdominal musculature on for enhanced core function.
7. The motors in the golf swing are the hips.
8. Relative rotation occurs in the sagittal plane, the frontal plane, and the transverse plane.
9. The hip is the power source of the body.
10. Conscious awareness must be transformed into initially and even ultimately subconscious reaction for injury prevention and effective rehabilitation.
11. The hip undergoes tri-plane loading upon heel contact. It then unloads during mid stance. It then undergoes tri-plane loading right before heel lift and swing phase to propel the body forward.
12. Functional Therapy is understanding how the body is efficient and then figuring out who is messing up the efficiency.



## FUNCTIONAL DESIGN SYSTEMS

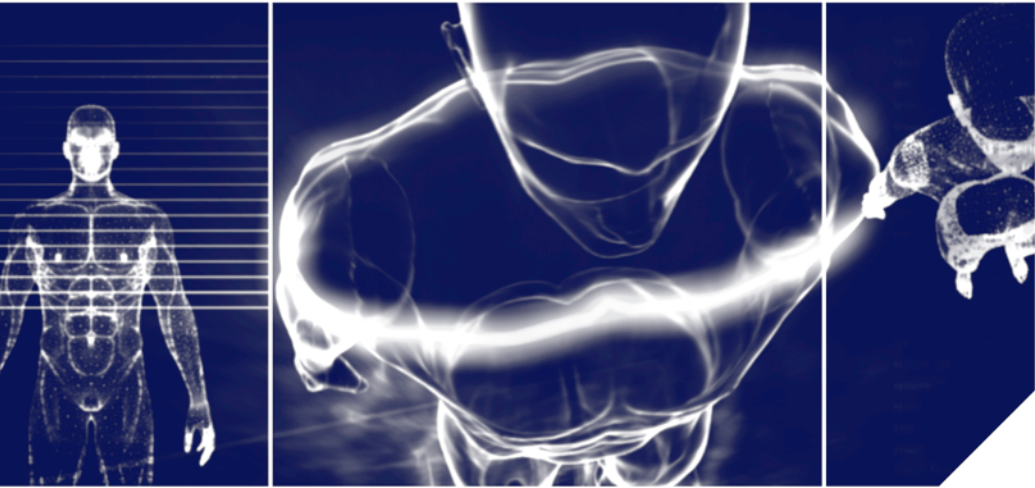
Transforming Knowledge Into Function

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# v1.5 THE HIP

## 3-D Power

By: Gary Gray, PT



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### OBJECTIVES FOR THE HIP *FUNCTIONAL GUIDE*

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

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

To understand and appreciate the tri-plane principles as they apply to the hip.

### HOW TO USE THIS *FUNCTIONAL GUIDE*

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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

## LIFE IS A HIP GAME

### STRATEGY 1

Understanding the loading and unloading (exploding) of the hips as the foundation for function.

### STRATEGY 2

The hips are the power source of the body in all forms of function including walking and running, pushing and pulling, throwing and catching, swinging and punching, jumping and landing.

### STRATEGY 3

We must appreciate the hips as a potential cause and/or potential compensation of dysfunctions. The hip is so powerful it can become a primary cause or it can subconsciously agree to be the primary source of compensation that causes primary as well as secondary problems within the Chain Reactions of the entire body.



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### STRATEGY 4

3D appreciation of the hip . . . fully taking advantage of the hip in the sagittal, frontal and transverse planes and further understanding the Chain Reactions that occur at the hip, above the hip, below the hip and between the hips.

### STRATEGY 5

We must understand relative rotation in reference to the hips. With the pelvis and the femur commonly moving in the same direction in all forms of function, full understanding of the concept of relative rotation allows us to take advantage of this understanding with respect to motions of the hip, loading of the hip in all three planes eccentrically and unloading or exploding of the hip in all three planes concentrically.

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THE HIP - Functionally understanding the hip as a powerful and friendly part of the body.

The hips allow the trunk, shoulders and the legs to be powerful and successful in all forms of function.

The hip is a friendly yet "tattletale" part of the body.

The hip is the epitome of a tri-plane joint.

### HIP MUSCLES

- Hip flexors
- Hip rotators
- Hip abductors
- Hip adductors
- Hip extensors

There is really no such thing as an agonist and antagonist with respect to muscle function in functional activities, and especially with the hips. All of the hip muscles work functionally synergistically to allow the hip, and more importantly the body, to be successful.

### PLANES OF LOADING AND UNLOADING OF THE HIP

- Functionally the hip gets loaded and unloaded in the sagittal plane with flexion as well as extension.
- The hip also gets loaded predominantly in the frontal plane through adduction and unloading into abduction.
- Transverse plane loading of the hip in internal rotation with unloading into external rotation.

### HIP RELATIVE ROTATION CHART

Relative rotation occurs in the sagittal plane, the frontal plane, and the transverse plane.

| DESCRIPTION   | ROTATION             |
|---|----------------------|
| 1. Pelvis and femur moving in the same direction, at the same time, at the same speed | no relative rotation |
| 2. Pelvis moving, femur fixed   | relative rotation    |
| 3. Pelvis fixed, femur moving   | relative rotation    |
| 4. Pelvis and femur moving in the same direction, with the pelvis moving faster       | relative rotation    |
| 5. Pelvis and femur moving the same direction, with the femur moving faster           | relative rotation    |
| 6. Pelvis moving in one direction, with the femur moving in the opposite direction    | relative rotation    |



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### THE HIPS IN GAIT

As the foot loads into contact, the contact foot side hip loads in all three planes into flexion, internal rotation, and adduction as a result of most of the relative motion occurring distally faster than the pelvic motion.

The propulsive foot side hip gets loaded in all three planes, with extension of the hip, abduction of the hip and internal rotation of the hip as result of the pelvis relatively moving faster than the femur in all three planes.

Upon initial foot contact all the muscles about the hip synergistically control the tri-plane loading of the hip. Upon propulsion all the muscles of the hip get fully loaded to help in the propelling of the body and the leg forward.

In the back swing of a right handed golfer, to the loading or transformation point or what golfers call transition, the pelvis is moving over the relatively slow moving femur in all three planes to get tri-plane loading of the hip. At the left hip, the femur is moving relatively much faster than the moving pelvis, which allows the creation of tri-plane loading of the left hip in all three planes.

### ADDITIONAL POINTS

- The real point is to ask the hip to give us evidence on how the patient, client, and athlete is able to load and therefore unload in order to benefit the rest of the body.
- In function, it is the hips that allow the ability to turn the abdominal musculature on for enhanced core function.
- One of the critical decisions we need to make when we see hip dysfunction is: Are we seeing a cause or are we seeing a compensation?
- Begin at the power source, end at the power source and allow the power source to give us evidence on the success and the components of dysfunction.

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## CASE PRESENTATION

HISTORY - Patient is a beautiful 45 year old female who initiated a jogging program 9-10 days earlier and presents with symptoms of left hip pain with intermittent left low back and left knee pain.

## GAIT ANALYSIS

- Fast walk (tweaking the sagittal plane)
- Long stride gait (tweaking the sagittal plane)
- Crossover gait (tweaking frontal plane and transverse plane)
- Toe in gait (tweaking transverse plane)
- Toe out gait (tweaking transverse plane)

## BAREFOOT GAIT EVALUATION

- Recheck of fast walk
- Recheck of toe in gait

## STANDING TESTS THROUGH ANALYSIS DEBRIEF WITH BOB WIERSMA, PT

- Relaxed standing evaluation
- Frontal plane pelvic sway
- Inversion and eversion of feet
- Relaxed position to eversion of feet
- Neutralizing knee with foot inversion and eversion
- Hip hiker test (note asymmetry)

## FUNCTIONAL 3-D TESTING SYSTEM™ (3D FTS)

- Right leg balance with left leg rotational reach, checking right foot inversion and right hip internal rotation
- Left leg balance with right leg rotational reach, checking left foot inversion and left hip internal rotation

***For additional information on the 3D FTS, contact Functional Design Systems at 866-230-8300***

## TRUE STRETCH™ EXAM

- Comparative left and right hip rotational stretch

## SUPINE EVALUATION

- Neutralize pelvis leg length examination
- Single knee to chest and double knee to chest
- Subtalar joint evaluation
- Midtarsal joint evaluation



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PRONE EVALUATION

- Neutralize pelvis leg length examination
- Forefoot examination
- First ray examination
- Callus examination
- Subtalar evaluation
- Knee flexion/hip rotation examination

STANDING EXAMINATION RECHECK

- Right hip rotation excursion
- Left hip rotation excursion

SHARING WITH PATIENT, REVIEW OF ASYMMETRY

- Review of hip hiker test
- Discussion of leg length difference
- Compensation of leg length
- Presentation of left patellofemoral dysfunction
- Discussion of left hip dysfunction to make left leg "longer"
- Resolving the problem

ANALYSIS DEBRIEF WITH BOB WIERSMA, P.T.

- Discussion of comprehensive evaluation
- Emphasis of getting to the cause
- Strategy of gait, balance and excursion to get started in the functional evaluation
- Concept of "prove myself wrong"
- Becoming a "biomechanical detective"
- Getting hints on "where to go"
- Dynamic to static to dynamic . . . ie; a "functional sandwich"
- Discussion of leg length difference
- Treat the cause, compensation and symptoms
- Utilization of full length lift
- "Whopper jawed" . . . tri-plane deformity

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## TREATMENT

- *Presentation of full length lift in left shoe*
- *Gait and hip hiker test recheck*
- *Hip hiker test, evening self check*

## TREATMENT/EXERCISES

Home treatment program to encourage the hip to appreciate the treatment of the cause:

- 3-5 minutes of warm-up prior to jogging
- 3D Stretch Matrix
  - Anterior lunge with bilateral arm anterior reach to knees
  - Anterior medial lunge with bilateral anterior arm reach to knees
  - Anterior lunge with bilateral arm lateral reach at knee height
  - Lateral lunge with bilateral arm same side rotational reach (conscious awareness of position of left foot)
  - Posterior lateral rotational lunge with bilateral arm same side rotational reach.

Discussion with patient regarding expectations

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REHABILITATION DEBRIEF WITH BOB WIERSMA, P.T.

- Discussion of documentation of home exercise program
- Getting to the "simple side of complexity"

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***THIS IS GARY'S OPPORTUNITY TO TRAIN WITH BETSY BROWN***

**HIP TRAINING PROGRAM TO ENHANCE PERFORMANCE  
AND PREVENT INJURY**

- Anterior lunge with sagittal overhead reach
- Lateral lunge with sagittal overhead reach
- Posterior lateral rotational lunge with sagittal overhead reach
  
- Anterior lunge with transverse reach to same side
- Lateral lunge with transverse reach to same side
- Posterior lateral rotation lunge with transverse reach to same side
  
- Anterior lunge with transverse and flexion reach to same side
- Lateral lunge with transverse and flexion reach to same side
- Posterior lateral rotational lunge with transverse and flexion reach to same side

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- Anterior lunge with transverse and overhead reach to same side
- Lateral lunge with transverse and overhead reach to same side
- Posterior lateral rotational lunge with transverse and overhead reach to same side
  
- Lateral lunge with med ball transverse load to same side
- Posterior lateral rotational lunge with med ball transverse load to same side
- Anterior lunge with med ball transverse load to same side
  
- Posterior lateral rotational lunge with med ball transverse load and throw

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## THE HIPS IN GOLF

*"The motors in the golf swing are the hips" G. Gray*

Creating the motion in the hips in order to facilitate a three dimensional eccentric load allows for the "loading of the cannons".

## THE RELATIVE ROTATION OF THE GOLF HIPS

- The loading mechanism of the right hip in the backswing of a right handed golfer reveals the pelvis moving faster than the femur, therefore creating internal rotation, adduction and flexion . . . tri-plane loading of the right hip.
- The loading mechanism of the left hip in the backswing of a right handed golfer reveals the femur moving faster than the pelvis, therefore loading the left hip into internal rotation, adduction, and flexion. . . tri-plane loading of the left hip in the backswing.



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### HIP DANCE LOAD RANGE DRILL

Off the right hip initially . . . then off the left hip

- left leg sagittal plane dance step to load right hip flexion (feed in)
- left leg sagittal plane dance step to unload right hip flexion (feed out)
- left leg frontal plane dance step to load right hip adduction (feed in)
- left leg frontal plane dance step to unload right hip adduction (feed out)
- left leg transverse plane dance step to load right hip internal rotation (feed in)
- left leg transverse plane dance step to unload right hip internal rotation (feed out)

Proper relative rotation of the hips makes it easier on the links above and below in order to prevent injury and in order to create a core foundation for power through the entire trunk, to the shoulders, legs and feet.

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- The hip is the power source of the body.
- The hip is the power source of function.

PEAK PE: *Promoting Encouragement and Athleticism in Kids through Physical Education*

One of the foundations we want to take advantage of and build upon is the giftedness of our hips . . . to allow our upper body and lower body to be successful in whatever we want to do and enjoy.

PEAK PE . . . starts with an understanding of the biomechanics of function and then takes advantage of that understanding to design proper functional tests where each student is successful.

PEAK PE . . . takes advantage of each student's successes to build upon what they can do and build upon the power of the hips to develop enhanced function in order to be encouraged and in order to encourage.

PEAK PE . . . creates a foundation and an environment for success.

For more information on PEAK PE go to [peakpe.com](http://peakpe.com)

RESEARCH ROUNDTABLE WITH DR. DAVID TIBERIO

*Understanding and Appreciating the Dynamics of the **Chain Reaction** with Respect to an Integrated Isolation Strategy*

LANDING STUDY

McNitt-Gray J.L. "Kinetics of the lower extremities during drop landings from three heights" *Journal of Biomechanics* 1993 Sep;26(9): 1037-46

Zhang SN, Bates BT, Dufek JS. Contributions of lower extremity joint to energy dissipation during landings. *Medicine & Science in Sports and Exercise* 2000 Apr;32 (4) 812-9

1. Jumping from progressively higher levels therefore creating a greater force into the lower extremities reveals the hip taking on an ever increasing role in the shock absorption and the loading stability of the lower extremities.

*"When you are in trouble subconsciously, call in the friend with the greatest power"*

- G. Gray



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### STUDY ON STIFF LANDING AND FLEXIBLE LANDINGS

Zhang SN, Bates BT, Dufek JS. Contributions of lower extremity joint to energy dissipation during landings. *Medicine & Science in Sports and Exercise* 2000 Apr;32 (4) 812-9  
Devita P, Skelly WA. Effect of landing stiffness on joint kinetics and energetics in the lower extremity. *Medicine & Science in Sports & Exercise* 1992 Jan;24(1): 108-115

2. Subjects consciously were able to create stiff landing and flexible landing utilizing the powerful hip.

*"Conscious awareness must be transformed into initially and even ultimately subconscious reaction for injury prevention and effective rehabilitation"* - G. Gray

### RUNNING AT DIFFERENT SPEEDS

3. With increased speeds, the hip was determined to take on a greater significance prior to heel lift. Then in swing phase, the hip has a negative or eccentric component which we would call loading.

*"The hip undergoes tri-plane loading upon heel contact. It then unloads during mid stance. It then undergoes tri-plane loading right before heel lift and swing phase to propel the body forward."* - G. Gray

### DISCUSSION OF THE RELATIVE BOTTOM UP LOADING AND THE RELATIVE TOP DOWN LOADING OF THE HIPS IN GAIT

*"Functional Therapy is understanding how the body is efficient and then figuring out who is messing up the efficiency."* G. Gray

### UNIVERSITY OF CONNECTICUT (Unpublished)

4. A look at the hamstrings, adductors, and hip abductors with a squat, balance opposite leg anterior reach, medial reach and medial rotational reach.

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