# NFPT CEC Self-Test Packet

## NUTRIGENOMICS
the symbiosis of genetics, nutrition and fitness

## Bone up on Stress Factors
*Prevent the Pain*

## *FUNCTIONAL RANGE CONDITIONING*
*Unlock Hidden Joint Potential*

**BIANNUAL EDITION: June 2022**

Continuing Education Articles for Personal Trainers
from www.nfpt.com/blog

National Federation of Professional Trainers

# NFPT SELF - TEST

# JUNE 2022 EDITION

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# Functional Range Conditioning: Unlock Hidden Joint Potential

Clients often present with what they call "tight muscles" which usually means the muscles are short and overactive and need to be lengthened and calmed down. I also frequently get requests to help clients "improve flexibility". In both of these scenarios, clients might be confusing *flexibility* with *mobility*; and truly the latter makes the difference in activities of daily living as well as the gym. Learn about Functional Range Conditioning, and how building this system into traditional workouts can help clients make a profound and positive difference!

## Turn Passive into Active and Accessible

***Functional Range Conditioning***, a science-based training protocol developed by Dr. Andreo Spina**,** aims to help clients acquire and/or maintain *functional mobility*. In this particular series of exercises, mobility refers to an individual's range of active and usable motion. Personal trainers always seek to help clients not only maximize their movement abilities but do so safely; with FRC, we can help clients cultivate control even at those difficult-to-access end ranges of motion surrounding a joint. Slowly and methodically, this practice turns passive range of motion into active, usable movement patterns, or mobility.

## Body Control

**FRC excels at improving load capacity in the joints, a key factor in activities of daily life as well as any sport-related movements.** By learning to enact body control (also referred to as *neurological* control), athletes can greatly reduce their injury risks. In order to perfect this system, we must understand how to harness the principles of both *specificity* and *progressive adaptation*.

By gradually adding to the load of any exercise or movement, muscle tissue adapts to the point where it can slowly tolerate more weight. Proceeding only at a pace within a client's relative comfort zone, systematic overload eventually leads to better tolerance. Specificity, working in conjunction with progressive overload, reflects how adaptation of a particular muscle tissue relies on a particular type of demand. The unique demands of FRC aim at liberating movement, and accomplish this with isometric moves… and a great deal of patience.

## CARs and the Brain

An important aspect of FRC includes ***controlled articular rotations*****, also known as CARs**, or **movement occurring at the very outer limits of a joint**. Unlike flexibility training, which utilizes a more *passive* approach toward improvement, Functional Range Conditioning relies on isometrics and tension.

In the absence of a full range of motion, the brain senses pain/short muscles and actually inhibits mobility. Before allowing a body to risk major injury, the brain signals us to cease the pain-inducing movement, perceiving it as a direct path to injury. FRC came about as a way to progressively *train the brain to release this protective grip*.

## The Degree of Potential

Dr. Spina often makes reference to his rule of 10-15 degrees, in which a body typically possesses an additional 10-15 degrees of ROM, yet the brain impedes access as a built-in safety mechanism. By engaging in purposeful isometric movements, one can gradually override this neurological "hold", thereby increasing usable mobility even at these difficult-to-reach end ranges.

## Kinstretch

*Kinstretch* refers to a system of precise movements which encourage the body to access/mobilize/utilize greater range of motion around joints. Furthermore, it neurologically "teaches" the brain how to *safely* accomplish this.

Trainers often begin a client's session with active rather than passive stretching, thereby warming the muscle tissue in an effort to thwart any potential tearing. Passive stretching proves more effective at the end of a workout. In observing a Kinstretch class, one may notice what seems like passive stretches at the onset; however, these series of movements create tension in their wake. As Dr. Spina tells us, "Kinstretch is what you do first to prepare yourself for whatever it is that you want to do."

## Putting Science into Practice

Prior to taking clients through the Kinstretch process, trainers might want to consider participating in a few classes. The utilization of isometric tension to master mobility at the end ranges of joints, an entirely novel way of approaching the body, plunges right away into what some describe as grueling positions. After all, re-training the brain to override sticking points without incurring injury requires a great deal of muscle recruitment, and isometric tension applied for an extended period of time meets this need perfectly.

Dr. Spina utilizes terms such as *Progressive Angular Isometric Loading* and *Regressive Angular Isometric Loading* to describe how he accomplishes his principles of a body's movement. In traditional strength training, we help clients break down and rebuild muscle tissue.

However, rather than cultivating strength and size of lean muscle mass, **Kinstretch provides the opportunity to *fine-tune one's ROM in an effort to make resistance training more effective*.** Consider the process of training a client with sport-specific needs.

If this athlete feels his baseball swing requires more power, instead of loading weight onto shoulder and arm exercises, for example, we might "teach" his body to cultivate an increased range of motion around the shoulder joint itself. In the process of accessing and re-training the hardest-to-reach joint areas, a client gains the ability to enhance each and every challenging lift/press/squat. Once sticking points get unlocked, the improved range of motion ultimately facilitates a greater depth of muscle movement. In our baseball example, the athlete starts to notice an improvement in the power of his swing.

One team of scientists took an in-depth look at the effects of full versus partial ROM resistance training exercises, specifically addressing functional movement adaptation. The data revealed that, as we would expect, **possessing a complete range of motion facilitates both hypertrophy and strength development**. Those subjects who utilized only partial range of motion capabilities fell short on functional adaptations.

## New Movement, New Life

Dr. Spina helped to illustrate the differences between flexibility and functional mobility, and how to harness one's maximum ROM in order to live a full and active life. While most trainers have yet to introduce Kinstretch and FRC into traditional training programs, we can now see the importance of learning the specifics of this system and utilizing this process to further clients' abilities and goals.

# Running Backward: The Advantages to Retro-Running

Clients who incorporate running into their workout programs may get burned out from the sheer monotony. Retro-running, or running backward, can interject some variety, whether clients are prepping for a marathon or just running the treadmill for cardiovascular health. Read on to discover the hidden benefits of moving in reverse!

## Force and Form of Running

Endurance athletes characterize traditional running as a combination of the force exerted *after "*hard landing*"* when muscle–tendon units are lengthened, and a lesser force exerted *before "*soft takeoff" when they shorten. **In retro-running (moving backward), the landing–takeoff process gets reversed, resulting in a reduction of output efficiency.**

Backward running (BR) offers a more aggressive cardiopulmonary response and muscle activity as compared to more traditional forward running (FR). One study measured the effects of sustained backward running training on the economy of traditional forward running. At the conclusion of a five-week trial, scientists found that BR training actually improved FR economy, making it a brilliant off-season training variation for both distance and trail-running athletes.

## Energy Expenditure

According to a 2011 study, running backward forces the body to expend ~30% more energy than conventional forward form. In this regard, retro-running mimics the workload expended while running up and down hills, or performing wind sprints. **Some athletes have likened running backward for just a single lap around a track to what the body experiences while running 8 forward-facing laps.** Trainers and coaches might choose to capitalize on this considerable difference in energy expenditure when preparing clients for running events, given that the backward movement renders it an excellent component of moderate interval training.

## Getting Started with Running Backward

Some clients might express initial unease at the thought of moving backward as a means of exercise. Prior to embarking on a backward treadmill journey, remind your client of the following tips to ensure a positive, safe experience:

- Make sure the safety "STOP" clips remain easily accessible
- Maintain eye contact with something at a comfortable height on the facing wall (or television monitor) to ensure appropriate posture.
- Begin at the lowest possible speed, lightly gripping the handrails of the treadmill. Once a walking pace can be maintained comfortably without encountering any precarious balance issues, encourage the client to slowly increase the speed, ideally in 0.5 mph increments. Experts suggest holding each speed for a full 1-2 minutes before attempting an increase, proceeding in this manner until attaining the desired pace.

Giving the client at least one minute at each treadmill speed before increasing to the next enables the body to fully adjust before boosting the intensity and/or asking it to go even faster. As a matter of safety, do not increase both speed and time intervals simultaneously. Just like in any science experiment, varying too many variables at the same time eliminates the opportunity to discern which aspect needs more attention before moving on to the next level.

## The Balancing Act

Walking /running backward on the treadmill facilitates improvements in balance while training lower-limb muscle tissue in a vastly different manner than that achieved with forward movement. Athletes often notice that they can transition from moving in one direction to another with greater ease, owing in part to a diminished workload on the knees.

**Still, clients often cite balance as their greatest challenge in retro-running.** By way of introducing this protocol as an interval training tool, until the client feels fully in command of his space and balance, seasoned running coaches recommend the introduction of one, or perhaps two at most, 30-second intervals spaced evenly throughout a routine run. *Adding inclines to the client's workout should only come after a great deal of practice on a level surface.*

## Assessing the Collision Risks

If a client prefers to run outdoors, suggest he keep in mind the *visual disadvantage of backward running* – not seeing the path or other runners. For this reason, trainers might advise looking for a fairly empty track when clients first embark on this challenge. More experienced retro-runners sometimes opt for clipping a mirror to their sunglasses, enabling them to see – and therefore plan how to move around – oncoming forward-facing runners.

## Correcting Muscle Imbalances

Backward running offers many advantages besides merely spicing up a client's training protocol. The unique challenges placed upon the body serve to improve hip mobility and posture; calf and quad muscles also benefit greatly. We know that the conventional forward running motion can potentially overdevelop the hamstrings, paving the way for knee injuries. Including occasional bouts of backward running can rectify (or at least compensate for) muscular imbalances while also helping to realign the spine.

Data suggests that for an individual undergoing rehabilitation, either from a stroke or athletic injury to the legs, continuing to exercise using backward walking/running at an intensity sufficient enough to maintain cardiovascular fitness levels proves relatively safe, until the client receives clearance to resume his former level of exercise.

## Caloric Expenditure of Running Backward

Scientists who studied a group of 26 female athletes discovered an advantageous caloric burn while running backward. Subjects who engaged in 6 weeks of retro-running, 3x/week for 15 to 45

minutes, saw a 2.4% decrease in body fat. We can expect this type of result when taking into consideration the additional 30% expenditure in workload referenced earlier.

With so many advantages to tap, consider adding backward running to your clients' traditional workouts. Try including the element for about 4-6 weeks, then assess for any changes in speed/muscle development/balance. You might just find that backward training can propel your athletic client forward in a very positive direction!

# Allergies and Exercise

Allergies affect approximately 20-40 million people each year. In this country alone, an estimated 15 million people live with asthma and its ensuing complications; sadly, this number continues to increase. As a result, many such individuals understandably shy away from exercise, fearing it may trigger an asthma attack. Learn how we can safely work with patients who have all kinds of allergies.

## Pollen Allergies and the Workout Challenge

Any serious bout of exercise elicits an increase in ventilation. During those times of the year when flowers bloom and pollen seems ubiquitous, individuals, especially athletes, find outdoor workouts tend to bring on allergic symptoms. Mid-exercise, individuals may experience a sneezing frenzy, runny eyes, and difficulty breathing. Less common but still disruptive reactions include fatigue and mood swings. In rare but frightening cases, anaphylaxis may set in, a condition that rapidly turns life-threatening if not addressed in a timely manner.

## The Precarious Physiology

The sympathetic nervous system bears responsibility for the increase in nasal airway space during periods of exercise. In the presence of allergens, however, the narrowing of these spaces brings about the aforementioned nasal congestion. For the serious/competitive athlete, such factors as sinus pressure, headaches, and potential disruption of sleep can take a toll on athletic performance.

A study looking at how allergic reactions may compromise the central nervous system yielded some upsetting results. Researchers found that allergy complications can bring about decreases in attention span as well as reflex response time, both of which can make the difference between winning or losing a sporting event. More severe reactions include anxiety and depression. Each of these, or any combination thereof, can derail even a top athletic competitor.

In spite of these discouraging data, studies continue to demonstrate the benefits of exercise, even during the height of pollen season. **Since aerobic movement causes a stronger flow of blood, any inhaled allergens will systematically proceed at a faster pace through the body, and just as rapidly get discarded via the kidneys.** A body at rest, experiencing a slower blood flow, enables allergens to remain rooted in place, where they eventually erode delicate tissues such as those found in the eyes and nose.

## Options Abound

Even if trail running fails as a sport of choice in the presence of considerable airborne allergens, many exercise options can help an allergy sufferer maintain his level of fitness.

**Water exercises, from lap swimming to aquatic resistance training and flexibility, present a highly suitable option for individuals living with asthma, whether exercise-induced or more prevalent in daily life.** The moist environment of indoor pools lends itself to maintaining clearer sinus passages,

and also proves gentler on delicate lung tissues. Asthma and allergy sufferers need not fear even the most invigorating of exercises in the water, as such an environment rarely causes the emergence of severe symptoms.

Other options, such as Pilates and yoga-based movements, encourage deep breathing as part of their protocol. This too can facilitate easier movement for those dealing with seasonal or general allergies. The American Academy of Allergy, Asthma and Immunology strongly urges athletes with respiratory challenges not to downplay the importance of *warming up* as a means of holding symptoms at bay.

## Can Allergy Medications Help?

For those individuals tempted to resort to the apparently easy fix of antihistamines to control asthma outbreaks during workouts, reading labels serves an important function. Many over-the-counter products tend to induce fatigue, not an ideal situation for the high-performing athlete. Choose a product that clearly claims "*non-drowsy formula*" on the packaging. When in doubt, always consult a pharmacist or medical professional. Dr. Sanjeev Jain, MD, Board Certified allergist and immunologist at Columbia Allergy, strongly believes that "antihistamines should not directly affect a person's workout performance and the benefits one should get from exercise".

## Fitness and Food Allergies

Much like pollen, certain foods can bring on allergic-type symptoms, even for those individuals who find that "intolerance" or "sensitivity" more aptly describe their exposure reactions. Anything, from itching and hives to shortness of breath, seems exacerbated when coupled with poorly-timed exercise. **Individuals with allergies/sensitivities to certain foods may discover that eating a meal several hours prior to the gym helps thwart unwanted symptoms.**

A rare condition known as *food-dependent exercise-induced anaphylaxis* flares up when consumption of food gets coupled too closely with workouts. Often neither the particular food nor the exercise on their own elicit a reaction; but when paired together, the body experiences very unpleasant effects. Anaphylaxis carries life-threatening potential; as such, athletes with a tendency towards allergic reactions, in general, might choose to carry an *EpiPen* in their gym bags. Once again, savvy timing of food intake makes a big difference here.

## Common Offenders

While every individual possesses a unique DNA makeup, some ingredients found in foods favored by the sports-minded population have earned labels of "common culprits" in regard to causing allergic reactions. The list below outlines a few of these:

- Fructose (present in many sports beverages and energy/protein bars)
- Gluten
- Cocoa powder
- Milk
- Nuts

- Oats
- Preservatives (notably, sodium benzoate and potassium sorbate)

If clients mention that they typically reach for such bars and beverages either before or immediately following a workout, merely out of convenience, trainers might choose to inform them of such ingredient considerations.

## Understanding the Immunology

When a human body faces an allergic reaction, the immune system kicks into high gear by promptly producing antibodies, our body's defense mechanism against what it perceives as a foreign invader. The challenge presented with exercise-induced anaphylaxis (EIA) stems from the production of antibodies *even in the absence of any foreign substance* other than the mere act of exercising.

The process of intense aerobic movement potentially elicits the release of mediators from substances known as *IgE-dependent mast cells*. These mediators proceed to degrade the mast cells, thereby triggering the severe EIA. Exercises of higher intensity, performed frequently within a few days' time, tend to exacerbate this condition. Altering one's exercise format of choice to something performed at a lesser yet still effective level of intensity serves as a safe platform, something to which trainers may want to adhere for their clients who frequently exhibit potentially dangerous allergic-type symptoms.

## Allergies to Pharmaceuticals

Recognizing when an allergic reaction of any sort presents itself during client training requires quick action on the part of the trainer. It may turn out that the client recently began a new course of medication (antibiotics in particular) to which he did not realize he was allergic. Chances are he did not bring an EpiPen, having never before experienced such a problem. Escort the client to a quiet area of the gym, where he can consult his physician or pharmacist on his safest course of action at this point. By knowing the signs, we can help calm the individual as he seeks professional medical advice.

# Understanding Quadratus Lumborum

The Quadratus Lumborum (QL) muscles, a common source of lower back pain, are located on either side of the lumbar spine. While they are situated at the lower back between the pelvis and the lowest ribs, and thus commonly referred to as a low back muscle, ***these muscles are considered to be the deepest abdominal muscles.*** These deep core stabilizers are used when we sit, stand, and walk, so understanding Quadratus Lumborum can give us a better understanding of the effect it has on our physical well-being, as well as the well-being of our clients.

## Origin and Insertion of Quadratus Lumborum

The QL originates at the posterior iliac crest and inserts at the 12th rib.

quadratus lumborum

## QL Function

The QL has various functions including both stabilization and movement of the spine. This muscle allows for lateral flexion of the spine as well as extension of the lumbar vertebral column; it stabilizes the pelvis, lumbar spine, and lumbosacral junction; and it contributes to elevation of the pelvis ("hip hiking"). Additionally, because of its connection to the 12th rib, the QL plays a role in breathing, supporting expiration and assisting the diaphragm during inhalation.

## CONTRIBUTION TO LOW BACK PAIN

The QL muscles are often mistakenly considered to be lower back muscles because of their contribution to pain or discomfort in the lower back. Though QL is just one part of a large system of muscles and cannot be solely responsible for low back pain, its various functions can result in overuse, stress, and repetitive strain.

The lower back pain is typically described as a deep aching pain. However, depending on the cause, it can be experienced as sharp and acute.

Activities with repetitive movements, like running or cycling, can cause QL strain when core and back muscles are weak and when posture is suboptimal. Additionally, sitting for long periods of time can create stiffness and tension due to the continuous contraction and tightness in this muscle. In cases of repetitive strain and prolonged sitting, the pain is more likely to be felt as a dull ache.

Twisting and bending can create tension in the QL and, because it is a core stabilizer, the QL can become tense or tight when having to work to stabilize the spine and pelvis.

As with any muscle, the QL can also become acutely injured. Sports, daily activities, heavy lifting, or accidents can cause trauma to the muscle.

Whether it is chronic or acute, QL pain can be disruptive when performing everyday activities like walking, sitting and standing.

## Posture

Posture is important to consider when the QL is tight or causing pain.

Tilting the pelvis and leaning to one side while standing or slouching while sitting can cause the QL to overcompensate to stabilize the spine and/or pelvis and aggravate it.

Using back support while sitting and finding a more neutral position for the spine and pelvis while performing any activities can protect the QL from this constant contraction and thus, spare a great deal of soreness and discomfort.

## Breath and the QL

Because the QL is connected to the bottom rib, when it is tight, it can affect breathing.

A tight and stuff QL can prevent the rib cage from fully expanding on inhalation, making it challenging to take in a deep breath.

For this reason, a healthy QL plays an important role in optimizing our respiration.

## Other Considerations

Its many functions and constant daily use make the Quadratus Lumborum muscle an important one to consider when training our clients.

Core and lower back strengthening can help support the QL so it is not overworked and strained unnecessarily. Special attention to posture and form must take precedence when we are strength training.

Additionally, lengthening this muscle can provide relief when it is tight. Lateral stretches, standing and seated, can help to lengthen the QL. Self-massage and myofascial release can help to relieve tension in the muscle and the surrounding tissues. Deep, intentional breathing can also help to relax an overactive muscle, as well.

Pilates and yoga classes that focus on breathing, lengthening muscles, and strengthening the core can be helpful in relieving low back pain associated with Quadratus Lumborum.

Finally, clients can always use a reminder that they don't have to live with lower back pain. Remind them to seek help from a medical professional if pain is long-lasting or severe, and that you are there to support them in the process of returning to pain-free living.

# Bone Up on Stress Fractures and Prevent the Pain

If you've ever suffered a stress fracture, then you know that pain: the aching, often stabbing sensation in the shins, reminding us we overdid it on the trail running and high-impact aerobics, or our athletic shoes seriously need replacing. Seasoned athletes and recreational warriors alike can suffer from this injury. Read on to gain a better understanding of how we can help clients avoid suffering, both in terms of pain *and* mandatory rest time away from the gym.

## Orthopedics 101

Stress fractures, indicative of small cracks in a bone, often occur following repetitive force and/or overuse — regular sessions of jumping, for example, or excessive frequency of cross-country running. Track and field athletes who specialize in events involving sprinting at high speeds or hurdle-jumping tend to fall prey to shin splints with alarming regularity, which are different from stress fractures but they share overlapping symptoms. Stress fractures also develop from everyday use if a bone already suffers from osteoporosis, or if an overzealous client dives into exercise too soon after having taken time off to nurse an injury.

Bone adapts gradually to increased loads through *remodeling*, a normal process involving osteoblasts and osteoclasts, the cells responsible for the breakdown and rebuilding of bone tissue. Any new, arduous or atypical force placed upon bone tissue, without allowing sufficient time for recovery, causes tissues to break down at a higher rate than that of replacement, rendering the tissue more susceptible to stress fractures.

## Etiology and Symptoms of Stress Fractures

**Whether on a treadmill or outdoor surfaces, the repetitive impact of running causes 20-75% of all stress fractures.** These tend to occur in the tibia, located in the shin. Feet, too, suffer a disproportionate number of stress fractures, most commonly observed in the 2$^{nd}$ and 3$^{rd}$ metatarsal bones within the toes. Physicians sometimes see stress fractures in the hip, back, and even the heel.

The initial signs of an impending stress fracture seem consistent from individual to individual, and include the following ~

- Pain when bearing weight
- Swelling
- Tender when touched
- Persistent pain, even at rest or engaging in normal ADL

## Diagnosing Stress Fractures

Several methods of scanning can reveal a stress fracture. The MRI (magnetic resonance imaging) seems most reliable, as it uses a magnetic field and computer-generated radio waves to produce highly-detailed images of affected tissue. Bone scans utilizing a radioactive tracer can prove helpful in diagnosing stress fractures; however, an X-ray only offers conclusive proof *after the patient has dealt with pain for 3-4 weeks*.

## Risk Factors for Incurring Stress Fractures

While participation in higher-impact sports such as track/field, basketball, and gymnastics definitely may increase one's chances of suffering a stress fracture, other risk factors do play a role. Moving too abruptly from a sedentary lifestyle to an arduous workout program, or increasing the intensity/frequency of one's current training protocol, can also place undue stress on the bones.

Women seem to incur more stress fractures than men, particularly those individuals who experience irregular menstrual cycles. Women's shoes, too, fashionably stylized with pointy toes and high heels, pose problems for feet. However, any ill-fitting footwear and athletic shoes can invite stress fractures. Runners often seek out shoes with ample room in the toe box, built-in stability, and side-rolling protection, for this very reason.

Any individual with weaker bones, either due to genetics, osteopenia, or a significant lack of nutritional calcium and Vitamin D in, can lead to problems. Young females who engage in eating-disordered behaviors, particularly consuming extremely little food, will naturally find themselves developing a weaker bone structure; couple this with intense physical activity, and stress fractures most likely will develop.

## NSAIDs and Bone Strength

Anecdotally, we know that clients often reach for non-steroidal anti-inflammatory drugs (NSAIDs) after a tough training session leaves them unusually sore. New evidence regarding the overuse of NSAIDs sheds an interesting light on stress fractures.

During weightlifting or any activity that places a significant load upon the body, an inherent adaptation leads to stronger bone formation. As trainers we always remind clients about the value of any weight-bearing exercise in holding osteoporosis at bay; scientists now feel this could actually help thwart a potential stress fracture in the area of the body experiencing the mechanical load. While more clinical trials on humans have yet to occur, animal studies suggest that overuse of NSAIDs may suppress this important adaptive response.

## Potential Complications

Nobody likes to remain idle for too long, especially those accustomed to regular physical engagement. However, resuming one's activity before an affected bone has fully recovered can delay the healing process as well as increase the risk for more serious and complete fractures. In such cases, an athlete may find himself sidelined for an even longer period of time. Individuals, and athletes in particular, who fail to properly address a stress fracture or delay treatment run the risk of developing a condition known as *avascular necrosis*, or death of the bone tissue. This condition occurs due to a lack of adequate blood supply. Left untreated, avascular necrosis could pave the road to severe arthritis as the affected bone loses its former shape. Due to constant pain even at rest, or the individual's ultimate inability to bear weight on the affected limb, we can see how this might spell the end of an athlete's career or the termination of a client's training abilities. Prudent athletic trainers, coaches, and personal trainers might advise their at-risk clients of all these pitfalls, while still keeping them on a satisfying exercise path.

# Nutrigenetics and Nutrigenomics: The Symbiosis of Genetics, Nutrition, and Fitness

As science draws ever closer to the reality of personalized nutrition for optimal performance, nutrigenomics — the study of the interplay between nutrition/bioactive food compounds and gene expression — offers an up-close view into human dynamics. In conjunction with the mapping of the human genome, we have the power to help clients not only remain healthy but understand the intricate relationship between nutrition, gene expression, and long-term health. Find out how nutrigenomics and nutrigenetics can help personal trainers guide their clients towards achieving their goals.

## Understanding Nutrigenomics

The beauty of personalized nutrition lies in its potential to optimize health, body composition, and exercise performance. Nutrigenomics takes the process a step further than simply targeting dietary recommendations to an athlete's goals; it also includes looking at one's genetic footprint.

**Nutrigenomics draws upon various technologies and genetic information to address issues related to nutrition and sports performance.** Outside of a basic "clean eating" ideal, we must now consider the role that genetics plays in determining how an athlete responds to food/nutrients. Genetic variants affect the way nutrients react upon ingestion, specifically the alterations that might occur in the metabolic pathways critical to exercise output. The information gleaned from personal DNA/genetic testing can finely tune recommendations for individual protocols. Understanding why one's body performs/reacts to certain nutrients can help trainers and sports dietitians propel an athlete's success in a highly specific manner.

## The Role of Nutrigenetics

***Nutrigenetics*** **addresses how genes determine the effects of nutrients upon the body.** Hence, the manner in which an athlete's body responds to the fuel ingested depends in part on his unique nutrigenetic profile. The profile categorizes nutrient absorption/utilization, food intolerances/allergies, and nutrient deficiencies.

We can consider nutrigenomics the polar opposite of nutrigenetics. **While nutrigenetics provides information on one's specific genome that might help influence what to eat for optimal athletic performance, nutrigenomics relates to how foods actually alter gene expression.** Going one step further, scientists studying these fields strongly believe that diseases may arise as a function of dietary compounds (proteins, enzymes, and other chemicals) which, in turn, exert their power to affect gene expression.

## Which Came First: Diet or Genetics?

The basis of nutritional genomics rests on the following principles ~

1) dietary chemicals harbor the ability to alter gene expression and/or structure

2) a specific meal plan can put one at risk for a number of diseases, especially if involving diet-regulated genes

3) genetic makeup may influence how diet affects/causes diseases

4) "individualized nutrition", steeped in the knowledge of one's genotype, may help to offset or even cure many common diseases

## Training Clients Outside the Box

Personal trainers and bodybuilders have long clung to the tenet that in order to build lean muscle mass, or cut subcutaneous adipose tissue, one must carefully balance calories in/calories out as well as the appropriate ratio and timing of proteins, fats, carbohydrates, and micronutrients. **Nutrigenomics points to the fact that, in addition to all of the above, our unique genetic makeup, too, plays a pivotal role in metabolic activity and the overall health of our bodies.**

John Mathers, a Nutrition Scientist at the University of Newcastle in the UK, poses the question of how diet may interact with one's genome, in an effort to extract the reasoning behind the expression of particular phenotypes. For example, many individuals in health-related endeavors adhere strictly to a clean and balanced meal plan. However, each of these individuals may possess a different set of genetic mutations, possibilities which can run well into the tens of millions, each leading to the expression of health or diseased states.

"We've started to better appreciate the fact that it's not just the diet and it's not just the genetic factors but it is an interaction of the two that permits a metabolic change that gets translated in a complex disease over time," says Kenneth Kornman, Head of *InterLeukin Genetics.*

## Nutrition, Genome, and Disease Prevention

What does this say for the future of individualized precision nutrition based on one's genome map? "Personalized nutrition advice may not be helpful to the general public if they don't know their own genetics," says Albert Koulman, an analytical chemist at the Medical Research Council in Cambridge, UK.

Now that scientists have come to view nutrition as an environmental factor that influences gene expression, nutrigenomics focuses upon how the pairing of food as fuel with an individual's genetic anomalies can help foster a clearer understanding of the origins of many of today's chronic health plagues: cancer, obesity, diabetes, cardiovascular disease, and aging in general.

A few examples may help elucidate this nascent yet compelling view. Delayed onset muscle soreness (DOMS), commonly experienced in the days following strenuous training, reflects exercise-induced muscle damage, which we know facilitates hypertrophy and strength. DOMS reflects oxidative stress, inflammation, and muscle protein degradation; the extent to which an athlete

reacts to these side effects varies with age, training, and genetics. Specifically, subtle differences in variations of the ACTN3 gene influence susceptibility to muscle damage after tough workouts.

The ACTN3 (rs1815739) gene encodes the alpha-actin 3 protein, a primary player in the contraction of fast-twitch or power-type muscle fibers. Athletes who carry a genetic variant display a lower functioning ACTN3 protein, leaving them more vulnerable to muscle damage.

As such, these individuals may face a higher incidence of over-use injuries, especially without sufficient rest/recovery and adequate protein intake between training sessions. Armed with this genetic knowledge, a trainer might suggest more downtime between sessions, and a diet that emphasizes lean protein as well as foods that lessen inflammation (fresh produce, seeds/nuts/legumes).

## DNA Testing and Individual Resistance

Although tremendous technological advances remain within our reach, many individuals shy away from delving too deeply into their personal information. Sometimes the fear associated with discovering the genetics for developing an incurable illness down the road paralyzes one's effort to utilize genetic information to his advantage. Yet if a client does not see desired results having followed traditional bodybuilding nutritional advice, chances are good that he will give up. However, such personalized information offers an understanding of how and why one's body responds to different diets and fitness plans, paving the way to increased motivation.

## Applying Nutrigenomics

The more researchers learn about the intricacies of the genes/nutrient relationship, the more we can understand the benefits of including molecular science in the formula of turning out true performance-oriented athletes. For this process to have a high level of success, a truly personalized meal plan will take into all of the aforementioned factors. While much of the DNA testing no doubt lies outside the scope of most trainers' practice, we can certainly educate clients about the possibilities open to them and allow them to take that next bold step.

# Vitamin B12 Balancing: The Hazards of Insufficiency and Excess

As personal trainers we occasionally dispense post-workout advice to curious clients; no doubt a significant majority of us suggest some brand or other of a hydrating “sports beverage”. Many clients whose eating habits may leave them deficient in key minerals and vitamins briefly read the beverage label and deem the quantity of vitamins sufficient for their active lifestyle. Could these individuals still harbor a risk for vitamin B12 deficiency? Conversely, what hidden culprits may result in a deleterious excess?

## B Vitamin Basics

Water-soluble vitamin B12, also known as *cobalamin*, plays a key role in many biological functions, such as the immune system response, mitochondrial processes, production of myelin and red blood cells, and the synthesis of the neurotransmitters serotonin and dopamine.

Several characteristics set B12 apart from other B vitamins, namely the fact that it contains a metal ion. The presence of cobalt accounts for the name *cobalamin*.

**A water-soluble vitamin will rarely reach the point of excess in the body.** Our renal system (kidneys) filters the vitamin from blood and eliminates it along with water. Even if an occasional transient excess builds up, the ramifications remain largely innocuous: the body can store sufficient B12 in the liver, meaning those whose bodies contain a slight abundance can go years without needing to purposefully consume it.

## B12 Deficiency Dilemma

In spite of the body’s capacity to store B12 in the liver, some individuals consistently present with low (often dangerously so) circulating levels in their blood. **The serious effects of vitamin B12 deficiency include anemia, depression, dementia, and hallucinations. Tingling in the lower limbs often sets in, along with neuropathy, fatigue, and an accelerated heart rate. Irritability also ranks highly on the list of reported symptoms.F**

Many factors exist to explain why some individuals have low B12 stores. Since the primary sources of the vitamin B complex group include animal-derived protein – beef, chicken, dairy, and fish – both vegans and vegetarians must find other B12-rich food sources. Fortified cereals and breads, along with plant-based milk substitutes and healthful seaweed can help to fulfill B12 requirements.

Additionally, certain gastrointestinal issues can lead to malabsorption of nutrients, including B12. Celiac disease, Crohn’s, leaky gut, and atrophic gastritis will all affect gut-related absorption. Age contributes to this problem as well; older individuals lose the ability to effectively absorb vitamin B as time goes on.

## Beware of Rare Excess

As mentioned above, the human body rarely accumulates an excess of circulating B12, certainly not to any degree of toxicity. **Thus, when a consistently high value of vitamin B12 in one's body presents itself, this generally indicates the presence of underlying illnesses, some of which need immediate medical attention.** A damaged liver/liver disease, kidney failure, and a unique subset of blood cancers known as myeloproliferative disorders (most notably, myelocytic leukemia) can cause an excess build-up of this micronutrient. In their very early stages, illnesses associated with high vitamin B12 often present with generally common symptoms, such as fatigue and loss of appetite. While such symptoms come and go at some point in all of our lives, persistent conditions create an urgency to consult a physician. A blood test will confirm a dangerous excess of vitamin B, and considering the potentially life-threatening nature of some of these illnesses, an early diagnosis makes all the difference.

One research study attempted to draw a correlation between levels of vitamin B12 in one's system and death rates. The scientists observed that among the participants studied, those whose blood showed the highest levels of B12 also had a higher death rate. Science has yet to determine any definitive reason for this outcome; hopefully continued additional research will eventually yield answers.

Senior author Dr. Stephan J.L. Bakker, a professor of internal medicine at the University Medical Center Groningen in the Netherlands, refers to the data as "only an association, not a cause-and-effect relationship." He adds, "High amounts of vitamin B12 are often taken without a medical indication." **Dr. Bakker goes on to say how excessive levels of B12 "might change the gut microbiota in ways that could be harmful — but no one really knows."**

## Natural Steps to Safely Lower Excesses of B12

When an individual presents with greatly elevated circulating levels of B12, and physicians have ruled out any serious underlying comorbidity, several easy steps can help return the level to a normal range.

Engage in regular moderate exercise. The resulting heat generated by the body causes sweating, a natural mechanism for shedding water (and with it, water-soluble vitamin B12). Exercise also lends itself to an increase in water consumption which, in turn, will boost renal activity. Water remains the beverage of choice, since a majority of "sports drinks" contain added vitamins, including B12.

*With the growing popularity of intramuscular and intravenous high vitamin doses to restore "energy" clients who subscribe to these practices need to be reminded that movement and nutrient-dense diet is still necessary.

Consume a natural mild diuretic, such as coffee or tea. Once again, this causes a positive impact on the body's renal system, thereby helping to filter out excess quantities of vitamin B12.

Shift meal planning to include more plant-based sources of protein. Reduce consumption of animal-derived foods, as they serve as a generous provider of B12.

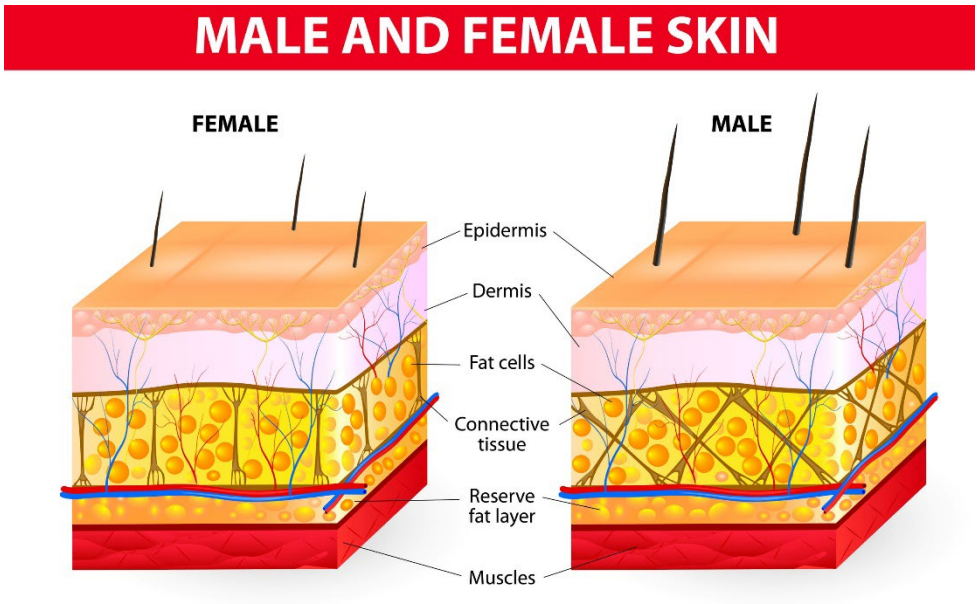
# What is Cellulite and Why Do Women Get it?

As a woman and a fitness professional, I have both "suffered" with and fielded countless questions about cellulite. If you as a personal trainer serve women in your practice, I guarantee this topic will arise and you should be prepared to handle both the scientific explanation of cellulite and also the discontent frequently associated with it. Here's everything you need to know about cellulite and how to best inform your clients.

## What Is Cellulite?

To tackle the issue of this fatty-fibrous phenomenon, one must understand exactly what it is without taking guesses based on appearance. Cellulite is the appearance of dimpling and puckering of the skin, most commonly affecting women (up to 90% of them!), and most likely to be found around the thighs, buttocks, and abdomen. The scientific designation, *edematous fibrosclerotic panniculopathy*, was first coined by Alquin and Pavot in 1920. They described cellulite as "interstitial edema associated with an increase in fat content."[1]

In layperson's terms, **cellulite is a herniation of subcutaneous fat tissue from their fibrous collagen enclosures, which then creates the phenotypical appearance of skin depressions.** The perpendicular nature of the fibrous septa in women is what ultimately manifests in the puckering. Men, on the contrary, have a transverse, or criss-cross, orientation of these connective tissue fibers, preventing the appearance of cellulite.




Skin male and female. Men tend to have more connective tissue that are arranged in such a way that it gives better support to the surrounding structures of the skin and fat. A woman's fat cells are held in place below the skin by cube-like structures contained by parallel collagen bands.

Unfortunately, the exact etiology of this complex condition is not clearly understood. There are several factors at play, and encouragingly, even some potential solutions to mitigate its appearance. While people of normal weight can still exhibit cellulite, the increased storage of fat cells will, in kind, exacerbate the appearance of dimpling.

In order to prevent the development of cellulite, lipogenesis (the development of adipocytes) must be slowed down while lipolysis, (the destruction of stored up fat), should be sped up.

## Lifestyle Factors

### Diet

We can say with certainty that excess adipose tissue will magnify the effects of cellulite, and so adopting a healthy lifestyle of nutritious foods and challenging activity will certainly reduce the amount of fat that can contribute to unsightly puckering. However, can the appearance of cellulite be reduced by specific dietary influences?

Some have proposed that an anti-inflammatory diet can reduce the puckered tissued appearance. This study concluded that a dietary intervention aimed at including fresh, preservative-free foods (whole grains, lean means, colorful fruit and veggies), free of added sugar, alcohol, pasta did not have an impact on visible cellulite despite some other markers improving (like skin thickness). The controlled diet did result in some weight loss, but it wasn't significant. Further, the authors point out that "although there is no consistent evidence on which food groups affect cellulite, the analysis of the diet recall before the intervention showed that most participants were used to eating industrialized food, with high glycemic index and rich in trans fatty acids."[2]

My personal take? I eat a very clean, and well-balanced diet of organic foods, minimal processing, and very low sugar. I do consume moderate alcohol, however. I have not found my cellulite to respond much at all to dietary interventions unless my body fat percentage decreased along with it. (and still, cellulite remains, just less prominent).

### Smoking

Because if its deleterious effects on the cardiovascular system smoking is thought to increase the likelihood of cellulite. See the study below under "genetic influences".

## Hormones and Cellulite

The influence of hormones on the cardiovascular system cannot be ignored. The female hormone estrogen is abundant and women but still plays a role in the male endocrine system. Unfortunately, starting in puberty, women may develop an imbalance of estrogen and progesterone (another female hormone). The high ratio of estrogen to progesterone is known as estrogen dominance. Even if estrogen levels are too low, one can still be estrogen dominant, resulting in hormonal dysfunction.

Steroid hormones like estrogen are responsible for the dilation of blood vessels. While the manifestation of cellulite on the surface may appear to be limited to connective and adipose tissue, this is not the full picture. The circulatory and lymphatic systems are involved in the clearance of toxins and lipid metabolism. Without proper functioning, accumulation of fat will occur in subcutaneous tissue and toxins will happily reside there. Furthermore, over time, abnormal tissue perfusion and altered metabolism can weaken the walls of tissue that pucker and create cellulite.

This suggests that examining the balance of hormones may offer insight to not only the formation of adipose tissue and resulting cellulite, but other mysterious ailments and conditions that imbalanced hormones may cause. A DUTCH test is one comprehensive test to shed some light in this area.

### Genetics

Like most things, science can point to some gene or polymorphism that explains, at least in part, why certain characteristics are expressed, and cellulite is no different. One experiment compared smoking and non-smoking women in their 30's and whether or not they had a polymorphism of the ACE* gene (rs1799752/rs4343). Interestingly, women who smoked but did *not* have this polymorphism were less likely to exhibit cellulite. Meanwhile, women who did *not* smoke but did have the polymorphism were more likely to have visible dimpling. Finally, combine this specific polymorphism and smoking, and the women were almost 14 times more likely to have cellulite than women who did not have the mutation and did not smoke.[3]

**Note: The ACE gene controls blood pressure via expression of the ACE enzyme. With the DD (sometimes relayed as G,G) polymorphism you have higher ACE levels and higher chances of heart disease.*

As a woman who has been athletic and enjoyed a low body fat percentage most of my life, yet have had visible cellulite on my thighs since I was 18, I found this piece very interesting. I went through my genetic health data and found that I do indeed have this polymorphism.

A second polymorphism was identified as increasing risk for cellulite expression, HIF1α.[4] Though the association is not as strong as is with the ACE mutation, the presence of this allele is still significant. (I do *not* have this polymorphism). If this is you as well (and really, you don't need to check your genetic data if you're like me—the proof is in the pudding, no?).

## What Can Be Done About Cellulite?

Are we to just accept that cellulite is part of our bodies and our life and just move on? The short answer is, yes. We should. Even if there are ways to minimize and eliminate cellulite (spoiler alert: I still haven't been successful more than 20 years later), the number one thing we should do and encourage our clients to do is ***love and accept our flawed and imperfect bodies no matter what.***

If I could rewind and tell my 20-something self that there are far more important things than aiming for bodily perfection I would have saved money, time, energy, and a healthy dose of self-deprecation. Self-love and body acceptance always paves the road to happiness, not self-loathing.

The unattainable mission of bodily perfection is self-defeating (for most) and never-ending; once a fix is identified for cellulite your mind is likely to move on to the next “imperfection”, and so on and so forth.

Ultimately, if 90% of women exhibit the “ugliness” of fat-puckering somewhere on their bodies, it would follow that we are in very good company, and are still perfectly loveable. Full-stop. With that, there are still purported treatments, approaches, and procedures that may help to minimize the appearance of cellulite, which I will explore in the following article.

# The Importance of Grip and Forearm Strength

Exercises like pull-ups, rows, kettlebell swings, and bicep curls all involve a certain amount of forearm strength. Rock climbing, one of the fastest-growing sports in this country, requires an incredible amount of upper body power, forearm strength, and grip strength. Read on to learn why trainers must not neglect forearm strength when designing comprehensive workouts for clients.

## Arm Yourself with Anatomy

The forearms contain more muscles than most of us realize, connecting to and impacting movements in the elbows, wrists, and hands. In terms of functional strength, forearm muscles assist in everyday tasks such as opening jars and carrying suitcases or heavy grocery bags. Sports-related movements such as those associated with golf and basketball also require strong forearms. Focus on the forearm muscles (both flexors and extensors) in the gym rewards a client with strength and hypertrophy (including forearm strength) and may potentially reduce hand, wrist, and elbow pain arising from other conditions or overuse syndrome.

## The Kinetic Chain Connection

The term *kinetic chain* originated in 1955, as orthopedic surgeon Dr. Art Steindler attempted to describe "individual joints and muscles working together as a group to perform any meaningful motion." If a client engages in a pull-up, for example, he not only taps the primary movers (back, triceps) but also every muscle involved in the kinetic chain assisting the movement. These encompass wrists, hands, forearms, biceps, and more. If a client lacks solid grip strength, this "weakest link" in the kinetic chain hampers him from deriving the most muscularity from his back workout. His hands will give out before allowing the major muscles to get appropriately activated.

## Forearm Health and Epicondylitis

**A condition known as *epicondylitis* refers to inflammation of the tendons, those cords of tissue that attach forearm muscles to the elbow.** Significant inflammation in this area can progress from sore tendons to eventual elbow pain. Epicondylitis commonly occurs due to overuse of the forearm during sports such as golf and tennis, or from work-related activities involving repetitive gripping and/or lifting with force. By knowing how to properly train our clients toward an improvement in forearm strength, we offer them a better chance of reducing or eliminating such painful situations.

## Forearm Strength and Wrist Relativity

One research study delved into the response of forearm musculature to combinations of wrist/forearm posture and grip force. Ten participants with no known forearm complications performed relative handgrip exercises (5%, 50%, 70%, and 100% of maximum) for flexed, neutral, and extended wrist positions. Another variable accounted for the three forearm postures: pronated, neutral and supinated. **Scientists concluded that the greatest amount of flexor activity occurred in supination with a flexed wrist. Extensor activity seemed maximized with forearm**

**pronation.** Forearm rotation affected grip force only when the wrist was flexed, with a decrease when shifting from supination to pronation.

## Key Exercises for Forearm Strength

Trainers can serve their clients' needs for forearm strength by including some of these basic exercises in a workout program.

**Farmer's Carry /Farmer's Walk:** Using a weighted object such as a sandbag, kettlebell, dumbbell, weight plate or even a tire, have the client pick up the item and start walking for as long as possible (or the length of the gym floor 2x-3x). Once the forearm musculature feels fatigued almost to the point of failure, set the object down, shake out arms and hands for a few seconds, then repeat the process.

**Pull-Ups/Chin-Ups:** While very basic in nature, using various grip positions (front, overhand, neutral, sideways, reverse, or underhanded grip) can help train the forearms in a variety of ways. If possible, vary the thickness of the pull-up or chin-up bar to create an even greater challenge. For more advanced clients, try draping a towel around the bar and have them hang or perform pull-ups holding only the ends of the towel instead of the bar. This exercise ranks as one of the most difficult strength moves there are.

**"Hang Out" at a Playground:** Hanging from a jungle gym, or moving hand-over-hand across a set of monkey bars, will definitely set the forearm muscles afire. If a client favors a rock-climbing wall, *bouldering* will certainly build grip, hand and forearm strength. Bouldering involves climbing up to a jump height *without the use of a harness or rope*. This activity also improves one's mobility and coordination when climbing.

**Work the Landscape:** Gardening and yardwork, in general, can strengthen hands and arms. Making use of shovels/rakes in the backyard, or even pulling weeds, will contribute to strong forearms and a powerful grip.

**Carry Heavy Bags:** Ask the checkout person at the grocery store to place your items in as few bags as possible, thereby guaranteeing that each bag will indeed feel heavy. This simple trick can work wonders at improving grip strength. Even when you feel the bags slipping or about to drop, challenge yourself to see how long you can hold on (just do not drop the bag containing the carton of eggs).

**Pinch Plate Hold:** Hand a client a weight plate and instruct him to pinch it between his fingers, letting gravity provide the challenge. See how long he can maintain his grip.

**Finger Curl:** Sitting on the edge of a bench, have the client hold a barbell with both hands, forearms resting on thighs, palms facing up. As he lowers the bar as far as possible, then catches it and curls the bar back up as high as possible while closing hands, he will feel a tremendous pull in the forearms. Repeat 5-10x.

A lack of forearm power can compromise one's ability to build strength in other parts of the body. Stronger forearms enable individuals to grip with confidence, allowing more muscles to generate a greater "squeezing force". This adaptation serves us well not only during workouts but also in many activities of everyday life.

# Balancing the Omega Fatty Acid Ratio in the Standard American Diet

Most health and fitness professionals are wise to the notion that more Omega-3 fatty acids in the diet is a good thing for controlling inflammation and heart health. However, that's not the entire picture. We tend to ingest more Omega-6 fatty acids than Omega-3's. Balancing the Omega fatty acid ratio is imperative to getting a maximal health and longevity benefits from these nutritional compounds.

## The "SAD" State of our Dietary Habits

In modern society, our Westernized Standard American Diet (SAD) reflects lower consumption of the omega-3 fatty acid *docosahexaenoic acid* DHA compared to our traditional, hunter-gatherer ancestors. The omega-6 to omega-3 ratio of the SAD diet varies, anywhere from 10:1 to 25:1, whereas the ratio of the long-ago foragers' diet brings the balance closer to 1:1 to 2:1. **This means we are now getting 10 to 25 times more Omega-6 than Omega-3's when our intake should be about the same.**

Our typical eating habits, as a society in general, lead us to stray significantly far away from the ideal ratio range. We might keep in mind, however — and remind clients when appropriate —that optimizing the Omega-6 to Omega-3 ratio is possibly the single most important thing we can do to support our overall health.

## Health Hazards of an Imbalanced Omega Fatty Acid Ratio

Excessive amounts of Omega-6 polyunsaturated fatty acids and/or a very high Omega-6:Omega-3 ratio can promote the evolution of many serious health issues, including cardiovascular disease, cancer, and inflammatory/autoimmune diseases, Alzheimer's disease, and diabetes. An increased level of Omega-3 and/or a low Omega-6: Omega-3 ratio seems to reduce these deleterious health effects.

The Omega-3s derived from fish oil, *eicosapentaenoic acid* (EPA) and *docosahexaenoic acid* (DHA), excel at reducing problematic inflammation. A recent study published in the journal *Brain, Behavior and Immunity* found that Omega-3 fish oil supplements lowered inflammation in healthy (but still overweight) adults. Over the course of four months, participants in this protocol received either a daily dose of 1.25 to 2.5mg Omega-3 supplement, or a placebo pill filled with the types of fats typically associated with the Standard American Diet.

The low-dose group saw a 10% percent decrease in circulating levels of an inflammatory marker known as interleukin-6 (IL-6), while the high-dose group saw an even more dramatic improvement, of decrease of 12%. Those taking the placebo saw a 36 % *increase*. Levels of another inflammation marker, tumor necrosis factor-alpha (TNF-alpha), also decreased in the Omega-3 group as compared to the placebo sector.

Co-author Ron Glaser stated, “You need this good inflammation for an initial response, but if it stays up, and inflammation becomes chronic, then you’ve got a problem. Our research and studies done by others have shown that these two cytokines are clearly related to overall health—and when they’re elevated in the blood that is not good for overall health. So, the more ways we can find to lower them, the better.”

**Omega-3’s, plentiful in fish, flax seeds, and walnuts, help to reduce inflammation in the body.** They also help protect the heart from lapsing into erratic rhythms, inhibit the formation of blood clots, and reduce the body’s level of triglycerides, the most common of fat-carrying particles in the bloodstream. Omega-6’s, found in dairy products, eggs, beef, chicken, and pork, contribute to building up “good” cholesterol (HDL) while helping diminish “bad” cholesterol (LDL). While we can see the benefits of each, the balance remains important. **Scientists suspect that a distorted ratio of polyunsaturated fatty acids ranks as one of the most damaging aspects of today’s Westernized meal plan.**

## Careful Nutritional Planning to Optimize Omega’s

Research indicates that the average American consumer ingests large amounts of processed seed-derived and vegetable oils, many of which pack a significant Omega-6 punch. These fats can potentially alter the health of the body’s cell membranes. In addition to sidestepping these oils for cooking or in recipes, experts stress the importance of also watching the consumption of processed foods that may contain sunflower, corn, soybean, cottonseed, and peanut oils.

Today’s cattle farmers typically opt for grain-based feed for their cows, which often contains both corn and soy. This not only knocks down the Omega-3 content of the resulting meat products; the quantity of Omega-6 in the meat becomes overly dominant. Grass-fed cattle meat definitely surpasses grain-fed in terms of quality and has begun to make a more prominent appearance on grocery shelves and on restaurant menus.

When purchasing eggs, paying attention to the type of feed used by chicken farmers can make a big health difference. **Consumers might seek out those labelled as “Organic” or “Omega-3 enriched”, which indicate that the hens consumed feeds without soy or corn.**

## The Opposing Viewpoint

As if often the case in the scientific world, opinions and data outcomes vary on just about any topic, as we see in any the Omega discussion. It seems somehow counterintuitive, but six randomized trials all showed that replacing saturated fats with *Omega-6 as opposed to Omega-3* fats actually lowered the risk of a cardiac event by a whopping 24%.

Yet another study, the results of which appeared in the *American Journal of Clinical Medicine*, revealed that simply replacing saturated fats in one’s diet with *any* polyunsaturated fats – Omega-6 or Omega-3 – could reduce the risk of heart disease. A referendum on the evils of saturated fat, or extolling the virtues of Omega-6?

According to the American Heart Association, the need to cut back on Omega-6 consumption does not seem dire. A science advisory board spent two years studying Omega-6 consumption as it related to cardiovascular health. Expert panelists included nine independent research scientists from all over the US, three of whom hailed from Harvard University. They concluded that purposeful avoidance of Omega-6 fatty acids to improve one's omega fatty acid ratio might actually backfire.

An article published in the journal *Circulation* back in 2009 quoted Dr. Dariush Mozaffarian, Assistant Professor of Medicine at Harvard's Brigham Women's Hospital: "Omega-6 fats are not only safe but they are also beneficial for the heart and circulation," says the coauthor. The American Heart Association findings revealed that rates of heart disease actually lessened as consumption of Omega-6 fatty acids increased. While we can ideally try to bring these fats into a better balance, the expert opinion now states that we should accomplish this not by drastically reducing consumption of healthy Omega-6 fats, but rather by incorporating additional sources of Omega-3 fatty acids.

## What Do You Think?

In the past three decades, the change in the composition of an American's fatty acid profile parallels the significant increase in obesity. Recent human studies once again demonstrate that the lack of balance between these two fatty acids seems to play an important role in what has become one of our nation's leading health crises. While we may never re-establish the ideal omega fatty acid ratio of our forefathers, striving for a more ideal balance continues to prove immensely critical for our overall health. How would you guide your clients on this topic?

# The Importance of Hip Stability in Runners

Training a runner? Here is why hip stability should be a primary focus of your training!

Did you know it is estimated that the average person who runs a marathon takes anywhere from between 55,000 and 65,000 steps? That is 55,000 to 65,000 frontal plane bipedal locomotive opportunities for not just stability, but for fatigue as well. While running, we propel ourselves from one foot, to the other. During foot strike and take-off we are effectively stabilizing on a single foot, through impact, transferring all the way up the chain to our hips.

It follows, that hip stability is going to play an integral role in running. We know that both the hip abductors and lateral lumbar flexors play an important role in stabilizing the hip during locomotion. If they are not proficient, and/or working in concert with one another, inefficient and even possibly injurious patterns may arise.

## Simplifying Hip Stability

If we effectively simplify the model of running to single-leg stability and having a client stand on one leg, we know that the (abductors) gluteus medius and gluteus minimus and even tensor fasciae latae must all work to prevent the hips from dropping in the frontal plane. We also know that if a client is weak or cannot fire that musculature, we see things like valgus knee, excessive foot pronation, and other inappropriate movement patterns.

We mentioned that the lateral lumbar flexors play an important role as well (we can't let the butt get all the attention!). Muscle groups such as the erector spinae, rectus abdominis, external and internal obliques, semispinalis thoracis, latissimus dorsi, quadratus lumborum and psoas all play a role in lumbar lateral flexion. Some may be more important than others for hip stability and running, but the important part is to consider them all and that there is a complex system and interconnection here that can all contribute to improved movement mechanics and running economy.

## Extrapolate

Now, incorporate ground reaction forces, fatigue, thousands of steps, road conditions, shoes, and many other factors, and you can begin to paint the vivid image as to why hip stability is so important for our endurance athletes and runners! It has even been shown that novice runners exhibit decreased movement stability compared to more trained runners, even regardless of shoe midsole thickness and stiffness, in one study. More advanced runners exhibit better hip stability.

To hammer the idea of hip adductor and stability importance in our runner population, we may further observe an extreme case; the *Trendelenburg gait*. **The Trendelenburg gait is an abnormal gait resulting from a defective hip abductor mechanism. The weakness of the involved muscles results in drooping of the pelvis to the contralateral side while walking.** When the hip adductors to not function appropriately, the pelvis rotates away from the planted limb, which can cause a compensatory trunk tilt to maintain center of mass.

Even if a trunk shift, or hip drop is happening on a very small scale, it may lead to larger issues over the course of training due to the excessive volume and repetitious nature of running.

## How to Help Clients Improve Hip Stability

First, as trainers, the best thing we can do is ensure we educate ourselves and understand the anatomical aspects of hip stability and the mechanics of running. This will empower you to be able to properly *assess* your client in a number of different movement patterns so that any problems or weaknesses may be addressed.

Training for hip stability and the best ways to improve it will be explored in a future article, but make sure you are assessing your runners on their hip stability and single-leg stability! Sometimes, looking at race images is also helpful to see if in a more fatigued state at the end of a run you can see any of those movement pattern faults to help ensure you are creating the best program possible for them!

Happy and safe stabilizing!

# The Link Between Plant-Sourced Proteins and Blood Pressure

Amino acids may form the foundation of all proteins; however, only a select few hold the potential to lower blood pressure. Read on to learn how these particular building blocks pave the way towards lower hypertension and better overall health.

## As Always, Diet and Lifestyle Play Roles

As medical research has demonstrated, hypertension – high blood pressure – comes about from a combination of both genetic and lifestyle factors. What we eat plays a pivotal role. Diets favoring a high salt/sugar content, and very few antioxidants, more often than not lead to hypertension. A recent study revealed a strong connection between *glutamic acid*, an amino acid found in greater amounts in vegetable protein, and lower blood pressure in humans. This makes sense when we take into account the abundant health benefits already associated with a plant-based diet, and plant sources of protein in particular.

This noteworthy data may explain the value in following the DASH Diet, and its success in reducing blood pressure. DASH stands for Dietary Approaches to Stop Hypertension, and stresses a meal plan consisting of lower sodium, fewer processed foods, and an abundance of vegetables, whole grains, and beans.

## Small Changes, Great Gains

The study further found that of all the building blocks that make up proteins, glutamic acid played the most dominant role. This amino acid figured prominently in almost a quarter of all the proteins consumed by those subjects adhering to a plant-based protein menu, yet only comprised 18% in the group who consumed animal sources of protein.

While the reduction in blood pressure associated with the vegetable protein component may appear relatively small, such subtle alterations can have a profound difference in one's health.

"It is estimated that reducing a population's average systolic blood pressure by 2 [points] could cut stroke death rates by 6% and reduce mortality from coronary heart disease by 4%," says researcher Jeremiah Stamler, MD, *professor emeritus* in the Feinberg School of Medicine at Northwestern University in Chicago, Illinois.

## The Unique Amino Acid Stars

The specific amino acids that confer anti-hypertensive effects do so through a variety of mechanisms and pathways, both in the human and the animal models. *Cysteine*, *glutathione* (a tripeptide), *glutamate,* and *arginine* attenuate and help thwart insulin resistance, decrease nitric oxide bioavailability, alter renin-angiotensin system function, and lower oxidative stress–all common precursors to the development of hypertension. *Leucine* improves insulin resistance by modulating gluconeogenesis occurring in the liver. *Taurine* and *tryptophan* attenuate sympathetic nervous system activity. The high *arginine* content and antioxidant activity of soy-based protein

sources, too, help lower blood pressure. Many vegetarians and vegans rely heavily on soy to meet their daily protein demands.

The famous scientist Linus Pauling developed a procedure to attenuate and manage heart disease. His format included the use of the amino acid *lysine*. In his own words, Pauling described the outcome of his experiments: "When there are extra amounts of *lysine* and *proline* in blood, the lipoprotein-(a) attachment sites get obstructed by *lysine*, creating a 'Teflon-like' coating around the lipoprotein particles and hence prevents the lipoprotein-(a) from binding to the arterial walls. Therefore, *lysine* prevents plaque build-up and then initiates the setback of plaque deposits and invariably prevents pressure build-up in the arteries and hence reduce hypertension."

## Variety (Not Just Origin) of Proteins Matters

A study led by Dr. Xianhui Qin, M.D., at the Southern Medical University in Guangzhou, China, investigated the link between the variety of protein sources in one's meal plan and the beginning of elevated blood pressure. **The authors found that eating protein from *many diverse sources* could help *lower the risk of high blood pressure* by as much as 50%.**

Dr. Qin suspected to find these results. "We speculated that consuming a greater variety of proteins in proper quantity could guarantee the intake of different essential amino acids, which may correlate with better nutritional status, microbiota richness, and diversity," he says.

## From Lowering Blood Pressure to Attenuating Cardiovascular Risks

An epidemiological study of 4,680 participants ranging in age from 40 to 59 years, and hailing from four countries, studied systolic and diastolic blood pressure readings. The groups met four times throughout the duration of the study, recording blood pressure readings a total of eight times. At each of the four appointments, individuals noted their dietary intake based on a 24-hour recall, including supplements.

Data points clearly showed that vegetable protein intake inversely correlated to elevated blood pressure. This finding further supports earlier evidence of how a diet high in vegetable products promotes a healthy lifestyle, especially concerning the prevention of high blood pressure and the myriad of potential health hazards associated with hypertension.

## Understanding Arterial Stiffness

Select amino acids, again those typically found in plant-based foods/protein sources, may also prove beneficial in other measures of arterial health, according to a study out of the University of East Anglia and King's College London.

Once again, researchers drew a link between levels of dietary *arginine, cysteine, glutamic acid, glycine, histidine, leucine,* and *tyrosine* and significant improvements in peripheral and central blood pressure.

*"These novel data suggest that intake of selected amino acids is associated with arterial stiffness and central blood pressure, with significant associations observed for [pulse wave velocity] and [central systolic blood pressure] similar in magnitude to established lifestyle risk factors for hypertension, such as physical activity, not smoking, and reduced intake of sodium and alcohol,"* researchers presented in the *Journal of Nutrition*.

Furthermore, they foresee great potential for lowering overall cardiovascular disease risks: *"The intake of amino acids associated with lower arterial stiffness and central blood pressure is easily achievable in the habitual diet, making these findings very relevant for public health strategies to reduce cardiovascular disease risk."*

## Coaching Hypertensive Clients

Across the country, pharmacists regularly fill prescriptions for medications to lower blood pressure; many individuals take more than one such medication. When training a client with hypertension, in addition to making the requisite tweaks in his workout, you may try to sneak in some dialogue about the benefits of sometimes choosing plant-based proteins instead of poultry/red meat. After a while, this might just evolve into a new culinary lifestyle habit!

# Pain Relief Options for DOMS

Pain can exert a powerful effect on the human body, from limiting one's engagement in/enjoyment of physical activities to leaving one frustrated, depressed, and anxious. The experience of DOMS (delayed onset muscle soreness) is one that most routine exercisers come to accept and even appreciate on a regular basis, but for those feeling this form of constant discomfort for the first time, it may be more of a deterrent than a motivator. Ice baths, therapeutic massage, muscle rubs, and foam rolling have all proven effective as tools for recovery from any form of intense exercise. In this article, we highlight several of the more commonly-used products to provide pain relief for muscle soreness and rate their effectiveness.

## Topical Pain Relief Resources

This review covers topical analgesics only. While over-the-counter oral pain relievers often prove helpful, the author limits the overview to more homeopathic remedies.

**Arnica Gel:** Categorized as a member of the sunflower family, the flowers and roots of the Arnica plant have proven beneficial as anti-inflammatory agents. According to a 2019 study that appeared in the journal *Medicine & Science in Sports & Exercise*, using a topical analgesic like Arnica can reduce the intensity of muscle soreness during the 72 hours following a run. Other over-the-counter topical products have also proven to reduce recovery time, owing to their content of ingredients such as menthol, magnesium and/or aloe. (It's important to note that arnica is a well-known homeopathic remedy, but not all preparations include diluted ingredients if not labeled "homeopathic", which is more likely to produce positive results.)

**CBD:** Cannabidiol, one of over 100 substances called cannabinoids found in hemp, can serve as a plant-based remedy for relief of chronic pain. The hemp plant resides in the same family as marijuana. Topically applied oils or creams consist of CBD plus the addition of hemp seed oil to appropriately dilute the preparation.

Cannabis-based compounds show promise as an anti-inflammatory agent, easing post-exercise muscle soreness. The human body produces its own endocannabinoids, which help regulate a majority of the body's systems in an effort to maintain homeostasis. If the body overheats, for example, the endocannabinoid system recognizes the need to cool down, thereby triggering the sweat response. The pain response works in a similar fashion. CBD oil acts by stimulating our endocannabinoids to block pain more effectively.

*Unlike tetrahydrocannabinol (Δ(9) -THC), CBD utilized in this method will not elicit any significant psychotropic effects.*

***BioFreeze*:** MenThe 3.5% menthol contained in this topical gel serves as enough of a skin irritant sufficient to "confuse" the electrical stimulation to the brain, effectively rerouting the brain's attention away from pain. The *gate control theory of pain* describes how non-painful sensations can override and reduce the perception of discomfort. A painful sensation stimulates primary afferent fibers traveling to the brain via transmission cells. Activating these cells results in an increase in perceived pain.

In the gate control theory, a closed gate blocks input to transmission cells, thereby reducing any painful sensation. This theory further asserts that non-painful input (in this case, the cooling sensation created by the menthol) closes the nerve gates to any acute pain, thereby "distracting" the individual long enough to mimic the effect of a temporary analgesic.

***ThermaCare* Patches:** These pain relief patches make use of drug-free heat cell technology, a combination of iron, oxygen, water, and salt. Once applied to bare skin, these heat cells activate a chemical reaction known as *iron oxidation.* By enabling heat to penetrate the affected tissue, the resulting increase in blood flow accelerates the body's natural healing process.

***Salonpas* Patches:** This company manufactures a number of pain relieving patch products with different ingredients. Utilizing the process of transdermal penetration, the active ingredients in these patches allow for direct application to the affected area. In bypassing the stomach, the user can avoid potential undue gastric distress which often results from oral pain relievers. Since the patches also contain water, a cooling effect to the skin results from the process of evaporation. Ingredients vary from methyl salicylate (derived from aspirin), levomenthol (sensation of cooling), capsicum (sensation of heat), diclofenac (NSAID), and even lidocaine–a known topical anesthetic. Much like an ice pack, the patches keep the sore area exposed to its effects for 6 hours. Similar to heat therapy, cooling techniques also work wonders for easing sore joints and muscles resulting from overexertion.

## Go with the (Blood)Flow

As personal trainers and athletes know, water can make the difference between a successful training session and faltering early. Below we outline a few rarely-considered methods to increase training recovery.

**Boosting the Blood Flow:** As we frequently explain to our clients, post-workout soreness is thought to result from the byproducts of resistance training's metabolic stress and micro-tears in the muscle tissue. Increasing blood flow to the affected areas enables a greater amount of oxygen/nutrient-rich blood to assist in repair. Before reaching for the bottle of NSAID's, try a warm bath containing Epsom salts instead. The warmth increases circulation, while the readily-absorbed magnesium in the Epsom salts can greatly diminish muscle pain.

**Hydration:** While quenching thirst during a tough workout makes logical sense, insufficient electrolytes in the body can also add to the sore muscle conundrum. Keep in mind that the human blood supply consists of approximately 82% water; as muscles train hard, their demand for oxygen-rich blood increases. Keeping a bottle of coconut water within easy reach accomplishes both hydration and replacement of lost electrolytes. Advise your clients to aim for a volume of water in ounces equivalent to half their body weight in pounds (a 150-pound person would need 75 ounces a day).

## Foods Can Provide Natural Anti-inflammatory and Pain Relief Aid

Knowing that muscle soreness, both acute and delayed, will accompany a challenging resistance-training session, many seasoned athletes opt for advanced preparedness. By including certain known inflammation-fighting foods/supplements in the diet, we can help thwart the severity of post-workout discomfort.

**Turmeric and its main ingredient, curcumin, along with fish oils help to speed post-workout recovery.** If fish oils pose a digestive challenge, increasing the quantity of fresh fish in one's meal plan works just as well.

A few studies have demonstrated that the ***L-citrulline*** **contained in watermelon can attenuate muscle soreness**. A single serving of watermelon juice enriched with L-citrulline not only demonstrated the ability to reduce DOMS, but also lowered blood levels of lactate (often responsible for the sensation of "a stitch in the side"). Watermelon slices/juice also fill the hydration need nicely.

## Avoiding Toxicity

Overdosing on some non-prescription oral painkillers, most notably acetaminophen, can bring about liver toxicity and failure over time. Mild forms of *toxic hepatitis* may not result in any symptoms; often only a doctor-requested blood test reveals this dangerous situation. The following symptoms should alert an athlete to seek immediate medical attention:

- Jaundice
- Pain in the upper right quadrant of the abdomen
- Extreme fatigue
- Loss of appetite/nausea
- Dark-colored urine
- Light-colored stools
- Swelling of lower extremities

Typically, treatment and cessation of the oral painkiller can reverse the situation. However, life-threatening scenarios may arise if an individual habitually engages in the following behavior in an attempt to ease post-exercise discomfort:

- Ingesting more acetaminophen than directed on the label
- Using more than one medicine containing acetaminophen (pay attention to cough/flu formulas)
- Consuming 3 or more alcoholic drinks while taking acetaminophen

## Recovering Safely

Tight, sore muscles need not keep one from pursuing his gym habits and reaching his goals. By adopting the practices mentioned within the body of this article, even die-hard strength training devotees can safely mitigate post-workout soreness. "When in doubt, try the natural route!"

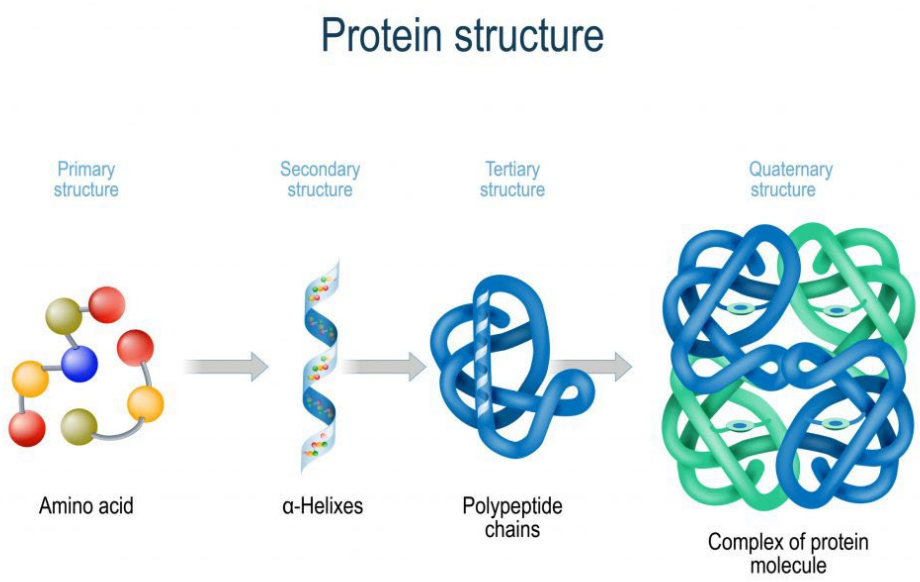
# Mixology 101: Combining Protein Powder with Hot Liquids

Personal trainers widely accept that in order to build muscle, one must consume a significant amount of lean protein. We frequently share such advice with inquiring clients. Many debates exist regarding the best way to ingest the right types of protein. Whey protein, considered the ideal source of protein for consumption immediately post-workout, receives a lot of attention in the industry. A fast-digesting protein, whey easily gets shuttled into the bloodstream, where it can set about its task of repairing damaged muscle tissue and ideally rebuilding it larger and stronger. Most athletes consume protein in the form of a shake, combining powdered whey isolate blends with a room-temperature or refrigerated liquid (water, milk, fruit juice). However, recipes abound in the bodybuilding community for creative and delicious ways to incorporate whey into everyday foods, thereby increasing their nutrient density. How does the integrity of protein hold up, however when mixed with hot liquids?

## Building Block Basics

Clients often ask whether or not heating whey protein powder while preparing a recipe will destroy its potency. To fully address this question, we need to recall the basic construction of a protein molecule. Created from a set of 20 amino acids, these building blocks link together in a variety of lengths to form polypeptides chains. Each protein consists of one or more unique polypeptide chains, typically as a globular complex.

Scientists make reference to four levels of amino acid configuration:




Levels of protein structure from amino acids to Complex of protein molecule. Protein is a polymer (polypeptide) that formed from sequences of amino acids.

*Primary Structure* ~ the linear sequence of amino acids, as determined by the genetic code

*Secondary Structure* ~ the formation of a regular pattern of polypeptide chains, largely due to hydrogen bonding

*Tertiary Structure* ~ the 3-dimensional globular construct of the polypeptide chain

*Quaternary structure* ~ the clustering of several protein chains into a final specific shape

## Denaturation

When subject to high heat, as in cooking, a process called protein denaturation occurs. This results in an alteration of the 3-dimensional structure of the protein, literally an "unfolding" of the protein. Some proteins, such as enzymes, actually lose their biological activity once they have become denatured, owning largely to the fact that heat denatures the quaternary, tertiary, and secondary structures of proteins.

However, the primary structure of a protein, the actual sequence of amino acids held together by covalent peptide bonds, remains intact during denaturation, maintaining the integrity of its nutritional value. Indeed, the denaturing process often renders a protein more digestible than its native structure. **Cooking a raw egg, for example, causes the albumin to lose its 3-dimensional structure, but renders it more digestible than in its original form.** Upon consumption of protein, our gastric juices in the digestive tract break the complex down into individual aminos. Once "reassembled" in the cells, the body can absorb this potent source of dietary protein. Cooked or uncooked, therefore, the body knows how to access and utilize the protein.

## Cooking/Baking with Whey Powder

**The University of Wisconsin's Center for Dairy Research preaches the following regarding baking with protein powder:** "*… Whey may also be used in baked products to add additional nutritional benefits…In general, protein solubility is affected by heat and most foods are heat-processed, whether it involves baking bread, cooking caramel, or retorting soup for preservation purposes…. During baking, some of the proteins may become denatured but as this is a structural change, the nutritional content of the whey remains and thus provides essential amino acids which are part of a healthy diet.*"

## Temperature and Nutritional Integrity

We can consider whey protein isolate as no different than any other collection of amino acids strung together to form peptide bonds. As long as its primary structure is not damaged during heat denaturation, it should retain most if not all of its nutrient value. However, one should still exercise care when adding whey to a warm food; the change in quaternary structure may render the food akin to wallpaper paste! Any bodybuilder attempting to add whey powder to oatmeal prior to cooking will encounter just such a mess, greatly reducing the desirability of the end product. Adding a scoop of whey protein to oatmeal promptly upon removing it from the stove enables it to mix evenly, thereby still possessing visual appeal.

Data published in the *Journal of Dairy Research* states that **direct, long-lasting heat damages "amino acid bioavailability,"** meaning the body must work harder to digest and utilize the protein. *Whey powder* begins to lose digestibility upon prolonged exposure to temperatures over 167+ degrees Fahrenheit. However, *whey protein concentrate* cooked at 194 degrees Fahrenheit for 5 minutes tends to retain 80% of its solubility. Scientists found that only upon heating whey protein at 250 degrees F. for 83 minutes will its nutritional panel take a serious hit.

## Freezing and Bioavailability

Some clients may ask trainers whether freezing protein powder (as in a homemade protein "slushie" or ice cream) reduces its bioavailability. Not nutritionally, according to Marni Sumbal, RD, CSSD, LD/N and owner of a coaching and nutrition company.

"**You shouldn't worry about losing nutrients from freezing a smoothie or protein powder and water**," Sumbal says. "Freezing overnight should keep the protein intact, but be sure to mix completely before freezing so you have a well-mixed drink when you thaw it out in the fridge," she adds. While heating/freezing may somewhat alter the product's texture and taste, the nutritional benefit to the body remains constant.

## Harmonious Blending

If clients wish to expand their protein powder repertoire to include beverages other than shakes, specifically something warm to drink on a cold morning, trainers can offer this easy solution. To mix protein powder into a hot drink, first mix the whey powder with a room-temperature liquid. Stir thoroughly for 2-3 minutes, creating a "paste", and add that to boiling water, warm milk, or even coffee. This process minimizes the appearance of those less-than-appetizing clumps of undissolved floating protein, and gives the beverage a significant nutritional boost. Use this method when adding protein powders to soups, too, as a thickening agent.

Many recipes for homemade protein bars include whey powder. If the desired recipe calls for baking, try a lower temperature (225 degrees as opposed to 350 degrees) and slightly extend the baking time. The beautiful end product, now free from any clumps of unmixed whey, has retained all the nutritional value of its raw ingredients.

With a little time, patience and experimentation, you too can become an expert mixologist in your own kitchen. Take protein consumption to new heights, and alleviate the boredom of repetitive post-workout shakes.

# Inner Fitness: How Altruism Keeps Us Healthy

A healthy diet, exercise, and screening for disease will always remain the cornerstones for lifelong health. Yet many experts — including, apparently, the well-respected late poet Ralph Waldo Emerson — feel that *inner fitness* must also make the list. Read on to discover the secrets of tapping into this enriching wellspring of potential positive energy!

*"The purpose of life is not to be happy. It is to be useful, to be honorable, to be compassionate, to have it make some difference that you have lived and lived well." —* ***Ralph Waldo Emerson***

## Inner fitness = Outward Health

***Inner fitness*** **refers to focusing energy on emotional health rather than being enslaved to diet variables, weight, and meeting exercise demands.** Practicing *mindfulness* reveals an inner sense of completeness–a piece often lacking in our quest to attenuate pain and veer away from dangerous health practices.

Practices including T'ai Chi, meditation, and expressing gratitude figure prominently in such a lifestyle. When engaged in regularly, this "healthy from the inside out" can bring about many positive physical changes.

Research shows that mindfulness can lower blood pressure, improve sleep, lead to better eating habits, and reduce chronic pain.

According to author Tina Lifford, who writes on the topic of emotional health, "Inner fitness means developing the mental, emotional, and spiritual skills and practices that foster ***resilience***. I'd like to see the idea of inner fitness become as ubiquitous, well understood, and actionable as physical fitness."

## The Key to Happiness: Doing Good For Others *and* Yourself

Happiness elicits a multitude of definitions, depending upon the individual. Psychologists make reference to two very distinct forms. ***Hedonic*** **happiness comes about through experiences of pleasure and enjoyment, while** ***eudaimonic*** **happiness refers to the euphoric state that evolves as a result of meaningful, purpose-driven experiences.** Both facets contribute to overall health and well-being, in much the same way as altruism.

Studies show that volunteering time or donating financially to a worthy cause unleashes the brain's endorphins, thereby triggering its innate "reward system". Circulating levels of the stress hormone cortisol can be measurably reduced during times of active altruism. "One of the best anti-anxiety medications available is generosity," said Adam Grant, an Organizational Psychologist at the Wharton School of the University of Pennsylvania.

Dr. Bryant P.H. Hui, author of a study conducted at the University of Hong Kong, researches prosocial behaviors such as cooperation, trust, and lending a helping hand. His article, published by the American Psychological Association, reveals that "Prosocial behavior – altruism, cooperation, trust, and compassion – are all necessary ingredients of a harmonious and well-functioning society….It is part of the shared culture of humankind, and our analysis shows that it also contributes to mental and physical health."

An interesting artifact of Dr. Hui's experiments illustrated how a random act of kindness can affect our overall well-being more significantly than a scheduled volunteering stint. Perhaps the sheer spontaneity of such occurrences fosters social networking, which in and of itself seems to elevate one's happiness levels.

**You Give *and* You Receive**

Personal trainers choose this profession because they possess an inherent desire to help others achieve their goals and carve out their most successful, healthy lives. Aside from a paycheck, what do we receive in return? **This prosocial desire for altruism shows a high correlation to one's innate happiness**. Research experiments using both longitudinal and cross-sectional data indicate that the belief that one's job makes a difference surpasses even the aforementioned happiness quotient of altruistic traits.

## Practicing Self-Compassion

Living an altruistic existence doesn't mean that you neglect your own needs, however.

Jack Groppel, an executive coach and Professor of Exercise and Sport Science at Judson University in Elgin, IL, suggests choosing to focus once in a while on yourself and your needs. Designate whatever time of day you feel the most energetic/creative/productive. *Give yourself permission to dive into your own priority list of emotional needs during this time* (rather than using that time to get "stuff done"). This does not mean you are selfish; rather, you are acknowledging that self-care ranks just as highly as working in service to others.

What would it take to treat ourselves with the same degree of compassion and support as we offer clients who struggle to meet their goals? Close to 75% of individuals who find it easy to care for others seem to discount the need to treat themselves with the same level of kindness and patience, according to research undertaken by Kristin Neff, an Associate Professor at the University of Texas – Austin. Intuition, sensitivity, and experience inspire us to treat clients, and even strangers, with respect. What happens to that attitude when we look in the mirror?

Just as we inquire of a potential new client, “How can I help you on your fitness/health journey?”, we might begin our search for self-discovery with the question “What do I need at this moment to feel better/healthier/more in control?” **Inciting self-compassion instead of flogging thwarts self-sabotage, promoting more peace and contentment.**

## Natural Selection

In the world of human psychology, many adhere to the belief that our psyche may have evolved, at least partially, by natural selection. Considering the brain as one of many organs in the body, might we postulate that altruism could get hard-wired into the brain’s neurons via a pathway akin to natural selection?

The field of social neuroscience research calls our attention to how one’s preponderance towards altruism aligns directly with greater activity within certain specific regions of the brain: the limbic area and the cortical region of the medial prefrontal cortex.

Much more research is needed in order to form a solid platform on which many of these ideas rest, especially those of pure conjecture at this point in time. However, our profession remains on solid footing in terms of how helping others can enhance our lives as well. This author often comes away from personal training sessions feeling enriched because of something a client said, witnessing a personal-best lift, or learning of some significant obstacle he overcame; I’m sure you have experienced this same “natural high” of making a difference in the lives of your clients. The gift of giving always returns to the giver!

# SELF-TEST: June 2022

1. Functional Range Conditioning, FRC, excels at improving:
    a. Athletic recovery time
    b. Load capacity in the joints
    c. Hypertrophic affect in muscle
    d. Movement of oxygen in blood flow

2. FRC training relies on _____ for results.
    a. isometrics and tension
    b. flexibility and passive movement
    c. concentric and eccentric exercise
    d. isotonic and flexibility

3. The brain puts a neurological hold on this %degree of ROM as a built-in stretch safety measure.
    a. 1-3%
    b. 5-8%
    c. 10-15%
    d. 18-22%

4. Retro-running refers to:
    a. Slow run forwards
    b. Short quick steps while crouching down
    c. Quickly moving sideways
    d. Moving backward

5. Retro-running places unique challenges on the body that serve to improve:
    a. hip mobility
    b. posture
    c. calf muscles
    d. all of these

6. Which body system is responsible for the increase in nasal airway space during periods of exercise?
    a. Lymphatic system
    b. Sympathetic system
    c. Autoimmune system
    d. Vascular system

7. The American Academy of Allergy, Asthma and Immunology strongly urge athletes with respiratory challenges to place emphasis on _____ in order to keep symptoms at bay.
    a. Warming up
    b. Increased resistance
    c. Longer bouts of running
    d. Stretching

8. Exercise induced anaphylaxis refers to:
    a. A condition that makes exercise impossible
    b. A suppression of probiotics during exercise
    c. An inability to produce immune responses during exercise
    d. The production of antibodies in response to exercising

9. The quadratus lumborum muscles are:
    a. located on either side of the lumbar spine
    b. found superficial to abdominal muscles
    c. positioned at the upper back
    d. all of these describe the QL muscles

10. Pain associated with the QL is often felt in the:
    a. Deep neck
    b. Internal hip
    c. Lower back
    d. Upper back

11. Which of the following are the cells responsible for the breakdown and rebuilding of the bone tissue?
    a. Osteoblasts and osteoclasts
    b. Neurons and neutrons
    c. Stem and nerve cells
    d. Endothelial and epithelial

12. What are NSAIDs?
    a. Neuron strengthening auto immune dietetics
    b. Non-steroid anti-inflammatory drugs
    c. Non-silicone agent in diabetic drugs
    d. Numbing substance for acute illness and disease

13. Avascular necrosis is:
    a. Death of bone tissue
    b. Decaying vascular structures
    c. Hemorrhage of arteries
    d. None of these

14. Nutrigenetics draws upon various technologies and genetic information to addresses how foods alter gene expression.
    a. True
    b. False

15. Which of the following is a basic principle of nutritional genomics?
    a. genetic make up has no influence on the relation between diet and disease
    b. Dietary chemicals harbor the ability to alter gene expression and/or structure
    c. A 'generalized nutrition' approach is best when working with team athletes
    d. All of the above are principles of nutritional genomics

16. Cobalamin is more commonly known as:
    a. Vitamin K12
    b. Vitamin C
    c. Vitamin B12
    d. None of these

17. The _____ filters the vitamin from blood.
    a. liver
    b. pancreas
    c. kidneys
    d. adrenal gland

18. One way to help the body filter out excess quantities of vitamin B12 is to:
    a. Increase consumption of animal proteins
    b. Reduce bouts of anaerobic exercise
    c. Drink more electrolyte-rich drinks such as Gatorade or other sports drinks
    d. Consume natural diuretics such as coffee and tea

19. The term *edematous fibrosclerotic panniculopathy* is associated with:
    a. interstitial edema
    b. cellulite
    c. increased fat content
    d. all of the above

20. Generally speaking, men will not have the occurrence of cellulite as compared to women because men tend to have more connective tissue that are arranged in such a way that it gives better support to the surrounding structures of the skin and fat.
    a. True
    b. False

21. The high ratio of estrogen to progesterone is known as:
    a. progesterone occurrence
    b. estrogen dominance
    c. cellulitis
    d. none of these

22. Which are forearm flexor muscles?
    a. Carpi Radialis
    b. Triceps brachii
    c. Carpi ulnaris
    d. Carpiradialis brevis

23. Individual joints and muscles working together as a group to perform any meaningful motion, describes which term:
    a. Epicondyl movement
    b. Kinetic chain
    c. Biomechanical connectivity
    d. Anatomical linkage

24. Consuming more _____ in the diet is a good thing for controlling inflammation and heart health.
    a. Omega-6 fatty acids
    b. Omega-3 fatty acids

25. Which of the following foods are beneficial for reducing inflammation?
    a. Fish
    b. Flax seed
    c. Walnuts
    d. All of these are good for reducing inflammation

26. Which of the following play an important role in hip stability during locomotion?
    a. Lateral lumbar flexors
    b. Brachial stability extensors
    c. Supine hip adductors
    d. Extensor abducting latae

27. These must work together to achieve hip stability:
    a. Abductors and tensor fasciae latae
    b. Gluteus medius and gluteus minimus
    c. Abductors and the lateral lumbar flexors
    d. All of these must work together for hip stability

28. The Trendelenburg gait is:
    a. An abnormal gait resulting from a defective hip abductor
    b. A strengthened gait resulting from hypertrophic enhancements of hip abductors
    c. A drop foot gait that is impacted by a weakened quadratus lumborum
    d. A quickened gait walk that generally occurs as a result of fluctuations in blood pressure

29. These form the foundation of all proteins:
    a. Fatty acids
    b. Amino acids
    c. Lipoproteins
    d. Hemoglobin

30. This is an amino acid found in greater amounts in vegetable protein and is connected to lower blood pressure.
    a. L-citrulline
    b. Glutamic acid
    c. Fatty acids
    d. None of these

31. _____ helps to reduce hypertension by preventing plaque build up an arteries.
    a. Taurine
    b. Cysteine
    c. Glutamate
    d. Lysine

32. When training a client with hypertension, it is good to encourage:
    a. Choosing plant-based proteins instead of poultry/red meat
    b. Choosing animal-based proteins with more frequency than fruits and vegetables
    c. Eliminating fish and poultry from the diet
    d. Never using supplements of any kind

33. Homeopathic remedies for DOMS includes:
    a. Topical analgesics
    b. CBD
    c. Arnica gel
    d. All of the above

34. Thermacare Patches use drug-free heat cell technology that is a combination of:
    a. Mercury, carbon dioxide, water and sand
    b. Iron, carbon and NSAIDs
    c. Iron, oxygen, water and salt
    d. Salonpas, arnica, mercury and water

35. What food that contains L-citrulline has been found to reduce the symptoms of DOMS while also lowering blood levels of lactate?
    a. Strawberry
    b. Spinach
    c. Watermelon
    d. Cauliflower

36. Which of the following is the outcome of practicing 'Inner Fitness'
    a. The knowledge of how important the internal setting of a gym/health club plays a major factor in progress
    b. The focus of energy on emotional health
    c. The understanding of the body in a physical sense
    d. The understanding that outer beauty is defined by inner beauty

37. Endorphins trigger the brains _____.
    a. Reward system
    b. Anxiety
    c. Nervous system
    d. Depression

38. This type of protein is considered the ideal source for consumption immediately post workout.
    a. Rice
    b. Egg
    c. Whey
    d. Powder

39. The linear sequence of amino acids' primary structure is determined by:
    a. Genetic code
    b. Anatomical structure
    c. Oxygen bonds
    d. Polypeptide chains

40. What is denaturation?
    a. The outcome resulting from extracting proteins to use in powders
    b. The freezing of foods in order to preserve their protein make-up
    c. The resulting alteration of the structure of protein when subjected to high heat
    d. The process of digesting proteins that are not natural occurring

SIDE 1

○ RESCORE ○ MARK ✓ ○ TOTAL ONLY/BOTH SIDES

| | T | F |
|---|---|---|
| 1 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 2 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 3 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 4 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 5 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 6 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 7 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 8 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 9 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 10 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 11 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 12 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 13 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 14 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 15 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 16 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 17 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 18 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 19 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 20 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 21 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 22 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 23 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
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| | T | F |
|---|---|---|
| 26 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 27 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 28 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 29 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 30 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 31 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 32 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 33 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 34 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 35 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 36 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 37 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 38 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 39 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 40 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 41 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 42 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 43 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 44 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 45 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 46 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 47 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 48 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 49 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |
| 50 | Ⓐ | Ⓑ Ⓒ Ⓓ Ⓔ |

**KEY ITEM COUNT**

| | | |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 1 | 1 |
| | 2 | 2 |
| | 3 | 3 |
| | 4 | 4 |
| | 5 | 5 |
| | 6 | 6 |
| | 7 | 7 |
| | 8 | 8 |
| | 9 | 9 |

1 FEED THIS DIRECTION

**NFPT ID**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |

**MARKING INSTRUCTIONS**


Use a No. 2 Pencil

Ⓐ ● Ⓒ Ⓓ Ⓔ
Fill circle completely

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
Erase cleanly

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| | | |
|---|---|---|
| SCORE | | # CORRECT |
| | | % CORRECT |
| RESCORE | | # CORRECT |
| | | % CORRECT |
| ROSTER NUMBER | | SCORE |
| | | RESCORE |

NAME _____

SUBJECT **JUN 2022 CEC Self Test**

PERIOD _____ DATE _____

**TEST ANSWER SHEET B**
Form No. 19641

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