

# MUSCLES DON'T WORK ONE WAY

*Why Econcentric Function Changes How We See Muscles*

Muscles are commonly introduced through isolated actions: the quadriceps extends the knee; the hamstrings flex the knee; the calf plantarflexes the ankle.

Those descriptions are anatomically useful—but they do not fully explain what muscles contribute when the body is upright, moving in three dimensions, reacting to gravity, ground reaction force, mass, momentum, and task.

Applied Functional Science® uses the term econcentrics to describe coordinated muscular behavior in which loading, deceleration, stabilization, transformation, and acceleration can coexist across joints, planes, tissues, and time.

## THE FUNCTIONAL QUESTION

Not simply: “What action does the muscle perform?”

Instead: “What motion, force, information, and task is the muscle being asked to manage?”

## MUSCLES AS REACTORS

- **RECEIVE** Motion and force create changing mechanical demands.
- **SENSE** Proprioceptive information helps organize a response.
- **CONTROL** Muscles and tendons absorb, stabilize, and redirect force.
- **TRANSFORM** The system moves from loading toward the next action.

**COACHING PEARL™** Do not coach a muscle as though it works alone. Create the conditions, observe the reaction, and coach the whole Chain Reaction®.

## WHY IT MATTERS

|                                                                       |                                                                          |                                                                            |                                                                        |                                                                         |
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| <b>RICHER ASSESSMENT</b><br>Look beyond the painful or weak location. | <b>BETTER STRATEGY</b><br>Match the environment to the desired reaction. | <b>SMARTER LOADING</b><br>Prepare the system to accept and redirect force. | <b>GREATER TRANSFER</b><br>Connect exercise to the client's real task. | <b>INDIVIDUAL CARE</b><br>Respect different solutions to the same goal. |
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## FUNCTION CREATES A TRANSFORMATION

|                                                                    |                                                                     |                                                                  |                                                                         |                                                              |
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| <b>1</b><br><br><b>DRIVER</b><br>A task or force initiates motion. | <b>2</b><br><br><b>LOAD</b><br>The system accepts motion and force. | <b>3</b><br><br><b>SENSE</b><br>Information shapes the response. | <b>4</b><br><br><b>TRANSFORM</b><br>Force is controlled and redirected. | <b>5</b><br><br><b>EXPLODE</b><br>The next movement emerges. |
| <b>UNDERSTAND</b><br>THE HUMAN SYSTEM                              | <b>DEVELOP</b><br>HUMAN POTENTIAL                                   | <b>EXPAND</b><br>HUMAN POSSIBILITY                               | <b>SERVE</b><br>A GREATER PURPOSE                                       |                                                              |

## SEE ECONCENTRICS IN WALKING

*One task. Several joints, planes, tissues, and muscular contributions.*

### 1. ACCEPT THE LOAD

Following foot contact, calcaneal eversion, ankle dorsiflexion, tibial/femoral motion, and forward progression create a changing demand. The calf complex contributes to controlling—not simply preventing—this motion.

### 2. REACH THE TRANSFORMATION

As the body progresses over the foot, the soleus, gastrocnemius, posterior tibialis, peroneals, and their partners manage motion across several joints and planes. Muscle fascicles and tendinous tissues need not behave identically.

### 3. RETURN & PROPEL

Late in stance, elastic recoil and muscular force contribute to heel rise, stability of the foot, progression of the body, and preparation for the next step. Loading becomes part of propulsion.

## WHAT THIS MEANS FOR COACHES

- **OBSERVE BEFORE YOU CORRECT** Watch how the foot accepts load, how the tibia and femur follow, how the pelvis progresses, and how the heel returns.
- **LOOK BEYOND THE CALF** A calf limitation may reflect insufficient motion, timing, stability, or confidence elsewhere in the Chain Reaction®.
- **ASSESS THE AMOUNT AND TIMING** Too little, too much, too fast, or too late can each change the task.
- **USE BOTTOM-UP AND TOP-DOWN DRIVERS** Foot position, opposite-leg motion, hand reach, trunk progression, and speed can change the calf response.
- **FIND THE THRESHOLD OF SUCCESS** Begin where the client can load and return with control; then expand range, rate, direction, or load.

### CLINICAL PEARL™

***A calf that appears “tight” may be protecting a task it cannot yet control.***

Before stretching the symptom, ask whether the foot, hip, pelvis, trunk, or opposite limb is failing to provide the motion, stability, timing, or confidence required.

**Treat the observed restriction as information—not automatically as the cause.**

## TOMORROW MORNING™

*Six coaching actions you can use immediately.*

### WATCH A STEP

Observe loading, tibial progression, heel rise, and return.

### CHANGE FOOT POSITION

Alter stance width, toe angle, or step length.

### ADD A REACH

Use the hands to change mass, momentum, and plane demand.

### CHANGE THE RATE

Slow down to learn; speed up only when control remains.

### CHANGE THE LOAD

Add resistance or assistance and observe the response.

### ASK BEFORE CORRECTING

“What changed?” The client’s perception is useful data.

**COACHING PEARL™** *The question is not whether the calf worked. The question is how the entire system organized the task.*

# WHAT THIS MEANS FOR COACHES, TRAINERS & MOVEMENT PROFESSIONALS

*Assess, understand, and coach the whole system.*

## KEY TRAINING PRINCIPLES

- **LOAD TO EXPLODE** Create a tolerable loading experience before asking for speed or power.
- **TRAIN IN THREE PLANES** Use sagittal, frontal, and transverse-plane demands according to the person and task.
- **MANIPULATE ONE VARIABLE** Change position, driver, direction, height, distance, rate, load, or duration and observe what changes.
- **MOBILITY + STABILITY** Do not separate available motion from the ability to control it.
- **PROGRESS THE RESPONSE** Increase complexity only while the person retains quality, control, and confidence.

## THE GOLDBLOCKS DOSE

- **TOO LITTLE** Insufficient motion, rate, or load may not create enough information or adaptation.
- **JUST RIGHT** The client can accept, control, and transform the demand with a successful return.
- **TOO MUCH** Excessive range, speed, complexity, or load may produce guarding or compensation.

*The best dose is not the most difficult dose. It is the amount that produces the intended reaction today.*

## WHEN THE TRANSFORMATION DOESN'T OCCUR

### LIMITED MOTION

A joint or region may not provide enough excursion for the task.

### LIMITED CONTROL

Motion is available, but the person cannot yet organize it under demand.

### POOR TIMING

The right motion may occur too early, too late, or too slowly.

### MISMATCHED CONTEXT

The exercise may not reproduce the position, forces, speed, or intention that matters.

## COACHING IMPLICATION

**Great coaches do not force a predetermined pattern onto every body.**

They identify the intended reaction, create an appropriate environment, watch the whole person respond, and modify the variables until a successful strategy emerges.

**The exercise is not the prescription. The individual, the goal, and the environment complete the prescription.**

## WHY IT MATTERS

- **ASSESSMENT** reveals what is available today.
- **TRAINING** builds the next usable resource.
- **PERFORMANCE** requires force to be accepted and redirected.
- **SERVICE** respects the person—not merely the exercise.

**CLINICAL PEARL™** *When a muscle appears weak, do not ask only how to strengthen it. Ask what motion, information, timing, or partnership it may be missing.*

UNDERSTAND  
THE HUMAN SYSTEM

DEVELOP  
HUMAN POTENTIAL

EXPAND  
HUMAN POSSIBILITY

SERVE  
A GREATER PURPOSE

# THE SCIENCE BEHIND THE INSIGHT

*Econcentrics expands observation without replacing established physiology.*

## FOUR LEVELS OF THE STORY

- **1. JOINT MOTION** Describes how segments change position; it does not directly reveal fascicle behavior.
- **2. MUSCLE-TENDON UNIT** The total unit may lengthen or shorten while fascicles and tendon behave differently.
- **3. SEGMENTAL POWER** Muscle forces can absorb, generate, and redistribute power among body segments.
- **4. WHOLE-BODY TASK** Contribution changes with position, load, speed, direction, environment, and intention.

## RESEARCH INSIGHT

In vivo walking studies show that muscle fascicles and tendinous tissues within the same muscle-tendon unit can display different length-change patterns.

Modeling also shows that muscle forces can redistribute energy across joints and segments.

**These findings support a multi-level, task-dependent view of muscular contribution.**

## COACHING TAKEAWAY

- **OBSERVE** Watch the task before naming the solution.
- **ASSESS** Identify available motion, control, timing, and confidence.
- **DESIGN** Create conditions that invite the intended reaction.
- **ADJUST** Change one variable and use the response as information.

- **LOOK BEYOND THE MUSCLE** The limiting resource may lie elsewhere in the chain.
- **FIND THE RIGHT DOSE** More range, load, speed, or complexity is not automatically better.
- **TRAIN THE TRANSFORMATION** Prepare the body to accept, control, and redirect force.
- **SERVE THE PERSON** Individual capability and purpose guide the strategy.

## TERMINOLOGY & PROFESSIONAL BOUNDARIES

Econcentrics, Load to Explode, Chain Reaction®, Transformational Zone, and Tweakology are Applied Functional Science® teaching concepts developed and taught by Gary Gray and the Gray Institute®. Here, econcentrics is used as a professional lens for integrated muscle function—not as a proposed fourth laboratory category of contraction.

## REFERENCES — VERIFIED

1. Gray G. Econcentrics 4.3: Functional Muscle Function. Functional Design Systems; 2002.
2. Neptune RR, Zajac FE, Kautz SA. Gait Posture. 2004;19:194–205. doi:10.1016/S0966-6362(03)00062-6.
3. Alexander RM. Comp Biochem Physiol A. 2002;133:1001–1011. doi:10.1016/S1095-6433(02)00143-5.
4. Ishikawa M, et al. J Appl Physiol. 2005;99:603–608. doi:10.1152/japphysiol.00189.2005.
5. Zajac FE, Neptune RR, Kautz SA. Gait Posture. 2002;16:215–232. doi:10.1016/S0966-6362(02)00068-1.

## ABOUT BOB FANELLI

**Bob Fanelli, M.S., FAFS**

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For more than 35 years, Bob has integrated exercise physiology, kinesiology, applied biomechanics, and movement education to help people understand and develop human capability.

## THE PRISM FRAMEWORK™ PURPOSE

Our purpose is service—to individuals, families, communities, and future generations. Science helps us understand the human system. Possibility guides us toward human potential. Service gives the endeavor meaning.

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