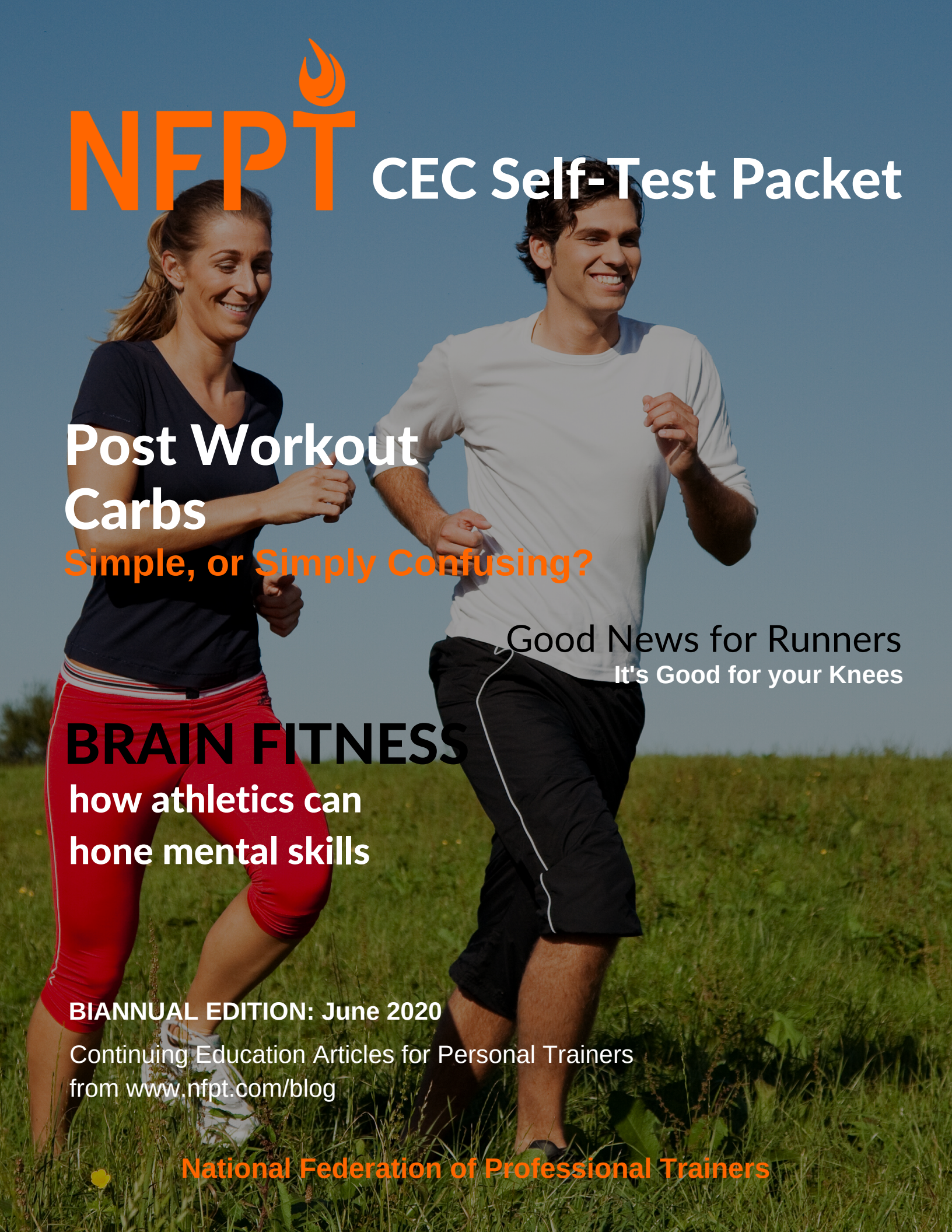

NFPT

CEC Self-Test Packet

Post Workout Carbs

Simple, or Simply Confusing?

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how athletics can hone mental skills

BIANNUAL EDITION: June 2020

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

National Federation of Professional Trainers

NFPT SELF-TEST
JUNE 2020 EDITION

Hello NFPT-CPT! Welcome to the summer edition of NFPT's Self-Test for CECs! This continuing education publication is provided to you as part of your personal trainer certification maintenance; we want to contribute to your certification maintenance and professional development in a way that will help you to receive CECs towards your certification. Take the self-test for a NFPT credit award, but don't stop there! Professional development is key to your trainer success. Don't let your CPT credential carry the load of your industry experience, there's so much more to gain from consistent personal enrichment.

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This packet includes continuing education articles that come from NFPT's Blog. Articles for this June 2020 self-test edition are from the publication months December 2019 to May 2020. All articles are enclosed here to assist you with answering the questions in the back of this packet. Please complete the bubble sheet provided (include your name and contact information) and return to:

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For recertification renewal and maintenance, you are required to obtain 2.0 CECs per each certification year (starting after your first full year of certification). Self-tests are provided bi-annually, every June and December, as a convenient continuing education method for obtaining credit awards that will go towards the 2.0 credit requirement. NFPT Self-Tests are worth 0.6 CECs each, for a total of 1.2 CECs each year. You may review your CE Report and also complete this self-test online by logging in to your NFPT Account at www.nfpt.com/account

NOTE: there are articles in this packet which contain links and/or references to resources and information that is only available online. Go to: www.nfpt.com/blog/cec for these additional resources. We thank you for your commitment to the fitness industry and to the NFPT organization of trainers.

We wish you continued success in all of your endeavors!

Contents

Dress for Fitness Success: Training with a Weighted Vest

A simple vest…we may consider it clothing, a fashion statement, or the third piece in a gentleman's suit…but the notion of wearing one as fitness equipment probably never entered our minds. Convincing new research points us in the direction of weighted vests as the latest tools for building power, strength, and propelling weight loss!

The Emergence of a New Metabolic Action

In 2018, Drs. Claes Ohlsson and John-Olov Jansson, professors at the University of Gothenburg in Sweden, reported their discovery in rodents of a new system that plays a potentially vital role in the metabolic process. They coined the term "gravitostat" to describe this unique entity.

Working with mice, the 2 scientists came to view this dynamic as a "heaviness machine" of sorts, a sensor device residing in bones. Functioning similarly to an inbred bathroom scale, the gravitostat appears to continuously monitor a rodent's weight, striving for maintenance within a specific range. In these studies, the gravitostat appeared to affect the rodents' appetites, causing them to eat more or less in order to restore homeostasis of body weight.

Amping Up Movement

Unfortunately, humans lack such sensors, most likely owing to the fact that *we spend so much of our lives in a sedentary state*. As a result, the human skeletal system fails to signal the brain to appropriately "activate" the gravitostat.

As trainers, we regularly encourage our clients to carve out "active hours" within each day. If they are challenged physically in some way, or in the midst of rehabbing an injury, we at least suggest they spend *more time standing than sitting*. Another new and innovative way in which clients can compensate for a sedentary lifestyle involves wearing a weight vest for a designated portion of the day.

Scientists set out to test whether artificially increasing weight loading on obese subjects, accomplished by wearing a weighted vest, elicited any change in body composition. 69 subjects participated in the study; approximately half received a heavy (11% of body weight) vest and the others received a lighter version (1% of body weight). All subjects wore their vests 8 hours/day for three weeks.

At the conclusion of the study, those individuals wearing the heavier vests noted a more pronounced loss in body weight when compared to those carrying the lighter load. Using bioelectrical impedance, assessments of fat mass likewise revealed a greater reduction for those participants wearing the heavier vests. Interestingly, these results matched those observed in experiments conducted on obese rats.

The Versatility of the Vest

It appears convincing that weight vests worn during workouts *may help build muscle mass while concurrently burning excess fat and calories*. Weight vests vary in design, ranging from as light as 0.5 lbs. all the way up to 30 lbs., according to sources at *FitStream.* Similar to Velcro ankle weights, some adjustable vests enable the user to add or remove weight bars as he progresses. “If used properly, weight vests can have extensive benefits in training the cardiovascular system and increasing VO2 max,” says Brock Christopher, CPT, a strength coach at Atlanta’s Porsche Human Performance. Another bit of good news relates to the musculoskeletal system. Bones can actually increase their density as they adapt to handling a heavier load provided from the vest.

If the mere effort of moving seems more challenging while donning a weighted vest, consider the benefits! "You'll improve your cardiovascular endurance from carrying the extra weight while working out," says Astrid Swan, a personal trainer based in Los Angeles. In addition, after training while wearing a weighted vest, both conditioning and speed increase once the user sheds the added weight. Power, too, shows an uptick after this mode of training. Brock Christopher has observed improvements among both professional and recreational football and baseball players. “Used very carefully and purposefully, weighted vests can be added to plyometric exercise,” Christopher says. “Vests can be a great precursor transitioning from body weight plyometrics into Olympic/power lifting.”

How to Train Properly While Wearing Weighted Vests

Viewed from the outside, wearing/training with weighted vests might not seem overly significant. Therefore, make sure a client understands the *goal of challenging himself*. "You should experience some huffing and puffing, even if you're walking," says Vicki Harber, Ph.D., a Professor Emeritus at the University of Alberta in Edmonton, Canada. "You should be a bit breathless as you talk," she adds. Body mechanics play an important role in deriving the full benefit of weighted exercises, and clients should receive periodic reminders to engage their core muscles. "All movement starts from your core, so it makes sense to keep it strong and engaged while you walk or run," says Ellie Herman, owner of Ellie Herman Pilates Studios and creator of the *Walk-ilates System*, which combines walking and Pilates. Zika Palmer, exercise physiologist and co-founder of ZAP Fitness in Blowing Rock, NC, likewise stresses focusing on the body’s movement through space when exercising with a weighted vest. To maximize momentum, she suggests “keeping (a) forward-leaning position throughout your run or walk… It should almost feel like you have to take a step to catch yourself from falling."

While Astrid Swan extolls the virtues of a weighted vest when performing bodyweight exercises such as squats and walking lunges, this piece of fitness equipment does have its limits. For example, Swan cautions against expecting an increase in performance by wearing a weighted vest while Spinning, or engaging in calming exercises such as yoga or T’ai Chi.

The Deconditioned Client

Very often we meet a client with little or no previous exercise history, or one whose foray into the gym comes directly upon discharge from rehabilitation. Such a deconditioned individual often shows improvements from wearing a lighter-weight vest at the beginning of his fitness journey. The intensity and significance of a simple walk easily get boosted from wearing the vest, a practice that involves very little impact for such a dramatic payoff. The *American Council on Exercise (ACE),* in collaboration with scientists from the University of New Mexico, revealed that women who wore vests while engaging in a walking treadmill session utilized 12% more energy in comparison to those without the vests.

What Lies Ahead?

Might humans, like rodents, also possess some mechanism for loading-dependent homeostatic regulation of body weight? Ohlsson and Jansson determined that the body composition changes revealed in their studies, specifically the sparing of lean muscle mass and the loss of fat mass, exceeded what one might typically expect following a training session. They plan to focus further studies on observing whether weighted vests worn for a longer daily duration, or for more than 3 weeks, further propels weight loss. Determining the manner in which fat mass gets burned -- through an uptick in energy expended while toting around the vest, a reduction in appetite, or simply a concerted effort at increasing mobility – also remains an investigative priority. We look forward to their future results!

Highlighting HILIT – High Intensity, Low-Impact Training

As the population of fitness enthusiasts over the age of 50 continues to grow, trends must keep pace with the realities of ageing bodies while accommodating an ever-increasing demand for creative, results-driven exercise models. Combining the best aspects of interval training with joint-friendly strength training, make way for a new and exciting format hitting the gym scene!

Gregarious Yet Gentle

Meet this year's newest fitness endeavor, for novice clients and seasoned athletes alike: ***HILIT***—aka *High-Intensity/ Low-Impact Training*. Nadav Ben-Chanoch and Kenny Rosenzweig, N.A.S.M.-certified personal trainers and co-founders of *Rowgatta*, originally built this unique blend of exercises utilizing rowing machines for cardio plus various resistance moves on the gym floor. Training in this manner enables individuals to achieve a traditional sweat-inducing workout while treating the body --- and especially joints –to a much lower level of impact. We might view this format as a kinder, gentler sibling to traditional boot camps!

The founders share their reasoning behind developing this program. "First, rowing is a full-body exercise that engages 86 percent of your muscles on each stroke. Second, it's incredibly efficient and burns more calories than running or spinning. Third, it's low impact, which was very important to us… Fourth, rowing is a great combination of strength and conditioning. Unlike a treadmill, for example, you have to create your own resistance on the rower and really push hard with your legs. This is how you build strength rowing."

While rowing definitely offers the duality of cardio and strength, workouts designed from this platform can make use of any form of cardio, either with equipment such as a cycle or elliptical, or by power walking.

Low on Impact, Not Results

The benefits of HIIT are well-studied, and include a top-notch caloric burn, an uptick in metabolic rate and improved heart health. "However, HIIT can be physically taxing on the body with constant exertion on the joints," Rosenzweig says. "HILIT combines the benefits of HIIT, but in a low-impact environment that diminishes the effects of stress on our joints." This trend is particularly welcomed by runners, CrossFit advocates and other athletes who frequently suffer wear and tear in their joints.

As you might have guessed from the name, HILIT workouts emphasize intensive exercise while easing up on the joint jolts experienced in HIIT exercises. HILIT doesn't disregard the importance of *some* impact to the body, in an effort to maintain bone density; in striking the perfect balance, personal trainers can open up an entirely new path to take clients closer to their goals.

High-intensity/low impact training works off of a platform similar to HIIT, with short rest intervals between sets of activities. When introducing this format to new or deconditioned clients, plan for somewhat longer breaks in between, and build up to the rest interval of 30-45 seconds that typifies HILIT.

A few examples of HILIT include the following:

- Walking at a brisk enough pace to elevate heart rate
- Walking uphill on a treadmill or adding hills to brisk outdoor walks
- Using walking poles to increase the intensity of power walking (or experiment with walking lunges)
- Hiking (especially uphill)
- Using the step machine at the end of a workout or as a short burst halfway through

The addition of upper body movements to these exercises forces the body to expend more energy, raising the participant's cardio experience. Something as simple as actively engaging the arms while hiking, or intervals of keeping arms above the head during a power walk, can achieve the desired effect. Even though you design a circuit for clients, interspersing bouts of cardio with traditional strength-training lifts, keep in mind that such workouts may need to last a bit longer than those performed in HIIT training, to compensate for the lower heart rate that HILIT produces…*lower, but still highly effective*!

Optimal Target Population

While these HILIT workout routines prove ideal for clients of all abilities, pay close attention to participants presenting with joint issues/bad knees/decreased lung capacity. Consider HILIT, too, if any of these conditions describe your clientele:

- A pregnant woman
- A novice interested in starting cautiously, needing to ease into a workout of lower intensity
- An overweight client instructed by a physician to embark upon an exercise program
- A client who suffered any injury affecting joints, bones or tissue
- A client choosing to combine rehabilitation therapy exercises with his cardio
- An older client dealing with arthritis or osteoporosis

What Defines "Low-Impact"?

Low-impact exercises involve keeping one foot on the ground throughout all movements. This alleviates a great deal of pressure that any kind of 2-foot movements (such as jumping) places on the joints. Justin Norris, personal trainer who partnered with Taylor Gainor in co-founding Los Angeles' studio *LIT Method*, adds what many participants consider the most positive attribute: "There's no jumping, no running, and no burpees". Try some of the routines listed below and *see how much you truly sweat*!

1. HILIT cardio kickboxing

This powerful and fun workout can incorporate plenty of kicks as well as intense upper-body movements. Take care to ensure no unnecessary wear and tear on the knees or ankles. An added bonus to this routine? No boxing bag required, further diminishing the worry of impact.

Try this routine, 3 times through:

- 1 min. alternating front jabs
- 1 min. alternating front kicks
- 1 min. modified jumping jacks
- Dumbbell bicep curls, 2 sets of 8-10
- 45-second rest
- Dumbbell overhead triceps press, 2 sets of 8-10
- 45-second rest
- 1 min. bob -and -weave
- 1 min. alternating uppercuts
- 45-second rest
- 1- arm bent-over dumbbell rows, 2 sets of 8-10/arm
- 1 min. alternating back kicks
- 2 min. rest

This workout likely mimics the caloric burn of traditional step aerobics — a 155-pound person can expect to torch about 260 calories during a half-hour workout.

2. TRX Workouts

TRX makes use of the participant's own body weight as well as nature's gravitational pull, creating an ultimate workout for both strength and cardio. As with most high-quality fitness gear, the TRX easily adapts to the client's level of fitness and his willingness to try "suspension training". This format does not suit all of my clients – there is a modicum of "fear factor" associated with suspension training; always best to listen to and respect the client's comfort level.

TRX circuit, 3 times:

- 30 sec. squat kick
- 30 sec. row
- 30 sec. flys
- 1 min. rest
- 30 sec. overhead squat
- 30 sec. skaters
- 30 sec. push-up's
- 2 min. rest

By either interspersing cycling or elliptical circuits within the TRX circuits, or completing them afterwards, a 155-pound client can expect to utilize an average 300 calories in 60 minutes, while minimizing joint stress.

3. Equipment-free cardio circuit

Sometimes clients request workouts they can successfully complete whether traveling or stuck at home (status quo now during the COVID-19 quarantine). Combining these joint-friendly movements with traditional strength-training exercises guarantees a good endorphin release. Instruct clients to perform each exercise for 30 -45 seconds, followed by a 1-minute rest interval. If dumbbells or *DynaBands* can figure into an outside-of-the-gym program, insert a few resistance movements between cardio sets. Once you design the program, encourage the client to run through the circuit 3 times.

1. Run/hop/skip in place for 1 minute: focus on elevating the heart rate without unnecessarily rushing the movements. Keep knees "soft".

2. Resistance/strength movement of choice: work 2 different body parts, 1 set of 10 reps each.

3. 40 Mountain climbers (20/leg): focus on maintaining a strong, stable core rather than the pace of the movement.

4. Repeat Step 2, either working the same 2 body parts or 2 different muscle groups.

5. 45 seconds of "low-impact jack": to avoid putting undue pressure on the knees, this movement involves more of a "step apart R foot, together; step apart L foot, together", at a brisk pace.

Calories burned: This low-impact, aerobic exercise burns about 260 calories/hour for a 155-pound person.

No Longer a "No Pain, No Gain" Arena

A one point in time, personal trainers and group exercise instructors alike adhered to and preached the "no pain, no gain, hurts-so-good" mentality. Such punishing workouts can only last so long, however, before the body begins to suffer and ceasing making progress. For a while, fitness professionals witnessed an increase in yoga participants and foam roller classes. While gentler formats have their place, hard-core gym-goers who savor that post-workout sweat-drenched feeling still longed for a safer action-packed platform. "HIIT was such a big thing, then foam rolling was big but people realized they weren't getting as much out of their workouts as they wanted to. So now we're seeing the trend moving toward high-intensity, low-impact with the focus being mobility and injury prevention," says fitness instructor Brookelyn

Suddell, the co-director of the Group Fitness department at Crunch gyms. “People want to walk out of the studio feeling like they got a good workout, but also feeling good in their bodies.”

One such high-intensity, lower-impact workout program, entitled *SLT*, gathers steam as it moves from the East Coast throughout the Midwest. “The way boutique fitness has evolved, this is the natural evolution,” says Amanda Freeman, founder of the program. “Before boutique fitness, people weren’t working out as often as they are now. Especially with the rise of high-intensity interval training and the frequency people are doing these classes, they’re seeing more injuries. They’re looking for alternatives that will get their heart rate up but not put them at risk for injuries or impact their joints.”

Taylor Gainor, a seasoned veteran of *LIT Method*, claims that “you can burn up to 1,000 calories in a class, or 500 calories in a 30-minute class, if you’re streaming a workout online. The cardio moves are structured to raise the heart rate for 20 seconds, then dropping it back down for 20 seconds.” Norris adds, “You’re saving your joints for longevity, but you’re still getting into that fat-burning zone—it’s the best of both worlds.”

Achieving Any Fitness Goal

In the vast and varied world of movement, something truly exists for every exercise personality. Sports Medicine doctor Jordan Metzl, MD espouses the all-familiar yet often-forgotten adage that “the best workout is whatever someone is interested in and brings a smile to his face, because that means it’s something he will do consistently.” Besides enjoying the activity, he adds, the key lies in revving up the metabolism. “You want your heart rate to go up and down through intense bursts of short exercise,” he says. “But that can be done through HIIT or HILIT. Physiologically, they can be the same.” Overall, good news for our bodies!

Post Workout Carbs: Simple, or Simply Confusing?

Understanding the importance of food intake to support clients' workouts depends partly on science, and also on each one's body unique response to the demands of physical exercise. In a society that tends to shun carbohydrates in general, how can we best guide them towards the optimal post-workout carbs as a recovery energy source?

Energy from Within

During exercise, hard-working muscles use glucose (readily available) and glycogen (stored sources) for energy. Glycogen stored in muscle cells pulls water inward to increase not only the *cell volume* but also the *fullness within muscle fibers*. Research suggests that a greater muscle cell volume can lead to long-term growth.

At some point during an intense lifting session, blood glucose levels and glycogen stores drop so precipitously low that exercise cannot continue. We refer to this state as "going to failure", that overwhelming sensation of not having enough power/strength to complete another single repetition. Here, the body begins to secrete the "stress hormone" cortisol, a highly catabolic chemical. Cortisol eats up muscle tissue for protein, converting it into usable glucose. A process called gluconeogenesis ensues, producing glucose from these amino acids in the liver. This results in a loss of muscle tissue.

As we know, strength training causes micro-tears in the muscles' fibers, and sweating causes the loss of fluids replete with electrolytes. Post-workout nutrients, therefore, take on a critical importance, essential for replenishing muscle glycogen depleted from physical demands. In addition, consuming an exercise recovery meal helps stimulate protein synthesis to repair and build new muscle tissue while restoring fluid and electrolyte balance.

Focus on Nutrient Timing

According to research, consuming the *appropriate ratio of carbohydrates to protein* can greatly impact the success of one's recovery. When to eat post-workout depends upon the type of exercise in which the client has engaged.

Intense weight resistance workouts, with a goal of increasing muscle size, favor the consumption of 20-30 grams (g) of lean protein with 30-40 grams of clean simple carbohydrates, ideally within 30 minutes of completing training. Shakes work extremely well for such athletes. Following lighter aerobic workouts, with a goal of staying in shape, experts suggest eating a well-balanced whole-food meal within an hour of exercising. The protein/carb ratio remains the same.

Of course, these specific macronutrient amounts vary with the size of the individual, an important aspect to keep in mind. (Always consult a Registered Sports Dietitian for assistance with specific guidelines before counseling clients.) Proper nutrient balance following training allows for the release of insulin, one of several anabolic or muscle-building hormones in the body. Clients who consistently train with heavy loads, especially in the absence of steroid supplementation, need to maximize the release of the body's anabolic hormones through any naturally available method.

The Great Importance of the Glycemic Index

A working knowledge of glycemic index helps trainers convey information regarding post-workout food choices. Glycemic index, or GI, measures how quickly a food raises blood sugar and insulin levels. Typically, we coach our clients to eat lower glycemic foods throughout the day (complex, slow-digesting carbohydrates) so as not to initiate an insulin spike. Foods with an assigned GI rating of 55 and under rate as low. But post-workout, the body requires the exact opposite.

Following intense exercise, the body needs carbs and protein shuttled to the muscle cells as fast as possible. An elevated insulin levels facilitates the driving of nutrients into these hungry muscle cells. High-glycemic carbs (with a rating of 70 or above) work optimally for this purpose. Insulin attaches to receptors on muscle cells, allowing a greater uptake of carbs, creatine, carnitine and other amino acids, all of which serve critical processes in muscle repair and recovery.

Carbs consumed immediately post-workout can result in a beneficial “super-compensation” of glycogen. Research has found that delaying the ingestion of carbs by even 2 hours following training can reduce not only glycogen replenishing but also recovery by 50%.

Too Many Post-Workout Carbs to Choose From?

When it comes to high GI, post-workout carbs, you have to read labels. There are lots of unusual and unfamiliar options that you have to know to spot. Here are a few:

Dextrose/maltodextrin combo This rates as the old school bodybuilder post-workout mix of choice. The combo has a fast uptake and causes less bloat due to the combination of molecule sizes; however, some still suffer from that side effect. The downside to dextrose is that it can cause GI distress due to the low molecular weight and high osmolality – it draws water into the GI tract, leading to the “bloat”.

Sucrose/high fructose corn syrup The debate surrounding whether high fructose corn syrup functions the same as naturally occurring sucrose continues to swirl. Some chemists concur, while others cite the creation of damaging reactive carbonyls, which occurs when the bond between the glucose and fructose is broken. Around 49% of the sugar found in fruits is fructose which, upon consumption, travels to the liver before being converted to glucose. This, in turn, further delays absorption to the critical areas of the body following a workout.

Waxy maize starch This sugar has a low osmolality and high molecular weight, which translates to larger molecules of starch. Thus far, the only proven claims about waxy maize show that its higher molecular weight classifies it as a long-chain complex (redundant) carbohydrate. Studies show that the greater the molecular weight of a carbohydrate, the more chains of glucose it contains and therefore takes longer to break down, delaying absorption. Waxy maize may prove beneficial for the endurance client, who out of necessity favors a steady supply and release of energy over time, compared to the rapidly digesting maltodextrin.

Optimal Source

Side-by-side comparative research indicates that the bloodstream absorbs maltodextrin better and faster than any other simple carbohydrate sources. In order to "refuel" glycogen to the muscles, glucose must be delivered to the bloodstream, traveling on to the liver and muscles for conversion to and storage as glycogen. Maltodextrin provides an insulin spike far superior to any other source. Upon ingesting a carbohydrate food source, absorption occurs through the intestines, the majority taking place in the duodenum. Maltodextrin begins to degrade in the mouth and stomach, the work of salivary amylase, which easily breaks the weak hydrogen bonds holding the chemical together.

A Fun New Option

Many lifters I know have abandoned the "real food" simple carbs post-workout in favor of seizing the opportunity to satisfy a sweet tooth. Of all things, they gravitate toward gummy bears! I immediately dismissed this as empty calories. However, surprisingly, the research advocating and supporting this choice really exists! It turns out that playfully enjoying 15-20 of the ever-popular *Haribo Gummi Bears* provides 30-40 grams of simple carbs! (And if you choose not to eat them, at least read the reviews and questions on the Amazon listing for a good laugh)

Do Not Rush to Shake Off the Whey Shake

The whey protein shake, often touted as the ideal source of immediate post-workout supplementation, still offers tremendous muscle-recovery potential. With so much talk regarding the importance of simple carbohydrates, where might the shake fit in? A 2011 study published in *Medicine and Science in Sports and Exercise* investigated this very question.

Researchers compared the effects of consuming 25 grams of whey protein against 25 grams of whey protein plus 50 grams of carbohydrates, to note whether the carbs played a significant role in raising insulin levels. They did not. The concurrent ingestion of 50 g of CHO with 25 g of protein did not stimulate mixed muscle protein synthesis or inhibit muscle protein breakdown any more than 25 g of protein alone, either at rest or after resistance exercise.

In another study, 12 healthy volunteers were served drinks consisting of either pure glucose (reference drink) or glucose supplemented with free amino acids or whey proteins. The beverage containing the branched-chain amino acids isoleucine, leucine, valine, and threonine (BCAA's) elicited a significantly higher insulin response than the glucose drink alone. In fact, the insulin peak mimicked the glycemic and insulinemic responses observed following consumption of a high-quality whey protein shake.

Discussion

Where should we go with these seemingly controversial results? It remains my strong conviction that, for starters, whey protein sources vary in quality, depending upon processing. I always counsel clients to take the time necessary to seek out the highest quality product they can comfortably

afford. The BCAA's typically found in such products also lend a significant hand in facilitating muscle recovery and rebuilding.

Regarding the simple carbohydrates post-workout, I continue to support the necessity of this macronutrient, and especially the timing of its ingestion. Learn as much as you can about the different types available, in addition to those presented here. Remember, what happens "in the kitchen", so to speak, often exerts an even more dramatic effect than the workout upon the long-term success of a bodybuilder.

How to Set up Virtual Fitness Classes

The novel coronavirus has spread rapidly around the world, claiming the lives of many, and leaving a feeling of danger for the majority of the rest of us. With social distancing and shelter from home orders coming from government officials, it can be difficult not to get caught up in the media, and even more difficult to stay positive. NFPT is committed to supporting our trainers during this difficult time.

For business owners like gym franchisees who have been forced to close their doors altogether, it has been tricky to see and stay in touch with clients – but as we have adjusted to this new normal, offering online courses and virtual conferences has become one of the most popular and successful tools to keep things as close to "business as usual" as possible.

Here's how to set up virtual fitness classes and keep up with your clientele in creative ways.

Virtual Workouts

Gyms were one of the first lines of business to be affected by the legal guidelines for coronavirus protection, but this also means that they were the first to get creative about offering solutions. In addition to uploading videos to their gym websites, several fitness instructors around the country have acted quickly in leading virtual workouts on the social media platforms, Facebook and Instagram. Both platforms have both video upload and live video tools that have eased the stress and fear of losing an in-person gym experience for their clients.

The great thing about streaming online? You can reach audiences far and wide, and connect with people who you may not have otherwise. Inviting class participants to like and share your social media pages, in exchange for a virtual workout, is a great way to spread the word even further.

If streaming feels like too much pressure and live performance, consider pre-recording a workout video and packaging it for sale online. You could create a series marketed to a specific clientele or adhere to your particular style of exercise and instruction.

Recording Guidelines

Production value is important for videos to be enjoyable. Here's what to be mindful of when you are recording your video:

- Choose a well-lit room with lots of space for your demonstration.
- Wear clothing that is easy to move in, that also reflects your brand image. Uniforms are great!
- Speak loudly and clearly as you teach.
- Encourage your students – though it may feel silly talking to a camera, it's important to keep them motivated by praising their hard work.
- Check-in with the group. Assure all technology is working well and that class participants are enjoying themselves.

Facebook

Whether you choose to create a group and upload videos to it or broadcast a fitness class live, Facebook is one of the most popular platforms to set up virtual fitness classes on. In order to upload a video, you'll log in to your business page and either select "Live" to start a live video, or upload a file under the "upload option." Facebook also gives you the option to tag specific people to encourage them to join!

Instagram

Similar to Facebook's live capabilities, Instagram offers users the ability to broadcast live videos using the Story feature. Instagram allows you to be "live" for up to one hour, and the video will disappear after 24 hours. If you are hosting a shorter workout, Instagram's long video feature, IGTV, allows video uploads of up to 10 minutes. IGTV content can be uploaded directly onto a page, assuring that it lasts unless you decide to delete it.

Zoom Meetings for Group Fitness

Zoom meetings allow up to 100 participants, and all they need to do is follow a designated link to join an online meeting. Once users have joined the meeting, they can choose a setting that allows their screen to only show the speaker/leader of the class, rather than having to face a grid of faces in a conference view. There is also an option to turn off their camera so that they (or their backgrounds) don't have to be visible.

Virtual Personal Training

One-on-one personal training may be put on hold for a while, at least on an in-person basis.

Personal trainers, like those certified with Special Strong, are still able to work with their clients and guide their workouts virtually through apps like FaceTime, Skype, Facebook Messenger, Houseparty, and Hangouts.

Explore all the options and consider polling your current clients for which technology they're already familiar with. You don't have to use the same platform for every client.

On April 10th, NFPT hosted a webinar 'Personal Trainer Tips for Coming Out on Top". This presentation focused on how-to's for virtual training and demonstrated a software app that helps you design and deliver in-home training. See These Resources >>

Workout Hangover? Blame Training, Not Alcohol

Have clients ever complained of experiencing unusual and daunting exhaustion after several intense sessions at the gym? In addition to a cascade of other physiological processes, he or she may have fallen victim to an all-too-common "workout hangover".

Overtraining = Workout Hangover

What does a "workout hangover" feel like? Not totally unlike the more commonly experienced alcohol-induced version, extreme fatigue rears its ugly head, rendering it impossible to return to the gym the next day. Injuries and sore muscles take longer to heal, often necessitating 3 – 4 days' worth of setback in meeting strength/muscle/endurance goals.

Why does this situation occur? A cumulative effect of poor workout habits will, over time, take its toll on the body. Training too heavy, or too often attempting heavy max rep lifts, can cause the problem; marathon runners and ultra-marathon devotees often experience such hangovers in the midst of training for an upcoming event. **Cortisol levels spike, negating optimal gains in the gym as the body fights constant fatigue and erodes at hard-earned lean muscle mass.** Avid bodybuilders and strength-training enthusiasts might experience these ill effects, especially when workouts shift from "dedicated" to "obsessive".

Putting Too Much "Head In The Game"

Training "on the nerve" is a practice espoused by Christian Thibaudeau, a leader in the training business for the last 16 years and owner of Thibarmy.com. He has been "Head Strength Coach" for the Central Institute for Human Performance, the official center of the St. Louis Blues (recent Stanley Cup champions and my hometown hockey team). **"On the nerve" refers to the mindset in which many lifters put themselves moments prior to a difficult lift or set: th*e heavy-duty psyching up*.**

In order to reduce workout hangover, experts advise athletes to minimize the number of maximally heavy lifts necessitating a major psychological prep session. This does *not* imply that a great deal of concentration isn't involved; such a task should demand 100% of the lifter's focus. However, reaching a frenzied emotional state before attempting heavy sets places undue stress upon the adrenal glands, well in excess of the amount naturally brought on by lifts using lesser weights. This, in turn, exacerbates the sympathetic nervous system as well as the parasympathetic nervous system, the one primarily responsible for aiding in recovery.

A Different Mindset

Most of the highly successful professional lifters approach the weightlifting equipment in a Zen-like state of concentration. They adhere to the belief that moving the heaviest weights should require focus and concentration, nothing more. When discussing the importance of recovery with an overzealous client, trainers may choose to take a few extra minutes at the conclusion of a session to ensure that the individual understands the difference between localized recovery (actually occurring at the muscular level), and recovery at the systemic level (the various nervous

systems). **Systemic recovery allows growth to occur.** Suffering from workout hangover indicates the imminent need for such recovery before progress can continue.

Lessening The Load

As dedicated lifters, we often overlook the fact that the *smallest* percentage of our training year should be spent going heavy, or pushing weights over 90% of a one-rep max range. Many clients want to push progressively more weight too soon or too often, and our advice may seem to fall on deaf ears.

The fact remains that most highly-regarded powerlifting methods worldwide tend towards volumized sets that fall between 68-72% of the one- rep max. Studies show that lower intensity loads produce an amount of hypertrophy equal to those observed when using higher intensity loads, without the negative effects on the recovery curve. While training all-out and hard-core seems required at times, regular sessions of consistently "good" workouts benefit the body much more than the weekend warrior mentality of *overdoing* once a week. Such a practice leads to subpar physical performance, often necessitating even more rest days.

Somatic Listening

Pay attention to the body's cues. Check in with your clients regarding adequate hours of sleep and on-point nutrition: if they claim success in both arenas yet consistently lack energy when training with you, the strong possibility of a workout hangover from the day before deserves attention. **Gently suggest that instead of masking fatigue with stimulants and fighting through, rest can help more than anything else.**

Relay to your clients the other benefits of restorative personal time to help them embrace this recovery mindset. Oxytocin, often referred to as the "love hormone", can reduce stress and anxiety, keeping cortisol within a normal range. We all know this feeling, the one generated during physical or emotional bonding, either with a close friend, loved one, or even a beloved pet. Tuning into a comedy show or a funny movie can evoke this cortisol-mitigating hormone. **Release of endorphins and growth hormone often accompany oxytocin in the bloodstream, improving the immune system response and promoting muscle growth.**

The Hardship of the Hangover

In a previous article on overtraining, I highlighted not only excessive exercise as a key player but also insufficient recovery practices. Well-meaning, goal-oriented fitness enthusiasts spend a quarter of their typical workouts going "too hard," then paying the price in the form of workout injuries and increased recovery time.

According to a new study, as many as 55% of individuals polled have at some point suffered a workout hangover resulting in a forced, unplanned rest day or two. Almost a third reported the need to pass on social outings with friends, attending parties, even canceling dates due to such hangovers.

Why invest so much mental and physical energy designing and executing the taxing strength training paradigm, only to "cut and run" without a plan following the workout? Dr. Aaron Hinde, co-founder of LIFEAID Bev Co., explains the importance of what happens after a workout and how we can potentially mitigate the chances of a workout hangover: "Proper workout and exercise techniques go hand in hand with post-workout recovery. By helping to improve the speed and efficiency of recovery, one can directly help optimize their overall fitness in a whole new way by increasing strength, endurance… you name it."

He further emphasizes his point by saying, "So much emphasis has been placed on what you consume or drink *before* a workout, when in actuality it's what your body needs to help it recover *afterward* that makes the real difference."

Dr. Clare Morrison, GP and Medical Advisor at *Medexpress*, offers an interesting perspective on the physiology of an intense training session. "Firstly, strenuous exercise causes blood to be diverted away from the digestive system, to the muscles, heart, and lungs. 'If you eat a rich meal shortly before exercise, it won't be digested properly, potentially causing nausea, vomiting, and diarrhea. In addition, exercise uses up glucose and glycogen stores, leading to nausea, headaches, and shakiness." The dilation of blood vessels during exercise, and the additional fluid and salt loss in the form of sweat, can trigger a precipitous drop in blood pressure following a heavy exercise session, bringing on light-headedness and weakness.

Healing the Hangover

What do professionals suggest as the best way to deal with workout hangovers? Not surprisingly, recovery involves rest and proper hydration and nutrition. "Do drink sufficient water to quench your thirst, but remember that drinking too much water, without eating a little salt, can make your salt levels fall too low,'" says Dr Morrison. "This will cause confusion, headaches, cramps, and nausea. Add a little salt to your food, perhaps in the form of crackers, salted nuts, or broth."

She also reminds us – and we might wish to remind our clients – "Eat some unrefined carbs to top up glycogen stores, and lean protein to help repair tired muscles. For example, a good post-workout meal would be whole-grain toast with scrambled eggs, or tuna and brown rice. Avoid alcohol and caffeine, which could make you more dehydrated and/or upset your stomach."

As you have now learned, workouts can either enhance your health and well-being, or knock your progress in a backward direction. Well-designed training sessions guarantee that your clients build strength and muscle mass. By reminding them and encouraging them to spend their non-training days at the gym wisely, trainers can ensure that each session with a professional will propel them in the right direction, with a minimum of recovery time.

Understanding Respiratory Rate and Exercise

Although heart rate and sweat are seen as measurements of a great workout, another big factor in exercise success is the respiratory response. The more your client huffs and puffs, the harder they believe they're working — and they're not wrong. Science doesn't offer a way for athletes and fitness enthusiasts to measure respiratory rate (yet), but we do know it plays an important role in cardiovascular workouts and interval training. Thanks to recent studies, we're closer to understanding the connection between respiratory rate and exercise.

Why Does Breathing Rate Increase During Vigorous Exercise?

We'll start with understanding why we get so winded while we're exercising — especially during aerobic and cardiovascular exercises. Even though it can feel like our lungs are greedily thirsty for air it's only to meet the oxygen demands of the rest of your body.

Your blood needs oxygen. Your muscles need oxygen. When you exercise and you put strain on your muscles, your body demands more oxygen, which is why you breathe so hard the harder you push your body. Your breathing is carrying oxygen to your muscles: First, it goes into your lungs, then it's pushed to your heart, which pumps it into your bloodstream, which then feeds into your muscles.

It's really no surprise that when your heart rate increases, your respiratory rate does, too–they are working in tandem. Your heart pumps all the oxygen-rich blood that it can to your muscles, but eventually, that oxygen becomes scarce. That's why at the beginning of a workout, you're not breathing as hard: There's a store of oxygen in your body already, but supply runs low when your heart rate is high.

Effect of Exercise on Breathing Rate

Just as exercise raises your heart rate, it also raises your breathing rate. The direct relationship between exercise and respiratory rate is that you will begin to take in more oxygen — about three to four times as much, to be exact. That doesn't necessarily mean that you'll be taking *more* breaths. **You can take in one long, slow, deep breath and get more Oxygen than you would if you were taking a series of shallow, quick breaths.** Yet, the latter is what people *tend* to do when they exercise.

In many schools of exercise, the focus is on heart rate and form, which are both important for physical health, weight loss, and stress relief. However, the way you breathe during exercise is also important. When doing slow and controlled movements (like in yoga or weight lifting), you'll want your breathing to mirror your movements — meaning that it should be slow and controlled too. If your body is moving quickly, then your breath will also be quick. It's important to note that quick and shallow are not necessarily the same thing. You'll want to direct your clients to breathe in deep enough to puff up the diaphragm, as shallow breathing can lead to dizziness, hyperventilation, and even fainting.

Benefits of Exercise on the Respiratory System

Exercise does the body good in a number of ways, but one of which is the benefit to the respiratory system. The more oxygen you take in — the more you exercise your lungs, and the stronger they get. The stronger your lungs get, the better they are at taking in oxygen and storing it in your bloodstream. As mentioned previously, you don't need to breathe as hard at the beginning of your workout because there's already a reserve of oxygen to be utilized. **In the same way, your lungs will become more efficient over time so that the body will be able to store *more* oxygen in your blood so that you won't be so out of breath when you exercise over time.**

This is something you can tell your clients: The more they exercise, the less likely they'll be to get winded during simple activities like going up the stairs or walking across a large parking lot.

It's worth noting that certain types of activity have a greater impact on the body's energy expenditure to repay the oxygen debt created from exercise: the more intense the exercise, such as in HIIT, the more oxygen is used, and the more effort the body must make to rebuild its oxygen store. This phenomenon known as excess post-exercise consumption or EPOC is highest right after concluding exercise and can burn up to 50 to 120 more calories.

Next week, we'll tackle the proper breathing techniques for different activities. which can vary vastly! Your clients will be amazed at how a shift in their intention and attention to breathing can make exercise that much easier.

Is Your Libido Losing to Your Workouts?

The majority of avid exercisers make the mistake of monitoring muscle soreness when deciding whether their bodies are ready for yet another tough workout. However, overtraining – or "under-recovering" — does not originate in the muscles, but rather has an impact on the nervous and endocrine system first…***including the libido***.

A Real-Life Scenario

On a personal note…some years ago, a male friend and I were both preparing to enter a bodybuilding competition out of town. The final "prep week" always poses a unique challenge, not only in the gym but in the kitchen as well. Lower intake of dietary carbs, additional sessions of cardio, and lifting with a greater volume of repetitions will make a body lean, or "ripped", in professional fitness jargon.

However, it is the cumulative effect of 13 weeks of pre-competition training that really takes its toll. During that week, I asked my friend Tom if he was ready for the show. His reply? "I am SO ready to get my libido back!" That comment caught me slightly off guard; I was expecting him to say something more along the lines of, "Yes! I cannot wait to eat pizza again!" He was brutally honest about what bothered him the most, and obviously his lack of sexual desire topped the list.

When "Just Enough" Becomes "Too Much"

On many levels, exercise can provide a boost to testosterone levels, in both men and women (yes, ladies, our bodies produce testosterone, too!) The difference lies in the frequency and intensity of the workouts. T levels tested in men following resistance training revealed increases of testosterone in the bloodstream. Yet another study conducted years later showed that recreational weight-lifting caused a temporary uptick in circulating testosterone as well as a positive impact on fat distribution in females.

While increasing physical activity may actually boost testosterone levels for individuals living an otherwise sedentary lifestyle, researchers at the University of North Carolina found a direct link between ***frequent*** **high- intensity exercise and decreased interest in "bedroom activities".**

One study followed 1,077 active men, including runners, walkers, cyclists, swimmers and avid weightlifters. Those whose training regimens fell towards the lower level of the intensity spectrum reported nearly seven times the likelihood of a normal healthy sex drive compared to the men who trained at the highest levels of intensity.

Clients who do not engage in competitive bodybuilding shows may still experience loss of libido, however. Individuals who set weight-loss or performance goals in the gym often exercise 5–7 days a week, allowing for little recovery time. Depending upon one's level of fitness, workout intensity and day-to-day life stress, such a high volume of output can lead to overtraining and under-recovery, effectively hampering one's progress.

Among my own clientele, I often must rein in clients who seem to get caught up in a vicious cycle of "more is better", especially women trying to shed extra pounds for an upcoming special event.

Hormones at Work

Researchers indicate that intense exercise training may lead to a condition known as "exercise hypogonadal male condition". This situation presents itself in the presence of concurrent suppression of testosterone and luteinizing. Coupled with the fact that exercising beyond a reasonable training threshold can lead to mental as well as physical fatigue, the diminishing of sexual desire comes as no surprise.

"Excessive muscle soreness, increased fatigue, decreased performance, irritability, difficulty sleeping, and injuries are all symptoms of overtraining," says Tim Hartwig, a Certified Strength and Conditioning Specialist from LA. These common symptoms are easily recognizable, whereas other warning signs may be more subtle…such as the marked decrease interest in sexual activity.

"Most people become lethargic and disinterested," he says. Intense training carries with it the potential to increase circulating serum levels of cortisol, which in turn depresses the levels of testosterone, estrogen, and progesterone. "Lower hormone levels will decrease sex drive **in both males and females**," Hartwig reminds us.

Symptoms Affect All Systems

Overtraining Syndrome (OTS) can manifest itself in the psychological, physiological, immunological, and biochemical realms. The sensitive nature of lowered sexual drive proves difficult for many clients to discuss with anyone let alone their trainers, especially men. If you or your clients notice and/or discuss any of the following symptoms, rest assured the unmentioned depressed libido may be an unmentioned factor on the list as well.

If clients voice concerns about any or many of the following issues, perhaps training protocols need reassessment and a deloading week is in order:

- *Irritability/mood changes*
- *Low motivation*
- *Lack of focus*
- *Reduced appetite*
- *Difficulty sleeping*
- *Increased resting heart rate*
- *Fatigue*
- *Depression*
- *Lack of progress, or even regression*

Stress Plays a Key Role

Experts now believe that the real issue in OTS stems from **instability occurring in the nervous system during periods of overtraining**, specifically in the *sympatho-adrenergic* nervous system. This

cluster of organs and nerves is responsible for handling stress. Exposing the body to more stress than it can handle, as evidenced during bouts of overtraining and/or under-recovering, reduces its ability to control certain somatic processes, resulting in hormonal imbalances that can pave the way for a lower or non-existent libido.

Hearing the Hesitant Client

Listening skills remain a top priority for trainers and coaches who hope to develop a good rapport with clients. Upon hearing such concerns from a client, a savvy trainer can take advantage of this optimal window of opportunity to delicately inquire about his level of interest in sexual activity. Note that denial may factor into his response to you; remain open to listening while still discussing the ramifications of overtraining.

Perhaps he had wanted to cut back for a while but didn't know how to approach the subject. Obviously, the research data is available for those who troll internet fitness sites, and the possibility exists that the client was aware of the OTS/libido link but could not find a way to approach the subject with you. Again, this remains a very hard topic to bring up, and patience on the part of the professional is essential.

If you don't feel comfortable broaching the topic verbally, feel free to share printed information on overtraining in general and where mention of loss of libido is included.

Good News for Runners: It's Good for Your Knees

The sport of running has always carried with it the stereotype that it might damage one's knees. New research aims to change that perception, suggesting recreational running as a panacea for middle-aged knee osteoarthritis.

You might find you have clients in their 40's-60's often expressing a desire to increase their cardiovascular efforts. Many such individuals tell us that they would like to try running, or have entertained the idea of participating in a local 5K. However, unsolicited concern from well-meaning friends harping on the ruination of their knee joints may deflate their enthusiasm. Propagating this notion not only discourages able-bodied clients from trying the sport it also invokes fear in those falling within this age demographic who *do* engage in and enjoy recreational running.

Research Shows Structural Improvement After Running

Interestingly, recent research on the kinesiology of runners' knees debunks the idea that joint problems *always* arise, leading experts to conclude that running typically does not inflict damage to healthy, or even slightly "worn", knees. In one such study, a group of 82 middle-aged, healthy adult subjects participating in their first marathon underwent MRIs of both knees six months prior to the race as well as 15 days post-marathon. Participants also completed *Knee Injury and Osteoarthritis Outcome Score* questionnaires to report perception of their knee function.

The pre-marathon and pre-training MRIs indicated damage, albeit asymptomatic, to several knee structures in the majority of the 82 middle-aged volunteers. **After completing the 26.2-mile race, MRIs showed a *reduction* of damage in subchondral bone marrow edema in the condyles of both the tibia and femur. The cartilage of the lateral patella, semimembranosus tendon, iliotibial band, and the prepatellar bursa likewise showed marked improvements.**

Proper Preparation Is Key

The research team concluded that embarking upon a program of distance running can potentially rebuild the health of certain components of middle-aged knees, even if the joints exhibited previous signs of wear and tear. However, a very important caveat exists: **if middle-aged runners neglect to prepare properly – including appropriate training, rest days, stretching and adequate nutrition/hydration – the *excessive mileage that accompanies distance running/training might erode particularly vulnerable areas within the knee*.**

Running and Osteoarthritis

Studies conducted on elderly runners showed a reduction in the rate of developing knee arthritis when compared to individuals leading sedentary lifestyles. Additional research showed that even the knees of younger athletes revealed less post-run inflammation than after extended bouts of sitting.

One study sought to determine if running incited measurable differences in the progression of osteoarthritis (OA). Volunteer subjects fell into 2 groups: middle- to older-aged runners and healthy

non-runners. The research spanned almost two decades (1984-2002) and employed serial radiography as a determinant of joint/cartilage damage.

Long-distance runners were recruited with a control group, with a mean age of 58 (range 50–72) years. Radiographic knee scores and the frequency of severe OA were assessed between runners and controls.

By the end of the research protocol, runners did not demonstrate signs of more prevalent OA (20% vs 32%) nor more cases of severe OA (2.2% vs 9.4%) than did controls. Interestingly, **data revealed higher initial BMI to be associated with worse radiographic OA at the study's conclusion**. This posed the speculation that since carrying less weight is known to reduce the risk for knee arthritis, *might an average runner display less OA simply due to his typically lower body mass*?

Synovial Fluid and Joint Mobility

Researchers at Brigham Young University in Provo, Utah, recruited 15 male and female runners under the age of 30. All of the participants reported no history of knee injury or arthritis. The scientists attempted to gather data on individuals with healthy knees in order to gain insight into running's effects on otherwise normal joints.

Healthy knees typically contain a different amount of synovial fluid than knees afflicted with osteoarthritis. The researchers looked for a variety of substances contained in the subjects' blood and synovial fluid, honing in on molecules typically associated with inflammation since this condition when in the knee contributes to the development of OA.

Unfortunately, not all outcomes could not be measured, since safely extracting synovial fluid from healthy knees proved to be a difficult and highly technical process. The data that was collected showed some interesting and consistent results: In almost every case, the runners' knees showed substantially lower amounts of two types of cells that can contribute to inflammation within the synovial fluid, compared to baseline levels.

It seems that following a run, subjects measured higher blood levels of the inflammatory substances in question and lower levels in their synovial fluid. **In effect, running seemed to have "squeezed" the molecules out of the knee capsule and into the bloodstream.** For a more sedentary population, sitting seems to increase concentrations of inflammatory-regulating molecules.

Robert Hyldahl, a Professor of Exercise Science at BYU and lead author of this study, published his results in the *European Journal of Applied Physiology*. He hopes to repeat the study using a much larger sample "…0nce we figure out how to get more synovial fluid safely from healthy knees." He believes that moderate running is "not likely to harm healthy knees and probably offers protection" against joint damage.

A Load-Bearing Issue?

Running appears to decrease knee pro-inflammatory cytokine concentration, and as previously mentioned, individuals who run regularly do not demonstrate an increased prevalence of knee OA. **Peak knee joint contact forces (ie, loads) pack a much greater punch during a run than during a leisurely or even moderately-paced walk, yet recreational walkers report a higher incidence of knee OA.** This paradox led experts to surmise that perhaps running mitigates the effect of high peak joint contact forces by providing a fairly low load per unit distance (PUD).

A research study was conducted in an effort to compare peak and low PUD knee joint loads while walking and running. Fourteen subjects were placed into two groups (walkers and runners) each moving at their own desired speed. Data points were assessed based upon ground reaction force and motion capture, designed to estimate peak joint loads, PUD loads, and a new parameter, the impulse of contraction force.

While the peak load recorded during a run tripled the amount seen for walkers, and the impulse of joint contraction force was

higher for runners versus walkers, **the PUD load decreased as speed increased**. Apparently, the *cumulative* load carries more significance for developing OA than peak load. The combination of short duration ground contact and long stride length in running curbs the effect of high loads. In the final analysis, PUD loads are no higher during a run than a recreational walk.

Good News for Trainers and Clients

Armed with this knowledge, trainers can help clients dispel the myth that running automatically leads to knee problems for an aging population. In fact, engaging in marathon (or even shorter distances) training may help “condition” knee cartilage to withstand the mechanical stresses induced by regular running. By making use of appropriate training methods, we can feel safe in helping our clients attain goals they may have set for themselves in terms of participating in an upcoming 5K. 10K, or even a half-marathon.

Brain Fitness: How Athletics Can Hone Mental Skills

We seldom question the physical benefits that exercise has on our bodies, but the benefits to the brain and higher functioning are not as regularly touted. How does being active and playing sports really impact the brain? Can someone improve "brain fitness"?

"No one would argue against the fact that sports lead to better physical fitness, but we don't always think of brain fitness and sports," said Professor Nina Kraus, director of the Auditory Neuroscience Laboratory at Northwestern University in Evanston, Illinois. **"We're saying that playing sports can tune the brain to better understand one's sensory environment."**

Improve Performance with Quiet Eye

Imagine a basketball stadium crowded with rowdy fans, cheerleaders, coaches, and announcers, all anticipating a final "at-the-buzzer" basket. All eyes turn to the player…but where are *his* eyes? Most likely, he is laser-focused on the basket. His brain remains active throughout these final seconds, taking in data from all sources: the precise location of the basket, its distance, and all motion from the opposing players anxiously hoping for a miss.

Professionals who specialize in what is called "attention research" have coined the term *quiet eye*, referring to the hyper-focused milliseconds before, during, and after an action when the athlete absorbs and processes all of this key information by keeping eyes fixed on the most salient aspects of the goal.

Dr. Gershon Tenenbaum, Director of the Sports and Exercise Psychology Lab at Florida State University, explains that a quiet eye indicates a very busy brain, a direct link to positive performance. With the use of eye-tracking tools, his research team observed the gaze of a tennis player in the seconds before he returns a serve. Advanced players demonstrated extended periods of this quiet eye, and this always resulted in a better volley than what was observed with average players.

"We know that when quiet eye becomes longer, you have a greater chance to perform well. But you can't concentrate forever, and in fact, concentrating too long can cause a deterioration in performance," Tenenbaum explains. "So, what's good? We're trying to determine the optimal zone of the quiet eye for novice, intermediate, and expert players."

This variety of brain fitness not only improves athleticism, but can certainly extend to other areas of life such as avoiding falls or accidents, quick reactivity in the face adversity, and even focus during personal training sessions.

Sound Filtering Forte

Professor Kraus and colleagues undertook the challenge of examining the brains of nearly 500 student athletes, both male and female. The study also included 493 control subjects. Their goal was to seek information regarding direct auditory responses in relation to background sounds. The

methodology involved the delivery of “sound bytes” through earbuds while also recording data from strategically placed scalp electrodes.

The research demonstrated that serious and/or competitive athletes can filter out background sounds better than non-athletes or even novice sports enthusiasts. This enables them to hone in solely on sensory input that will improve their abilities.

Mysteries of the Midbrain

A group of colleagues at Northwestern University, led by Dr. Jennifer Krizman, tested whether athletic benefits extend beyond muscle and speed, and might include superior auditory processing. In this study, she assessed a parameter known as **frequency-following response** (FFR) by recording neural activity to complex sounds, stemming predominately from a specific portion of brain anatomy, the auditory midbrain.

The research project began with the premise that if FFR amplitude responds to enriching physical experiences in general, perhaps playing sports can lead to greater FFR amplitude. Results demonstrated a strong positive correlation, most likely hinging on the fact that athletes, especially those who engage in a competitive realm, possess a greater ability to quickly take in and decide on only important auditory stimuli and respond accordingly.

Train for the Brain Gain

Can such ability be acquired through proper training? This and many other theories comprise the extended reach of Dr. Tenenbaum’s lab. In addition to looking at athletic prowess, a great deal of their time is devoted to unraveling the mysteries of how information is actually accumulated and processed.

Nataniel Boiangin, Assistant Professor in the Sport, Exercise, and Performance Psychology Master’s program at Barry University in Miami, FL, also heads up their Sport & Exercise Psychology Laboratory. A recent study allowed him to explore the possibility of training athletes to improve split-second decision-making. To do so, he used **stroboscopic eyeglasses** that quickly alternate between opaque and clear, with the goal of creating limited or open fields of vision.

As previously discussed, a tennis player’s first priority in those crucial seconds before returning a serve include taking in and processing environmental cues. While inexperienced players’ eyes show a tendency to jump from the angle of an opponent’s wrist to his feet movement to trees swaying in a breeze, more seasoned athletes focus only on valuable patterns, without distraction from incidental details.

“**Experts aren’t actively looking at each little cue. They’re able to chunk that information**,” says Boiangin. The question he seeks to answer is whether training that includes limiting a player’s field of vision with such specialized eyeglasses might enable their brains to find and focus on appropriate visual cues.

Helping General *and* Special Populations Excel

How can the field of Sports Medicine extrapolate and capitalize upon this unique discovery? Some believe that participating in athletics may help patients with sensory processing challenges, such as individuals with language disorders. The medical community might also look at individuals who have suffered severe head trauma. Perhaps a deeper understanding of auditory processing could lead to improved treatments for head injury patients.

As for the majority of our clients, we can employ certain mindfulness techniques to facilitate the acquisition of greater concentration skills. Once innate, this can benefit competitive runners, powerlifters, and even seniors who must garner as much concentration as possible before attempting to climb stairs or even walk around the block without tripping. Given this unique power, the possibilities are endless.

Micro-HIIT: Exercise Efficiently on a Time Crunch

Maximizing results in the gym may seem all about how many grueling hours we exercise. However, new research indicates that we can *train smarter instead of longer* by changing up protocols and moves. In fact, short intense bouts such as micro-HIIT in or out of the gym, may prove even more beneficial for overall health and fitness than prolonged steady-state exercise.

Short in Duration, Long on Results

"Micro workouts can be super effective for people who don't have time to make it to the gym," says trainer Michael Massetti. "They are a great way to keep your full body engaged while keeping your heart rate elevated." The idea behind micro workouts is based on HIIT, or High Intensity Interval Training.

HIIT interval training encompasses short bursts of high- intensity activity followed by periods of active rest. According to the *American College of Sports Medicine*, high-intensity intervals describe exercises performed at 80%-95% of one's maximum heart rate, lasting anywhere between 5 seconds and 8 minutes. Higher levels of intensity accompany the shorter intervals. The work load alternates with equal time periods of active recovery, performed at 40%-50% of maximum heart rate. Often this time frame varies depending on the fitness level of the participant.

No Equipment? No Problem

HIIT is highly adaptable for varying fitness levels and goals, which explains its popularity among elite athletes as well as individuals undergoing cardiac rehabilitation. Any typical gym equipment can suffice, from stationary cycles to treadmills or rowing machines. In the absence of accessibility to a fitness center, bodyweight exercises such as pull-ups, push-ups or burpees can serve the same purpose.

Research shows that even a quick 11-minute workout that contains a full minute of high-intensity, all-out effort might deliver the same benefit as engaging in a 50-minute, moderately-paced workout, according to a study in the journal *PLOS One.* This 4-minute workout involves 40 seconds of all-out movement followed by 20- second rest intervals:

- 40 seconds of squats
- 20 seconds of rest
- 40 seconds of pull-up's
- 20 seconds of rest
- 40 seconds of "mountain climbers"
- 20 seconds of rest

"If you are looking to use minimal gym equipment while traveling or at home, this workout is perfect for you," says Patrick Thompson, NSCA-Certified Personal Trainer on *Trainerize.me*. The following workout utilizes no elaborate fitness equipment at all:

- Jump Rope, 60 seconds

- Forearm Plank, 60 seconds
- Walking Lunges, 60 seconds
- Jumping Jacks, 60 seconds
- Rest or Active recovery, 60 seconds

Try to complete four rounds for a thorough and exhaustive training session!

Small Bursts Add Up

The physical activity guidelines put forth by the CDC (Centers for Disease Control) recommend striving for 150 minutes of moderate-intensity work per week, in order to maintain a healthy body. However, within those parameters, no specific details exist regarding how to achieve or accumulate these minutes. Experts have concluded that engaging in brief but intense workouts more frequently (10 minutes of effort, 3 times a day) can offer a desirable and convenient option for individuals who already face a time crunch.

"We're all super busy, so it can be hard to find motivation during precious downtime," says Ivana Bolf, a trainer at *Body Space Fitness* in New York. "It's important to get moving whenever possible, even if it's for short periods of time." Bolf clarifies that engaging in a 10-minute session of yoga flows does not yield these same benefits. Instead, she recommends micro-workouts that boost intensity.

"I find EMOMs (every minute on the minute) to be the most efficient and challenging workout," she says. "Basically, I'd set a timer for 10 minutes. At the top of the minute, I begin a set of 3 to 4 exercises to complete as fast as possible within that minute. Whatever time I have left after finishing the exercises qualifies as recovery time."

Aerobic and Anaerobic Systems

Tom Cowan, an exercise physiologist with the *Centre for Human Health and Performance (CHHP)* in London, echoes this sentiment. "The best way to explain it is repeated bouts of high intensity followed by a bout of recovery," he says. Ramping up a workout's intensity forces the body to tap into its anaerobic system for energy, since it cannot possibly supply the oxygen required to work aerobically as quickly as needed.

The recovery intervals enable the body to revert back to an aerobic system. As such a workout session continues, the body begins to rely less on the anaerobic system, as quick-release energy sources of phosphocreatine and glycogen get depleted. This reverts the body's reliance back to the aerobic system, which releases energy slowly but more sustainably from stored fat. Intensity naturally begins to taper off, yet Cowan views this as an overall double win: "You're essentially using a mixture of the anaerobic and aerobic systems, so you get an improvement in both."

He points out that utilizing anaerobic respiration taxes many of the body's systems, stressing the importance of clearing resulting lactic acid and hydrogen ions from the bloodstream. "All of those things increase the workload following the exercise….three sessions a week is probably okay, but it's not something that you're recommended to do every day."

New Health Benefits on the Micro-HIIT Horizon

We already know that HIIT reduces fat – both surface adipose tissue as well as deeper, visceral fat that tends to surround inner organs – while enabling the body to hold onto hard-earned muscle mass. Now, athletes and novices alike have welcomed the micro-HIIT news, which points to improvements in overall fitness, cardiovascular health, cholesterol profiles and insulin sensitivity.

According to a 2017 study published in the journal *Cell Metabolism*, bouts of HIIT and micro-HIIT can possibly slow cellular aging by increasing the production of proteins within the mitochondria, the cells' energy-releasing powerhouses. Other forms of exercise, such as strength training, also induce this benefit, albeit at a lesser level. In the absence of any significant physical exercise, cells (and the mitochondria in particular) will deteriorate with time. The study also stated that muscle cells, like those in the brain and heart, wear out over time; scientists reasoned that if exercise prevents deterioration of mitochondria in muscle cells, it very likely induces a similar effect in other tissues as well.

HIIT and micro-HIIT workouts score better than continuous moderate-intensity exercise in terms of releasing brain-derived neurotrophic factor (BDNF), a protein that confers a protective effect upon nerve cells. This in turn promotes plasticity (the forming of new connections), facilitating learning and memory.

In a famous 1996 study conducted by Dr. Izumi Tabata (who eventually developed a popular workout program by the same name), subjects engaged in 1 of 2 workout regiments over the course of 6 weeks. The group engaging in a 4-minute protocol on an exercise bike, five times a week, showed a 15% improvement in VO2 max. The participants who exercised for 1 hour at moderate intensity, again five times a week, showed only a 10% improvement. Moreover, the 4-minute or "Tabata" group boosted anaerobic capacity – the body's ability to produce energy without oxygen, used for short bursts of hard effort – by 28%, while the values for the moderately paced continuous exercisers remained constant.

The Need to Re-Feed

If glycogen stores do not receive enough replenishment following micro-HIIT, subsequent workouts will lack the required intensity. Clean, high-quality carbohydrate sources facilitate this recovery process. Just like any other mode of resistance training, bodyweight HIIT leads to micro-tears in muscle tissue that require time as well as lean protein intake to repair. Research recommends a post-workout meal consisting of 60g of carbs combined with 10g to 20g of protein to optimize glycogen synthesis.

Shorter is NOT Easier

Another risk with micro-HIIT involves the perception that such workouts provide an easy option; nothing could be further from the truth. "You've really got to push yourself," says Cowan. "It's not that enjoyable for some people." Despite its challenging and rigorous reputation, HIIT has been rated as more enjoyable than continuous vigorous and even moderate-intensity exercise. Researchers at the University of Turku, Finland, determined that HIIT workouts can produce an

uptick in endorphins, helping the brain to overcome negative feelings better than continuous, more moderately-paced training sessions.

If this mode of exercise appeals to your clients, start them on their journey by introducing 10 minute bouts in your sessions, and then encourage them to go it alone with some key suggestions. By scheduling mini-workouts the same way they might go about planning breakfast, lunch, and dinner, they optimize their chances of dedication and adherence. Most folks do not like to miss a meal! Likewise, in this fashion, exercise can also receive priority attention a few times a day.

Offer the Best of Both Worlds

Alternating between micro-HIIT days and moderate-intensity longer workouts, clients can be assured of results. Reassure them that these very different protocols each contribute to their physical development and overall health. Adding in 1-2 sessions a week of resistance training completes their “menu” of exercise options. Remember to stress the importance of rest days, so that the body can fully recuperate – and grow appropriately in response to the challenges placed upon it.

How Consumption Below BMR Can Undercut Fat Loss and Mass Gains

Restricting calories below metabolic needs might initially sound like a surefire path to weight loss. However, this process often backfires when the body's protective mechanism of entering "starvation mode" kicks in. Fat reserves get stored, to be utilized as energy until the body is once again appropriately nourished. Here's why consuming below Basal Metabolic Rate (BMR) is a bad idea for even the most determined weight loss clients.

The Body as a Machine

Think about the human body as a car. By putting fuel in a car, the engine runs efficiently, enabling the vehicle to move. In a similar fashion, the body utilizes calories from food, or energy, in order to execute and maintain all of life's functions. Insufficient caloric intake slows the body's metabolism considerably.

In desperate need of a fuel source, without enough energy, the body begins to tear down muscle tissue, generating a drop in lean muscle mass, despite efforts used during exercise.

In the case of grossly underfed bodies, or if too long between a period exists between meals — over three or four hours — the body slows its metabolic rate in an attempt to conserve energy. This is an evolutionary process, much like a bear entering hibernation. This explains how severely restricting calories for purposes of weight loss almost always fails.

In a 2005 study, Friedlander et al measured the results of restricting diet to 40% of caloric needs in nine young, healthy men for 3 weeks. Protein intake was maintained at proper levels of 1.2 grams/kg; still at the 3-week assessment, the men lost an average of 3.8 kg, half of which was lean muscle mass.

Furthermore, at the end of the 21 days, the collective BMR dropped over 200 calories! Although aerobic capacity was not significantly impacted, muscle endurance did decline by 20%.

Surprisingly, our basal metabolic rate constitutes the majority of a body's calorie needs — about 60 % of total energy expenditure, according to research from the University of Colorado at Denver. Calories utilized to metabolize food and to fuel activity comprise the remaining 40%.

Lean muscle tissue remains the body's biggest BMR calorie burner. Therefore, determining a client's BMR can help you estimate his/her caloric needs for losing weight. Keep in mind that BMR slows as weight goes down, requiring even fewer even calories for maintenance.

How the Process Works

Severely restricting calories forces hormonal adaptations to kick in during this "protective mechanism" mode, most notably affecting circulating levels of leptin, thyroid, and testosterone. These changes initiate the cascade leading to a depressed metabolic level. If a client begins a

training/dieting program with you, understanding this process can help guide both his workouts and his meal planning.

Adding in Exercise

If a client indicates acceptance of the gradual loss of his excess poundage, (as opposed to a sudden, precipitous drop) you can help him/her set smart and attainable goals. **When one reduces daily intake by 300-600 calories, the aforementioned hormonal changes do not pose a threat and the individual progressively loses weight.**

At this point the client may also increase activity and exercise; here is where metabolism hangs in a delicate balance.

If the client adopts a less than optimal meal plan and reduces caloric levels *too* significantly, the hormonal scale is thrown off. He/she may notice that the amount of energy available for workouts plummet. While it may seem counterintuitive, the client ends up burning fewer calories for each hour of exercise.

Muscle Mass to the Rescue?

In a previous article, we covered the topic of muscle mass and metabolism. We learned that while muscle remains the most metabolically active tissue in the body (as compared to fat and bone), the increase is measurable but small. However, the addition of lean muscle mass is always advantageous.

The workouts that facilitate building muscle are not for the faint-of-heart, and require the consumption of additional calories to fuel and recover. This presents a conundrum of sorts for a client whose goal is weight loss, since shedding fat requires one to burn more than he consumes.

The difficult paradox: by engaging in a calorie deficit to lose fat, the muscles end up lacking the fuel to grow. Does generating sufficient energy levels for anabolic muscle growth fly in the face of caloric reduction for weight loss?

Since meal planning for a client is outside the scope of practice for a personal trainer, suggest that s/he reach out to an exercise-focused nutritionist. Otherwise, reviewing food logs, caloric intake, and macronutrient balance is certainly within your purview. In general terms, we know that protein and amino acids are the building blocks of lean muscle tissue. Armed with such knowledge, clients often hesitate to include carbohydrates and fats into their weight-loss regimen.

You can explain in easy-to-understand language how glucose, or glycogen, is the body's preferred fuel source, obtained in a healthy manner by taking in sufficient amounts of appropriate carbohydrates, both prior to and/or upon completion of a workout. Individuals who are in the process of severely restricting their calories often eliminate entire food groups from their menus. We can provide an invaluable service by outlining how the presence of a variety of healthy fuel sources allows for "muscle-sparing".

Matching Nutrition to Goals

The uniqueness that defines every single individual extends from the gym and into the kitchen as well. **Depending upon gender, build, genetics and general physical output, clients are going to utilize energy and create deficits in differing ways.** Regardless of this, the greater the intensity of one's workout, the more time the body takes to recover. During this recovery period, the body continues to burn additional calories. Although there exists great variation from person to person, post-exercise metabolism often remains elevated for up to to 48 hours, according to expert Len Kravitz.

It may be disheartening to recognize that a typical strength training workout on average only utilizes 180 to 266 per hour, as reported in Harvard Health Publishing. This quantity proves difficult to calculate because training large muscle groups inevitably requires more energy than working smaller muscles. However, such a session also gradually increases muscle mass, helping the body to more effectively burn calories even at rest.

The Aerobic Factor

For all of its benefits, strength training will not burn as many calories as cardiovascular exercises, minute for minute. However, we must teach our clients to take into consideration the whole fitness outlook. Many individuals remain stuck on the notion that constantly increasing their aerobic training is the path to losing fat.

When losing weight, some muscle mass *will* get utilized along with body fat. **During the period of a calorie deficit, it is vital to continue resistance training regularly; if it is neglected in favor of running or cycling, potentially up to 30% of the weight lost comes from that hard-earned muscle tissue.** As we will cover further on in this article, adding "size" to one's body through serious bodybuilding and proper nutrition will also invariably add at least *some* adipose tissue in the process since a caloric surplus is required.

The Challenging Calculation

Once you and your client have determined roughly how many calories s/he burns daily, you can begin to address a nutrition plan. A dedicated strength-training male client can maximally build a half-pound of muscle, and a woman can maximally add a quarter of a pound in a week's time, at best.

Experimenting over time with the addition of calories is challenging, knowing that a surplus will add some adipose tissue along with muscle. Some experts suggest beginning with an additional 250-500 calories each day, and adjusting down if too much adipose is gained.

A hard-gaining client would aim for a higher number, whereas one who finds shedding weight to be a slower process would start adding calories cautiously. Discovering the client's "sweet spot" between an insufficient calorie increase and too great of a gain, becomes simply a matter of trial and error.

It has been widely accepted that in an effort to gain muscle while acknowledging that fat will come along for the ride requires around 3,500 additional calories in a 7-day period, though this is an estimation. Extra caloric energy beyond what is needed to fuel workouts, recovery and addition of muscle mass will indeed get stored as fat.

The job of a highly trained and successful fitness professional includes an awareness of a client's goals and motivation, as well as the path of your joint journey to success. Patience, support, and attention to detail are key players here. Reassure your client that adjustments can always be made and what may appear to be undesirable weight gain is not a "failure" and can certainly be reversed with some tweaking.

Be observant during training sessions: does the client seem to lack energy? Is s/he pushing significant weight loads with no visible addition of muscle mass or strength gains? These clues point to an insufficient amount of energy entering the body. Armed with the knowledge gained here, you can feel confident in addressing this topic in a safe and appropriate manner.

SELF TEST: June 2020

1. Studies show that wearing a weighted vest:
    a. does contribute to a more pronounced loss of body weight
    b. does not contribute to a more pronounced loss of body weight

2. A truly fit individual will never present with medical conditions.
    a. True
    b. False

3. The acronym 'HILIT' stands for:
    a. High-intensity/Low-impact Training
    b. Heavy-interval/Light-interval Training
    c. High-interval/Low-intensity Training
    d. Heavy-intensity/Light-interval Training

4. The key for successful results using HILIT is to rev up the metabolism due to:
    a. Heart rate going up and down through intense bursts of short exercise
    b. Heart rate staying steady through a long duration of the same exercise without stopping
    c. Burning calories as you continue to exercise while purposefully keeping the body from being able to rest
    d. Burning calories during sweat production that occurs with high intensity exercise and long rests in-between

5. During exercise, hard-working muscles use _____, which is readily available.
    a. Glycogen
    b. Glucose
    c. Fructose
    d. Cortisol

6. 'Going to failure', when exercise cannot continue, is experienced when:
    a. Oxygen intake is prohibited by diminishing lung capacity that occurs throughout exercise
    b. Blood flow has decreased to the muscles being worked
    c. Glucose levels and glycogen stores drop too low to continue
    d. Glycolysis in the liver starts to occur which drains the muscle cells of energy

7. How many grams of protein, within what period of time, is ideal following an intense weight resistance workout?
    a. 10-20 grams within 30 minutes
    b. 20-30 grams within 30 minutes
    c. 10-20 grams within 1 hour
    d. 20-30 grams within 1 hour

8. The Glycemic Index measures:
    a. The amount of protein needed to raise glucose and energy levels
    b. The time it takes for food entering the body to be absorbed in the small intestine
    c. The length of time it takes for protein to act on recovering muscles
    d. How quickly a food raises blood sugar and insulin levels

9. _____, consumed immediately post workout, can result in a beneficial 'super-compensation' of glycogen.
    a. Proteins
    b. Carbs
    c. Fats
    d. Vitamins

10. Following the closure of gyms and the ability to work one-on-one with clients due to COVID-19, trainers got creative using the following platform/s/ to engage with and train their clients:
    a. Facebook
    b. Zoom Conferencing
    c. Instagram
    d. All of the above are optional video platforms for virtual training

11. Be mindful of the following when recording workout video:
    a. Being encouraging
    b. Lighting and space
    c. Speaking clearly
    d. All of the above are things to be mindful of when recording or performing a live workout session

12. What causes a 'workout hangover'?
    a. Training too heavy or too often
    b. Drinking alcohol right after a workout
    c. Not training heavy enough or often enough
    d. Not consuming water during the workout

13. What physiological process is occurring which causes a 'workout hangover'?
    a. Glucose levels drop and prevent energy from going back into the muscle
    b. Cortisol levels fall and the body's energy levels spike too high
    c. Cortisol levels spike and the body fights fatigue and eroding lean muscle mass
    d. Glucose levels spike and create a gap in the energy continuum

14. In order to reduce a workout hangover, experts advise athletes to:
    a. minimize the number of maximally heavy lifts requiring major psychological prep
    b. increase the psychological prep to get the mind ready for extreme heavy lifting with every rep
    c. be of a different mindset whereby you are thinking of something other than working out while performing each movement
    d. None of these will help a workout hangover

15. _____ recovery is occurring at the muscular level, whereas _____ recovery occurs within the various nervous systems allowing growth to occur.
    a. Localized; Systemic
    b. Systemic; Localized

16. The release of this 'love hormone' can reduce stress, anxiety and improve the immune system response, promoting muscle growth.
    a. Oxytocin
    b. Cortisol
    c. Seritol
    d. Melatonin

17. Respiratory rate can be measured on any heart rate monitoring device.
    a. True
    b. False

18. Breathing carries _____ to your muscles.
    a. hormones
    b. blood
    c. oxygen
    d. water

19. EPOC stands for:
    a. Excess post-exercise consumption
    b. Exercise post-exerting control
    c. Energy positive exercise condition
    d. Elevated position oxygen control

20. The more intense the exercise, the more oxygen is used and the more effort the body must make to build its oxygen store.
    a. True
    b. False

21. Studies show a correlation between overtraining and which of the following?
    a. Reduced appetite
    b. Decreased sex drive
    c. Low motivation
    d. All of the above can occur when overtraining

22. OTS stands for:
    a. Overtraining Syndrome
    b. Overt Training Standards
    c. Obstacle Testing Systems
    d. Overtaking Sickness

23. Studies suggest that OTS stems from the:
    a. sympatho-adrenergic nervous system
    b. exposing of the body to more stress than it can handle
    c. instability that occurs in the nervous system
    d. All of the above are linked to symptoms of OTS

24. Properly preparing for running, in order to get its most benefit, includes which of the following:
    a. Stretching
    b. Adequate hydration
    c. Rest days
    d. All of these are needed to get the most benefit from running

25. Studies show that which of the following is most associated with osteoarthritis?
    a. Higher BMI
    b. Lower BMI
    c. Sprinting
    d. Long distance running

26. Which of the following can be used to estimate running load Per Unit Distance (PUD)?
    a. Time spent stretching
    b. Ground reaction force
    c. Environmental stresses
    d. None of these can be used as a measurement for finding PUD

27. Engaging in long distance running, like training for a marathon, may help to condition knee cartilage to withstand the mechanical stresses induced by regular running.
    a. True
    b. Not True

28. 'Quiet eye' is best described as:
    a. A quiet gaze that is held long enough as to create a feeling of intimidation
    b. An eye that has been more worked than the other, whereby its associated eye muscles are actually stronger than in the other eye
    c. A hyper focus milliseconds before, during and after an action whereby the eyes are fixed on only aspects of the goal
    d. A laziness of focus throughout an activity which makes the execution of the exercise unmanageable or impossible

29. Research shows that, compared to non-athletes, serious and/or competitive athletes are:
    a. better at filtering out background sounds
    b. better at purposely not filtering out background sound
    c. more likely to speak louder in daily speech
    d. more likely to speak quieter in daily speech

30. Whether training an athlete or a general fitness client, it is of great value for reaching any fitness goal to have:
    a. Mindfulness towards goals
    b. Purposeful form
    c. Proper recovery
    d. All of these are needed to effectively reach the goal

31. The physical activity guidelines put forth by the CDC, recommend striving for a minimum of how many minutes of moderate intensity work *each week*?
    a. 30 minutes
    b. 60 minutes
    c. 90 minutes
    d. 150 minutes

32. The recovery intervals in high intensity training enable the body to:
    a. Revert back to anaerobic respiration
    b. Revert back to an aerobic system

33. BMR slows as body weight _____.
    a. Increases
    b. Decreases

34. Engaging in a calorie deficit to lose fat will result in which of the following:
    a. A loss of fat that is sustainable, with a continuous calorie reduction
    b. A loss of water weight, which must be maintained by drinking less water along with the calorie reduction
    c. A leaner BMI, because the muscles' processes are more efficient with fewer calories
    d. Lean muscle being negatively impacted, lacking the fuel to grow

35. Extra caloric energy beyond what is needed to fuel workouts, recovery and addition of muscle mass, will be stored as:
    a. Protein
    b. Lean muscle
    c. Fat
    d. Additional Energy

SIDE 1

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KEY ITEM COUNT

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1 FEED THIS DIRECTION

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MARKING INSTRUCTIONS

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