NFPT

CEC Self-Test Packet

SYMBIOSIS OF MAXIMIZING SIZE AND STRENGTH

GROWING MUSCLES AND GAINING STRENGTH ARE NOT NECESSARILY ACHIEVED BY THE SAME MEANS

"LOW T": NOT SOLELY A MALE PROBLEM

WOMEN, NOT JUST MEN, CAN SUFFER ILL EFFECTS FROM DEPRESSED TESTOSTERONE LEVELS

TRAINING DIABETIC CLIENTS

BIANNUAL EDITION: June 2019

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

National Federation of Professional Trainers

NFPT SELF-TEST
JUNE 2019 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. NFPT offers three (3) specialty courses and many more continuing education courses too. We work with a wide variety of recognized continuing education providers that offer hundreds of options for CECs as well; visit us at www.nfpt.com/continuing-education to learn more.

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Contents

Barefoot Training Basics for Personal Trainers

Do you train with your shoes off or see others doing so? Maybe at first, you just scratched your head and worried that the barefoot girl at your gym doing deadlifts might inadvertently crush her naked, little toes. You may now know that removing your clients' shoes for their training sessions could tremendously bolster the impact of your work together.

Do Shoes Distort Our Neuromuscular Feedback?

To understand how footwear can alter our movement patterns, first examine the relationship between foot mechanics and proprioception to our overall functioning.

There are both biomechanical and neuromuscular components to foot function. The former is that which can be observed with regards to foot positioning: Is the foot overpronated, neutral or supinated?

The influence of neuromuscular and sensorimotor stimulation, however, is more complex. For instance, there are mechanoreceptors in the plantar foot that can detect the texture of a surface. Feedback is then sent to the brain about how slippery that surface is, signaling specific motor compensations up the kinetic chain.

There is also evidence of co-activation patterns between the muscles of the foot and those of the core. This is fascinating! It means, when you properly engage the muscles of your arch, a cascade of muscle activations is set in motion, ending with the deep core musculature. (Splichal, 2015).

This makes sense if you think about walking gait. During a stride, there is a moment when one leg only is in contact with the ground, effectively becoming a single-leg stance. In that moment, the hip rotators must be engaged to properly stabilize the joint. If the muscles of the foot are weak or unable to fire, this cascade may not take place or take place too slowly.

Additionally, a connection between sensory stimulation of the plantar foot and intrinsic muscle activation was reported by Nurse and Nigg (2001). These researchers found that muscle patterns were strongly affected by essentially "numbing" sensory input to the plantar foot using ice. When stimulated, numbed areas did not produce the same degree of vibrations in the intrinsic muscles as the areas that were not numbed. They concluded that reduced sensory stimulation, such as with overly cushioned footwear, is likely to weaken the muscles of the foot. Weakened intrinsic musculature can lead to maladaptive patterns and injuries.

Basic Barefoot Movement Integration

Now that I have hopefully convinced you that a grounded foot is the foundation for a stronger core, it's helpful to include a few basic foundational exercises before having your client perform burpees unshod.

It is important to note that most folks accustomed to wearing shoes do not instinctively adopt proper barefoot mechanics and will require instruction (Hashish et al, 2016). You must also assume that there may be some foot pathology and weakness.

Release the Intrinsic Muscles of the Foot

To start, spend about five minutes performing basic trigger point release in the foot. This will help improve muscle activation and aid in blood circulation. Simply use a small ball that has some give, like a lacrosse ball or bouncy ball to find trigger points in the arch.

Instruct your client to stand with the ball under the arch of one foot and place some weight onto it that is bearable. The objective, like other trigger point release methods, is to find a tender spot and hold it until some relief is noted. The ball should be kept on soft tissue and not under the tarsal joints or calcaneus.

Teach "Short Foot"

Next, the client must learn to engage the intrinsic muscles of the foot to both strengthen them and to initiate that cascade to the core. The "short foot" exercise can be difficult to describe verbally, so be sure to learn it yourself! It involves attempting to shorten the distance between the tarsal joints and the heel by dome-ing the arch.

Learning to do this successfully is even harder than describing it! Have patience. Once there is some visible activity in the arch, it's time to start incorporating some barefoot movements while activating short foot.

All exercises performed barefoot must be done with intention. Short foot should be engaged during all barefoot movements, and it is your responsibility as the professional to make sure your client is focused on engaging it.

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Lymphatic System Logistics for Exercise

The lymphatic system is tied to the optimal functioning of almost every aspect of the human body. It plays a role in injury and muscle soreness. It has a function for tissue regeneration, mental concentration, fluid regulation and warrants significant attention in the cancer population. Knowing how this system functions and the implications for exercise will benefit all of your clients even if they have no direct interest in lymphatics.

Understanding the Lymphatic System

The lymphatic system is a complex pathway made up primarily of lymph vessels and lymph nodes. Lymph is a colorless fluid, essentially the waste disposal system of our tissues; and the lymph nodes are the body's battlefields where most infections are fought.

The lymphatic system works to maintain healthy immunity, to drain stagnant fluids, regenerate tissues and detoxify the body by filtering out foreign substances. Any significant impairment in the lymphatic pathways can affect one's ability to concentrate. Individuals suffering from this seem disorientated and tired and experience a feeling of general malaise without knowing why.

Knowledge of the importance of the lymph system may be of special interest to athletes and our clientele who may regularly experience muscle soreness or sustain the occasional injury. When tendons or ligaments have been damaged, fluid collects in small spaces surrounding the soft tissue; such pooling is referred to as swelling or edema.

While this is part of the natural healing process, as the body works to bring nutrient-rich fluid to the injured tissue for repair, recovery time can be decreased dramatically. The quicker the old, stagnant fluid moves out and tissues can receive fresh nourishment for regeneration, the sooner healing can occur.

Exercise and Fluid Regulation

The primary role of the lymphatic system during exercise is to assist in the regulation of tissue volume and pressure by carrying excess fluid and plasma back to the cardiovascular system. The heart, arteries, and veins could not operate without the lymphatic system, since the only means of returning fluids and plasma proteins back to the blood (approximately 2-3 liters every 24 hours) are via the lymphatic vessels.

During steady-state exercise, the flow of lymphatic fluid is two or three times higher than in a resting state. The National Institute for Health and Care Excellence (NICE) has made recommendations about exercise and lymphedema after breast cancer.

While there is no indication to date that exercise causes or worsens lymphedema in the otherwise healthy population, lymphatic system functioning can be impaired in a third to half of all breast cancer survivors.

Cancer and Its After-effects

Lymphedema is caused by the removal of axillary lymph nodes during breast cancer surgery, or by damage to those nodes or other lymphatic vessels during radiation treatment. Excess fluid collects in areas where lymph vessels/nodes are no longer present to help shuttle it to other body parts. Although lymphedema symptoms vary among individuals, they typically include swelling and pain in the arm, chest, and breast area. It may also induce a feeling of heaviness and difficulty with fine motor skills required in daily life.

A 2009 study done at Lund University in Sweden in Physiotherapy Theory and Practice found that when women with breast cancer engaged in a regular program of light free weights as well as walking and water aerobics, they experienced relief from their symptoms.

Routine lifting of one-pound weights helped with muscle tone, arm strength, and bone density. Data from a 2005 study was published in the journal *Lymphology.* A small group of women with lymphedema learned to combine the practice of deep breathing with arm exercises, performed for 10 minutes every morning and evening.

At the end of one month, participants reported a decrease in arm swelling. In addition, their lymphedema symptoms were much milder than before engaging in regular exercise. Some of the women said that their arms felt better for a full month after the study concluded.

In 2009, a research project was undertaken with the examination of 141 people with breast cancer and subsequent lymphedema. Each of these participants had taken part in an exercise program. Half of the subjects received instructions about not overusing their arms; the other half engaged in progressive weight lifting.

All of the women in the study had lost one breast, had relatively healthy body weight, and had been finished with all therapy for at least one year. Certified lymphedema therapists monitored the women's arms, and fitness professionals taught 90-minute classes twice a week. Results were later published in the *New England Journal of Medicine.* Researchers were surprised to find that the group assigned to weight lifting had significantly fewer lymphedema symptoms than the women who protected their arms.

Those who lifted weights, not surprisingly, also cultivated more strength. Gentle weight lifting can raise a client's self-esteem, a vital step in the cancer recovery process, while also providing a sense of mastery over one's body.

Initiating a Client's Recovery Journey

If your client has not exercised in quite some time, either out of habit or the debilitating side effects of chemotherapy, discuss the importance of engaging in some aspect of exercise every day. Just as you do with her one-on-one strength training, anything done on her own should start gently and build up slowly.

Encourage her to think of ways she can build it into her daily routine. It may be as simple as including a daily walk with the family, a friend or a dog. Other options include Pilates and yoga classes, swimming, water aerobics or cycling.

Deep breathing helps by changing the pressure in the abdomen and chest. This encourages lymph to flow back into the blood system. Prior to embarking upon deep breathing exercises, position the client in a way that helps the lymph to drain properly and naturally. Show the client how to sit with her arm raised to a comfortable level, either on a cushion or a pillow, but not exceeding shoulder height.

Exercise Suggestions For Lymphedema

Instead of viewing a post-cancer client as having limitations, capitalize on all of the exercises she is capable of performing, and the multitude of ways they can improve her overall state of wellness.

Neck exercises

Tilting – guide client to tilt head towards one shoulder, hold for 3 seconds, return to the center and repeat on the other side.
Reminder: Keep shoulders still throughout exercise.

Turning – turn head to look over one shoulder and hold for 3 seconds; return to facing forward and repeat the movement over the other shoulder.
Reminder: Turn the head only, not the body.

Chin to chest – bend neck down as far as comfort tolerates, chin to chest; hold for 2 seconds and then slowly bring head back up to neutral alignment.

Shoulder exercises

Shrug by first relaxing the shoulders, then bringing them up toward the earlobes before allowing them to drop back down.

Shoulder rolls – alternately rotate shoulders forward and backward.

Arm exercises

Seated comfortably in a chair, place hands on knees, then shoulders, and progress to reaching fully extended toward the ceiling. Reverse the process.

Pass a medicine ball around the waist, first in one direction and then the other.

The Detoxifying Bounce

An excellent way to purify the lymphatic system is through the practice of rebounding. While considered a relatively low impact movement, rebounding involves jumping on a trampoline. Such action promotes the flow of lymph through the body and is believed to increase the drainage of toxins from organs and muscle tissue.

Rebounding is a fun and safe way to detoxify the body's lymphatic drains. If a mini trampoline is not yet part of your gym's equipment collection, have the client jump on a stack of mats, reminding her to land each time with soft knees.

The Nutrition Component

Consuming a diet of anti-inflammatory foods, specifically raw fruits, and vegetables, helps hydrate the body and promote an alkaline environment. Since germs cannot flourish amid higher pH, the consumption of these foods expedites the removal of pathogens that may stagnate in lymph fluid. Some foods that best detoxify the lymphatic system are red fruits and vegetables: pomegranates, raspberries, cherries, beets, and cranberries.

Understanding the intricacies of the human body is the cornerstone of our careers. Recognizing the importance of the lymphatic system will enable you to better serve a varied clientele, from dedicated athletes to those recovering from the aftereffects of breast cancer. There is always something positive we can offer our gym members; the better informed we remain, the better trainers we become.

Eat Drink and Sleep?

When you eat and drink can affect sleep and how you sleep can impact how much and what you eat and drink. Meeting health-related goals like weight loss warrant attention to this interconnected relationship. Come explore the physiology so you can guide your clients thoroughly.

The body has many separate parts but ultimately (and ideally) works as a fluid system. Paying attention to the various components of human physiology helps all the parts work together fluidly; leading to more complete wellness.

How Sleep Affects Appetite

Sleep scientists have examined how a low night of sleep affects food choices by presenting study participants with a buffet of food the day after a full nights sleep and after a low night of sleep. Food choices and caloric intake are recorded to determine the effect of sleep on appetite.

Not only do study participants eat more calories after not sleeping enough, but they choose foods that are richer in carbohydrates (Walker, 2018). Appetite hormones can be measured in saliva and also blood plasma.

When a person doesn't get enough sleep…
Ghrelin increases. Ghrelin is a hormone that signals hunger. Lack of sleep causes a person to eat more than usual or necessary.

Leptin decreases. Leptin is a hormone that signals the feeling of satiation and fullness. Without sleep, satiation is suppressed and hunger overrides.

Endocannabinoids increase. Endocannabinoids do in fact cause the munchies. Enough said. Willpower and self-control are no match for these appetite hormones. It seems the internal chemistry of the human body can be challenging to override.

Sleeping enough regulates appetite but also limits the amount of time awake for eating to occur. (Unless you are a sleepwalker and find yourself in the pantry while snoozing!)

How much sleep is enough? However much leaves a person feeling rested in the morning and able to go about her day without caffeine or other alertness supplements.

Another food-related reason to get enough sleep is "After approximately 6 hours of nonfeeding, stored glucose, or glycogen, is depleted enough to initiate a shift from glucose metabolism to fat metabolism." (Peeke, 2018).

Eating a few hours before bedtime and again shortly after waking has health benefits when there is enough sleep in between the two meals.

How Food Affects Sleep

Sleep might be better after an early and light dinner. Not just because of digestion but because the earlier a person finishes dinner, the earlier he can wind down for bed. We spend the entire day under stimulation and stress. Allowing time to relax and settle down can help a person get the sleep he needs. Dinner signals the start of evening activities.

The *Better Sleep Council* says, "Try to finish eating 2 to 3 hours before bedtime so your whole system is ready to relax. Drink alcohol in the early evening instead of right before bed so your body has time to digest it before you hit the sack. Make caffeine a morning-only drink and stick to other beverages in the afternoon and evening. Caffeine stays in your system longer than you might think and can disrupt your sleep." Some sleep and circadian rhythm experts recommend limiting carbohydrates after 3 pm and also suggest avoiding sugar in the evening. Carbohydrates are more optimally metabolized in the morning and early afternoon, based on insulin levels and sensitivity (Qian & Scheer 2016).

Protein and healthy fats might be better choices for dinner when you're wanting to sleep well and manage weight. Hunger before bed might be best remedied with nuts as a snack.

Dr. Erin Nitschke, an ACE and NFPT Fitness Nutrition Specialist, and Precision Nutrition Level 1 Coach says, "Food is medicine. Food heals and nourishes the body and soul. When individuals choose to eat well-rounded meals daily, the body will function better overall. This includes the experience of better sleep. While there's no "magic" diet that will cure all, nutrient-rich foods – as opposed to energy-dense foods (with the exception of nuts) will ultimately facilitate more efficient bodily processes and systemic repair."

How Drinking Affects Sleep

Matthew Walker, a sleep scientist says that research can't find an amount or timing for alcohol that doesn't disrupt sleep (except daytime – which isn't a recommendation) even though we would like it to beneficial for sleep. Research studies show that sleep is disrupted when drinking any amount of alcohol in the evening – even if the study participant felt that they slept well.

The reason caffeine is best limited to the late morning and not again later in the day is that it is an antagonist to adenosine. Adenosine is responsible for building up the pressure to sleep. The pressure starts building when you wake up. If a person feels tired mid-morning he or she might not have gotten enough sleep. If a person feels sleepy in the afternoon, suggest a walk outside, nap or mediation before reaching for caffeine.

Low sleep and caffeine consumption can become a vicious cycle, just like sleeping pills. When a supplement is used to counteract lack of sleep and in effect disrupts sleep further – it requires a person to need the supplement, even more, to get by. Any evening beverage consumption will likely land up in a trip to the bathroom at midnight. This isn't necessarily a problem unless getting back to sleep is challenging.

Consuming plenty of water throughout the day becomes another important beverage related habit to acquire for healthy sleep. Suggest people fill a jug of water and aim to finish it before dinnertime

or set an alarm to remind them to catch up on water in the late afternoon. Sometimes the afternoon slump is simply a need for hydration, physical activity and a mental break from work. The human body is a complex and fascinating system made up of many working parts. When we take care of our bodies the way they were designed we don't need as much outside support. Reaching health goals is a multidimensional process that involves attention to the many dynamic pieces.

Beyond exercise logs, help your clients keep track of habits with food journals and sleep journals. Going full circle around health habits reveals the weak links more clearly for them and you.

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Balance Concerns: Age-Related or Warning Sign?

Lack of balance can be normal or it can be a serious health concern. Knowing the difference is essential for the personal trainer. The ability to control and maintain the body's position, whether moving or remaining still, is integral to the overall quality of life. Fortunately, clients often come to us seeking improvements in balance related to stability, so there is room to educate.

The Complex Network of Body Systems

A healthy sense of balance enables us to walk erect and in a straight line, rise from a chair with relative ease, climb stairs, and bend over without tumbling forward. Balance involves the integration of various sensory and motor systems, including vision, the vestibular system in the inner ear (which monitors motion and provides orientation clues, such as which way is "up") and proprioception (the ability to sense the body's position relative to space).

Being able to steady oneself after any movement – laterally or up-and-down — also requires good muscle strength and reaction time.

Age as a Factor

Having less than stellar balance is fairly common, and tends to get more problematic as we age, according to Dr. Helen Bronte-Stewart, a specialist in movement disorders at Stanford Medicine. Often, over time, simply standing or walking results in considerable unsteadiness. For adults ages 65 and over who do not currently reside in nursing homes, one in three tend to fall at least once a year—and 10 to 15 percent of these falls result in serious injury, according to a 2008 Australian research study.

When Poor Balance Indicates a Bigger Problem

Assessing a potential balance problem is fairly straightforward, though many individuals shy away from accepting this idea. "The most concerning outcome is falling, but if you have trouble putting on long pants when you have to balance on one leg, that suggests you may have balance problems," Bronte-Stewart says.

She goes on to list a few other red warning flags: "If you cannot walk in a straight line, have a tendency to bump into things, or if you have trouble standing with your feet together and eyes closed, it is time to consult a physician."

Hidden Culprits

Unbeknownst to many older adults, regularly taking medications or coping with chronic conditions can interfere with balance. Some of the more common conditions are:

Complications of the inner ear (vertigo, infection of the labyrinth, Meniere's disease or acoustic neuroma, a noncancerous growth on the vestibular nerve which connects the inner ear to the brain)

Eye problems (cataracts, glaucoma, diabetic retinopathy, incorrect eyeglass prescription or macular degeneration)

Numbness in feet and legs (neuropathy)

Arthritis

Circulation/cardiac disorders

Long-term diseases of the nervous system (cervical spondylosis, Parkinson's disease or Alzheimer disease)

Combination of maintenance medications/prescription drugs

Deconditioning/lack of exercise/obesity

Vertigo is often the first sign of a pending stroke. Orthostatic hypotension—low blood pressure that occurs upon rising from a sitting or horizontal position—causes many individuals to feel faint, but is usually harmless and often the result of dehydration.

If consuming adequate fluid does not mitigate such dizzy spells, other more significant disorders leading to low blood pressure or poor circulation could be contributing factors. Cardiovascular disease, heartbeat arrhythmias, and diabetes-related neuropathy or hypoglycemia all have the potential of bringing on such dizzy or lightheaded sensations.

Multiple Sclerosis is an autoimmune disease that affects the entire nervous system, including the brain and spinal cord. According to experts at the Multiple Sclerosis Society of Canada, "The disease attacks myelin, the protective covering of the nerves, causing inflammation and often damaging the myelin." The myelin sheath is responsible for transmitting impulses. Individuals diagnosed with MS often report that loss of balance or numbness on one side of the body was their first symptom.

The Deconditioned Client

Unrelated to age, balance issues can come about when an individual experiences a significant deterioration in his physical fitness capabilities.The longer this situation is allowed to continue, the more breakdown of muscle mass occurs. Deconditioning extends beyond merely having a desk job, provided the individual makes a concerted effort to exercise regularly, Bronte-Stewart says.

However, the reality of a truly sedentary lifestyle is loss of core strength and decreased power in the gluteal muscles. Struggling to balance during physical activity that involves standing on one leg, or hiking over somewhat challenging terrain, should not be ignored, “It could be because you don’t challenge [these muscles] that often with exercise,” Bronte-Stewart says. “There’s an absolute rule that applies to muscles and the brain: If you don’t use it, you lose it,” she explains.

How Trainers Can Conquer Challenged Balance

You can help identify a balance problem by asking a client some key questions, listed below. Afterward, let him know that any affirmative responses are worth discussing with his physician.
Is client regularly feeling unsteady?

Does client feel as if the room is spinning around him?
Is he experiencing a sense of “motion” when standing or sitting still?
Have falls occurred recently?
Has client reported lightheadedness, or sensing that he might faint?
Has client’s vision become blurred?
Does the client talk about feeing disoriented, losing sense of time, place, or identity?

Once a diagnosis has been made, whether it is simple deconditioning or a series of comorbid conditions, there are exercises trainers can implement to help strengthen a client’s sense of balance. Participation in a Tai Chi class offers many benefits.

With its approach of strengthening the body while focusing the mind,tai chi has proven to reduce falls in older adults by up to 45%, according to Dr. Peter Wayne, research director of the Osher Center for Integrative Medicine at Brigham and Women’s Hospital and Harvard Medical School. It can also improve balance in any number of neurological diseases. A recent study published in *The New England Journal of Medicine* found the program particularly effective for patients living with Parkinson’s disease.

Setting up an obstacle course for a client struggling with balance offers the opportunity to challenge the body as it moves through space in a variety of directions, including stepping over objects or walking on unstable surfaces. Guide the client at first, ready to steady him or catch him in the case of a potential fall.

Sitting on a stability ball or physioball helps facilitate not only balance but proper posture as well. By placing the ball within arm’s length of a wall, the client can feel assured that he has a stable surface on which to rely should a significant wave of dizziness or profound instability sweep over him.
All of us at some point in our lives either have or will experience some loss of balance. Awareness of the hidden issues can help shed light on what changes can be made in terms of health and lifestyle, helping to keep our clientele upright and tumble-free.

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Exploring Breathing Muscles and Exercise

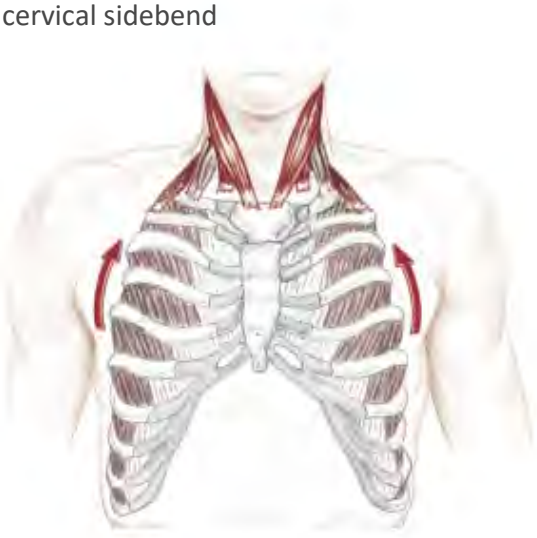
There are 18 muscles working when we breathe, including the pecs. More often than not, the diaphragm and transverse abdominus are the main two muscles talked about most for breathing. Yet there is so much more happening beneath the skin when you inhale and exhale.
Exploring the muscles of breathing is a great way to strengthen your anatomy knowledge and step up your game as a fitness professional.

What are the muscles that help you breathe?

There are 12 muscles of inhalation and 6 muscles of exhalation. Why are there more muscles for inhalation than exhalation?
Perhaps it's because more strength is needed to breathe in than to breathe out?
Is it because inhaling resists gravity?
What do you think?
Reference an anatomy book to identify the location and attachments of each muscle listed so you can explore how it facilitates breathing.

Muscles of Inhalation (12)

With a breath of inhalation, the ribs need to elevate and expand to allow the lungs to fill with air. By studying the muscles and attachments you can see how movers like pec major have a role in breathing.
All of the muscles listed attach from the ribs to another anchoring bone that allows them to literally lift the rib cage. So cool!
Identify the attachments (origin and insertion) of each muscle while you inhale to connect to the muscle and its function.
Diaphragm
Anterior scalene – bilaterally, unilateral would cause cervical sidebend
Middle scalene – bilaterally, unilateral would cause cervical sidebend
Posterior scalene – bilaterally, unilateral would cause cervical sidebend
Sternocleidomastoid – assists due to medial attachment
External intercostal
Serratus posterior superior – anchoring ribs superior (up) medially to vertebrae
Quadratus lumborum
Pectoralis major – assists with arm flexed
Pectoralis minor – with scapula fixed via rhomboids and trapezius
Serratus anterior – with scapula fixed via rhomboids and trapezius
Subclavius



Muscles of Exhalation (6)

During an exhale the ribs need to depress and the organs compress to expel air out of the lungs. Using an anatomy book, identify the attachments (origin and insertion) of each muscle while you inhale to connect to the muscle and its function.

Internal intercostals
Serratus posterior inferior – anchoring ribs inferior (down) medially to lumbar vertebrae
External oblique – by compressing abdominal contents
Internal oblique – by compressing abdominal contents
Transverse abdominus – by compressing abdominal contents
Quadratus lumborum

Breathing Exercise

Breathing is a natural process that happens without much thought, yet many people may not breathe to their full potential. *"Ideally, the ribs are designed to expand in three directions during inhalation: anterior/posterior, lateral and superior). Yet, for reasons ranging from posture to emotional trauma, few people truly breathe in this manner (Biel, 2014)."*

There are many methods to enhance breathing. The first step to better breathing is an assessment.

Breathing Assessment

Ask your client to breathe fully while you observe their rib cage.
If the client is comfortable you can ask to place your hands gently on the lateral rib cage to feel what is happening.
You might close your eyes to experience the movement differently.
A lot can be observed simply watching as well.
Observe from the front, back and each side.
Have the client report what they notice about their body when taking a deep breath.

Note if the ribs:
Expand in three directions.
Move together.
Move equally on the right and left sides.
If anything seems abnormal refer the client to their physician. You might already know if your client has COPD, scoliosis, asthma, or other conditions that affect breathing. In this case, seek recommendations from client's doctor and educate yourself on appropriate training methods for these conditions before training.

Breath training is a great tool to implement with all clients. Your goal as a personal trainer is to strengthen the torso complex and core. Even if everything seems perfect, try some breath training with the client.

Four Breathing Techniques

There are several goals you might keep in mind when integrating breath training into your workouts.

Energy – Coach full inhalation breaths and powerful exhales. Incorporate energizing words and arm movements or a yoga flow to integrate the entire body.

Relaxation – Guide gentle and mindful breathing techniques. Talk your client through long, slow, full breaths by counting and having her place her hands on her ribs to feel what is happening. Use words associated with relaxation such as: let go, relax, melt, etc.

Stretching – Teach full inhalations with a hold. This can generate a wonderful stretch. Add a gentle torso rotation, side bend, flexion or extension motion to the breath. If there is any discomfort with this or any stretch during exercise, stop and consider referring to a physician.

Body Awareness – In order to become more aware of each of the 18 breathing muscles to optimally increase strength, a client might need you to show them pictures of each muscle in an anatomy book or help them locate the muscle of themselves. This is something you can learn how to facilitate in NFPT's Anatomy Fundamentals Course.

Breath training can be added into a workout routine so it doesn't take up too much extra time. You can focus on breathing at the beginning or end of a session for a few minutes or guide breathing during the exercises you are already teaching. Breathing seems natural and automatic but can benefit from some attention just like the other components of human movement.

Reference

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Should Clients with Exercise Induced Asthma Exercise in the Cold?

If we train our bodies to the point of failure, or just shy of that threshold, we typically find ourselves more than a bit winded. The feeling can be exhilarating! However, for clients with exercise-induced asthma, such a scenario tells a different story.

Making The Distinction

13% of our country's population suffer from exercise-induced asthma, commonly referred to as EIA. "Exercise-induced asthma occurs in almost every individual diagnosed with chronic asthma, but there is a separate group of people who have what we call exercise-induced bronchospasm," says Timothy J. Craig, MD, chair of the American Academy of Asthma, Allergy and Immunology's Sports Medicine Committee.

For the average asthma sufferer, triggers such as a high pollen or mold count in the air set off the cascade of chest tightness and wheezing. This is due to many factors, but inflammation of the lung tissue is almost universally present. However, for individuals with EIA, as the name implies, asthma attacks come solely when participating in strenuous exercise.

Cold Concerns

At this time of year, as the mercury dips lower and lower, outdoor fitness and recreation activities can pose a significant challenge for our clients with EIA. A 2014 study conducted in China found that hospital admissions for asthma increased dramatically throughout the colder months.

In northern Finland, where temperatures dip into what we might call a frigid zone, as many as 82% of asthmatics experienced shortness of breath while trying to complete their typical outdoor exercises. Studies of winter Olympic athletes demonstrated that EIA affects up to 50% of these competitors, the highest rates correlating to cross-country skiers and competitive ski mountaineers.

If a client has been newly diagnosed with this condition, he may not be familiar with the proper precautions to take prior to running in cold weather. There are many ideas we can present to clients who do not wish to curtail their outdoor workouts but also strive to maximize the limits of their respiratory systems. Here, a bit of physiology goes a long way.

The Air Transport

The bitterly cold air inhaled by an outdoor winter runner reaches the lungs at a much warmer temperature, having been warmed to body temperature as it approaches the lower half of the trachea. From there, the inhaled breath gets 100% humidified prior to actually hitting the lungs. Still, those with EIA must take extra precautions. The combination of cold air and aerobic activity such as running can create a "perfect storm". Such a scenario not only exacerbates general asthma symptoms but also has the potential of igniting severe EIA symptoms.

Winter conditions can set off bronchial spasms, blocking incoming air from fully entering the lungs. Wheezing, coughing, a tight feeling in the chest, or shortness of breath soon follow (within 5-20 minutes after the start of physical exertion) and can turn into a serious asthma attack if not addressed promptly.

If you are joining your client on his outdoor winter workout, be on the lookout for these symptoms and be prepared to redirect the client, slowing your running pace and changing to walking as soon as possible. If the client's symptoms do not subside upon reduction of intensity or total completion of the exercise, it may be wise to consult a physician. If he uses a rescue inhaler, this would be the time to suggest he use it.

How Trainers Can Help

We do not often associate very low temperatures with sweating, but this process occurs more than we realize. Reminding avid outdoor athletes to remain well-hydrated can stave off that undesirable burning sensation felt in the trachea during a brisk winter run.

It may seem like common knowledge for healthy athletes, but breathing is a very important component of any exercise, and even more so for those living with EIA. Proper breathing techniques exist and can be practiced by athletes with already compromised respiratory systems., to help ready them for extreme outdoor workouts. Training their bodies and minds to focus on slower, deeper breaths as opposed to taking shallow and quick breaths.

While inhaling through the nose, cold air must traverse a longer route prior to reaching the lungs. This air is therefore much warmer and better filtered than experienced by mouth breathers. This suggestion works well for outdoor runners who plan on relatively short excursions at a moderate pace.

However, as the intensity/duration/distance of the run increases, a nose breather will soon experience shortness of breath; it is not possible to provide the body with sufficient oxygen solely through average nose inhalations. This can pose a serious threat for those with EIA.

According to asthma specialist Dr. Rachel Taliercio, a good rule of thumb is to avoid outdoor exercise when temperatures dip into the single digits. When the mercury rises to the teens and above, a light warm-up is essential before breaking into an all-out run. At these temperatures, many runners find that covering both the mouth and nose with a light scarf helps the breathing process.

Having prudent, easy-to-follow suggestions for EIA clients who enjoy cold-weather workouts can empower them greatly, rather than simply regaling them with a list of potential pitfalls. Be smart, be safe, be successful!

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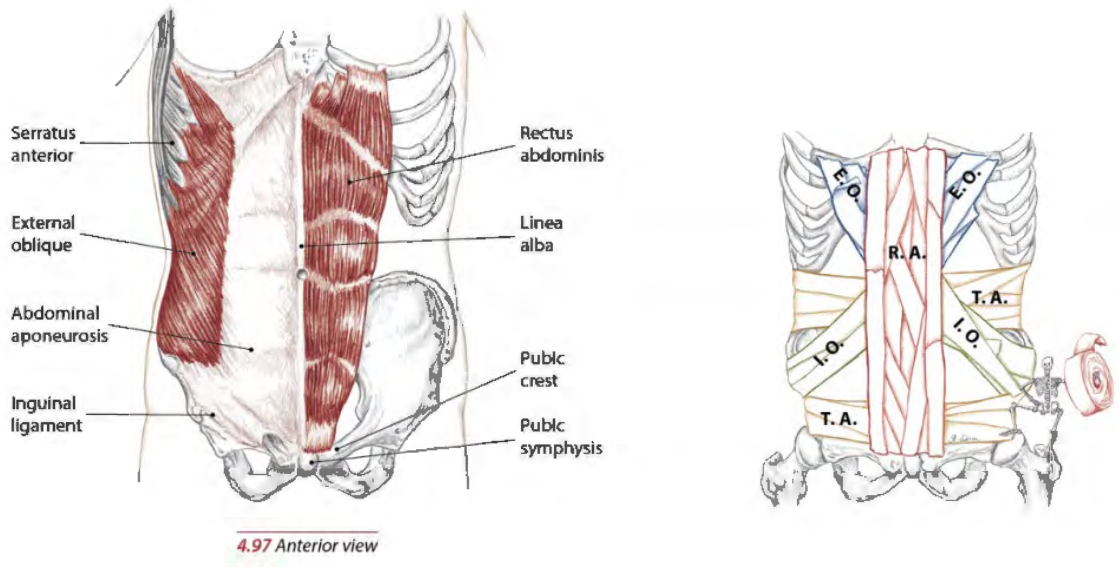
Understanding and Training Core Abdominal Muscles

Training core abdominal muscles is sometimes a straightforward goal and other times – injuries and discomfort arise when crunching, planking and rotating the spine. Studying core anatomy closely helps you design exercises and make alterations accordingly when helping clients strengthen their core.

The term “core” is often used synonymously with abdominals. It is important to note that the core of the trunk includes other muscles like quadratus lumborum, latissimus dorsi, pyramidalis, multifidus, iliocostalis, longissimus, and serratus posterior. AND….Some people believe the pelvis is the core of the body.

In this article, we will explore the basics of the four main abdominal muscles as a part of the larger core.



4.97 Anterior view

Four Core Abdominal Muscles

Above you can see how the core abdominal muscles criss-cross one another creating a blanket of stability around the torso. Below is a brief description of each core abdominal muscle that can be used for basic review and understanding. Click on each highlighted name below to be re-directed to an article that addresses the specifics of each muscle.

Rectus Abdominus

The rectus abdominus (RA) is often described as the six pack muscle. It is easily identified on an individual with a defined muscular tone. RA attaches superior to inferior on the anterior trunk. Its main role is in trunk and spine flexion, although it assists with side bending and rotation.
It is important to counteract RA flexion exercises with properly directed spinal extension, sidebend, and rotation.

Transverse Abdominus

The transverse abdominus (TVA) is like a corset or belt that wraps around the lower half of the spine. It hugs the lumbar vertebrae and stabilizes the lower trunk. Exercising the TVA often requires more skill and awareness than working the other muscles. Breathing is an important component to consider when strengthening any abdominal muscle, but especially the TVA.

External and Internal Oblique

The external and internal oblique cross over one another on the lateral anterior abdomen. They are often grouped together as one muscle called "obliques". These two muscles are interesting mechanically because they both flex and side bend the spine. However, they each rotate the spine in an opposite direction. This means the right external oblique and left internal oblique contract together in spine rotation.

Unified Movement of the Core Abdominal Muscles

The core abdominal muscles flex, side bend, rotate, and compress the spine. Even though certain abdominal exercises are meant to target one or the other, these muscles truly work as a unit – all performing all three actions. The RA might be better at flexion then external oblique, but this is unique to the individual.

It may be impossible to isolate one of the four abdominal muscles from the others. Rather than trying to train each muscle individually, seek to train the various movements and combinations of movements when strengthening the core.

For example, exercise the anterior trunk and core by:
Flexing only
Flexing and side bending
Flexing and rotating
Flexing, side bending and rotating
Side bending and rotating
Side bending only
Rotating only

Include a variety of isometric holds at various lengths of time, various combinations of repetitions. Tweaking the training tempo changes results. Performing both large powerful movements with the core and smaller more refined exercises is essential to maintain balance and stability within the system.

Training the Core Abdominal Muscles

There are hundreds of exercises that exercise the core abdominals. You can train them by crunching and flexing the spine or without. You can train them with rotation or without. You can train them by planking or not.

Many upper and lower body strengthening exercises work the core abdominals by nature. So does cardio. You can train the core abdominals with isometric exercise, or by using repetitions. Once again, variety in programming is the key to success.

How you train the core abdominal muscles depends on the client's goals, health history, and current function. Training this area is a common ambition of fitness enthusiasts, but can lead to injury when not approached properly.

Examining each muscle, its attachments, function, specific needs for training and limitations is essential for optimal training and injury prevention.

Studying anatomy and the core abdominal muscles as a region can help you cue proper form and program for your clients. Advanced knowledge in anatomy sets you apart from other trainers and helps you get results more effectively.

"Low T": Not Solely a Male Problem

Women, not just men, can suffer ill effects from depressed testosterone levels, also known as "Low T" syndrome. Gender equality has long been at the epicenter of many societal debates, it now appears as if the human body itself is sending us a message in regard to hormone regulation.

Mother Nature's Gender Bias

The hormone testosterone belongs to a group of chemicals known as androgens. Women generally have about fifteen-to-twentyfold lower concentrations of circulating testosterone than men. Regardless of gender, however, testosterone plays a key role in the development and maintenance of muscle mass, strength, energy levels, body composition, red blood cell production, and bone density. For women, in particular, the maintenance of bone density and muscle mass is important, as both of these tend to deteriorate with age.

Mediating Menopause

Testosterone levels will naturally wane as a woman ages; upon reaching menopause, the ovaries cease producing the formerly higher levels of hormones which have helped the female body maintain healthy sexual function. This holds true for both testosterone and estrogen. During this period of life, many females choose *hormone replacement therapy* (HRT), to ease bothersome menopausal side effects.

Unfortunately, taking oral estrogen regularly can actually lower a female's already depressed testosterone levels. When circulating blood levels dip too low, many females experience undesirable symptoms, such as sluggishness, muscle weakness, weight gain and overall fatigue.

The Science Speaks for Itself

While it is commonly accepted that women begin to gain body fat 10 years before they experience menopause and that many women gain weight when taking birth control pills, doctors often overlook the role that testosterone can play in helping to ameliorate this situation. In truth, doctors and researchers still do not fully understand how low testosterone levels affect women, or how best to treat the deficiency. This is likely because many physicians are uninformed about the use of testosterone replacement therapy in women.

Recent scientific studies, such as one reported in the *Journal of Clinical Endocrinology and Metabolism*, have shown that when given low doses of synthetic analogues of testosterone (nandrolone), obese women lost more body fat and subcutaneous abdominal fat, and gained more muscle mass, than those females who were given a placebo. The study participants followed a low-calorie diet but did not change their exercise habits; after nine months, those women taking nandrolone had lost twice the body fat and gained six pounds of lean muscle mass compared to women in the placebo group.

Another study conducted by the *North American Menopause Society* tested the effects of supplemental testosterone on sexual function, body composition, muscle performance, and physical performance. The 71 subjects involved in this research study were post-menopausal

women who had previously undergone a hysterectomy and had circulating testosterone levels less than 31 ng/dL or 3.5 pg/mL.

These women received standardized transdermal estradiol regimen during the twelve-week study, and randomly received weekly intramuscular injections of either a placebo or testosterone. Results demonstrated that those women who received testosterone showed significant strides in lean mass, chest-press power, and loaded stair-climber power. In addition, the rate of adverse events remained very low.

Too Much of a Good Thing

Overcompensating with excess testosterone supplementation may result in unwanted side effects such as acne, deepening of the voice, growth of facial and chest hair, lower HDL ("good") cholesterol levels, and male-pattern baldness.

There is also some concern that testosterone therapy may contribute to the development of breast cancer and heart disease, although this has not been conclusively proven. A large study of a new testosterone gel for women is currently evaluating these risks.

A Drug-Free Solution

What might we suggest for clients seeking to maximize their potential without resorting to supplemental hormones? According to Jade Teta, ND, an integrative physician and fitness coach from North Carolina, "Weight training is the only activity that creates hormonal changes that help both men and women burn fat while maintaining or gaining muscle."

Indeed, an appropriate strength training regimen has been shown to stimulate production of sex hormones and help rebalance them for both genders. It is notable however that strength cycles that continue for eight weeks or longer seem to be the ideal impetus for endocrine adaptation for increased testosterone levels.

While it extends past a personal trainer's scope of practice to assess hormone levels in clients, suggesting their medical professionals monitor levels can help establish a starting point. As clients progress through their strength cycles, elevations in testosterone should become evident in the second or third phases of training.

Proper Exercise Selection

Several of the most rudimentary strength movements have the potential for increasing testosterone levels:

Squat– Every variation of the squat engages several large muscles simultaneously.
Leg Press – If clients are unaccustomed to using machines as part of their workouts, it might serve them well to incorporate the leg press, which hits the lower body somewhat differently than a squat
Deadlift– This exercise is another compound movement that recruits the larger muscles of the lower body.

For optimal results, strive for program designs that incorporate strength training *and* cardiovascular exercise (both high-intensity intervals such as sprinting as well as steady-state cardio). Peppering in plyometrics also will boost testosterone production.

For women, in particular, programming is the key to producing the best physiological results. Ineffective protocols can undermine hormonal responses in the female body. Educate clients about the effects of excessive cardiovascular exercise. Any form of overtraining can lower testosterone along with many other metabolic hormones.

Life Is A Balancing Act

Hormone supplementation works wonders for many athletes, both male and female. Mitigating "Low T" can help propel clients into the next level of training and refinement of body composition, including our female athletes. However, if a non-medicinal approach is preferred, a well-designed strength training regimen has the potential to keep hormonal levels well-balanced. As Ms. Teta reminds us, such workouts can "produce the changes and the look of a healthy, fit physique."

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Are Sports Drinks Necessary for Fitness Clients?

Sports drinks are popular training aides, but they may not be the best form of hydration for general recreational activities. Why do so many individuals think these drinks are the best option? Mostly, smart marketing and savvy promotional efforts by the manufacturers increase the appeal (Orru et al., 2018).

Whether to drink water or sports drinks before, during or after exercise often depends on the type, duration, and intensity of the activity. However, it's common for fitness clients to choose a sports drink as their go-to hydration solution.

What's in a sports drink?

Contents will vary by brand, but a sports drink typically contains a form of simple carbohydrates, potassium and sodium, and water – all necessary elements for *sustained*, *high-intensity* activity. Water hydrates; electrolytes enhance the absorption of water and glucose, and assist in maintaining blood volume; carbohydrates provide energy for activity (Orru et al., 2018). All positives. BUT there's a caveat to consumption.

When to consume a sports drink?

Activities lasting less than 60 minutes do not generally require the consumption of a sports drink as a re-hydration tool. However, research has long supported the use of sports drinks for exercise lasting *over* 60 minutes and especially among athletes.

When compared to water, sports drinks can significantly boost an athlete's endurance due to the carbohydrate concentration and electrolyte balance. During practice or competition, an athlete loses fluid (water and electrolytes) through the processes of sweating and breathing (Stachenfeld, 2014).

After prolonged exercise (2-4 hours of continuous exertion), electrolyte and carbohydrate replacement become crucial; hot weather also increases the need for electrolyte and glucose replacement. Dehydration and energy depletion will negatively impact an athlete's performance. In order to offset the impact of heavy exercise, sports drinks and/or gels are used to replenish what is lost to allow the athlete to successfully complete the event.

Another benefit of sports drinks is the wide variety of flavors available, which may entice the athlete to drink more fluids and avoid a dehydrated state.

While certain sports drinks offer many benefits to those who engage in heavy, prolonged activity, they are not always the best or healthiest choice for the recreational individual. The growing popularity, availability, and variety of sports drinks have influenced individuals to consume these products on a daily basis – even during sedentary activities. Generally, consuming sports drinks during non-active times is not cause for alarm; however, being aware of the quantity and calories being consumed is wise.

Consuming Sports Drinks Mindfully

Depending on the brand of sports drink, a normal 32-ounce beverage contains four, eight-ounce servings and has 50 calories per serving. In addition, each eight-ounce serving contains 14g of sugars and 110mg of sodium. If one were to consume the entire 32-ounce beverage, he or she could take in an excess of 200 calories, 56g of sugar, and 440mg of sodium. Now, those numbers are alarming!

If you have clients hooked on sports drinks, try using some of these tips with them to build beverage awareness.

To effectively manage portions, pour single servings (8 ounces) of the beverage into smaller cups. Mix half a serving with cold water and ice. This reduces the sugar and calories and still gives water flavor.

Consume adequate amounts of water throughout the day before enjoying a few sips of another beverage. Water is often the best hydration tool.

Help your client evaluate why consuming sports beverages is so appealing. If it is simply because water seems bland, try making your own "sports drink" by using fresh fruit to flavor water or combine part real fruit juice with cold water and green tea. Take it an extra step and blend the drink for a "slushy-like" treat.

For our fitness clients who wish to maintain a reasonable caloric intake and manage (or even lose) body weight, drinking sports beverages on a daily basis can potentially derail that goal. This is not to say that sports drinks cannot be part of a balanced diet. But in order for that to be true, we need to help our fitness clients develop awareness about the contents of the drink so that they are consuming them mindfully instead of habitually.

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Discerning Disordered Eating from Eating Disorders

Encountering a client with *disordered eating*, which can be distinct from clinical eating disorders, is highly probable at some point in the fitness professional's career. Fad diets, low caloric intake, and a general preoccupation or obsession with food and body weight is common in American culture and, more specifically, in the health and fitness industry.

When should a fitness professional step in if he or she suspects a client's original general interest in eating well has evolved into a potentially unhealthy relationship with food? And how does one distinguish between an eating disorder and *disordered eating*?

Disordered Eating

According to the Academy of Nutrition and Dietetic, *disordered eating* is a descriptive term used to describe a wide array of irregular eating behaviors and patterns that may or may not warrant a diagnosis. This is in contrast to eating disorders such as anorexia or bulimia that have narrow diagnostic criteria. Although, many individuals displaying characteristics of disordered eating may be misdiagnosed as anorexic or bulimic.

Features of eating disorders are present in an individual exhibiting disordered eating; the number of symptoms that he or she presents with isn't enough for a clinical diagnosis. The level of severity and the frequency in which those behaviors occur are also distinguishing factors. Still, those with disordered eating tendencies may develop a clinical eating disorder over time if the behaviors are not addressed.

Look out for behavior such as taking diet pills, laxatives, enemas or diuretics misuse, fasting (for weight loss, rather than autophagy), skipping meals, binging, or unbalanced eating, such as cutting out carbohydrates completely for fat loss.

EDNOS/OSFED Disorders

The Academy of Nutrition and Dietetics reminds us that, like anorexia and bulimia, *Eating Disorder Not Otherwise Specified* (EDNOS), also known as *Other Specified Feeding and Eating Disorders* (OSFED), has unique diagnostic criteria as defined by the American Psychiatric Association. Again, disordered eating behaviors may lead to this clinical diagnosis.

Diagnostic examples of these types of EDNOS/OSFED include:
Atypical anorexia nervosa (all criteria are met but the individual does not experience weight loss)
Bulimia nervosa of low frequency and/or limited duration
Binge eating disorder of low frequency and/or limited duration
Purging disorder
Night Eating Syndrome

Warning Signs of EDNOS/OSFED

Individuals dealing with a type of EDNOS/OSFED will likely display a range of emotional, behavioral, and physical signs and symptoms. This list is not exhaustive and is not intended for the fitness

professional to use as a diagnostic tool. Instead, use this information to educate yourself and thoughtfully document your observations.

Note if your client:
Experiences dramatic weight loss
Makes frequent comments about feeling "fat" despite weight loss and progress
Denies feelings of hunger
Skips meals or takes small portions of food at mealtime
Complains of lethargy
Drinks excessive amounts of water or other non-caloric beverages
Frequently diets
Shows extreme concern with body shape
Has notable mood swings
Experiences noticeable fluctuations in weight
Has difficulty concentrating
Experiences sleep issues
Complains of dizziness, stomach cramps, or other non-specific gastrointestinal concerns

Clinical Significance of EDNOS/OSFED

A study conducted by Le Grange, Swanson, Crow, and Merikangas (2012) discovered that adolescents with EDNOS/OSFED tended to "endorse comorbid psychopathology and suicidal behavior as frequently" as those adolescents clinically diagnosed with anorexia or bulimia. Further, adult participants with EDNOS/OSFED reported more plans to carry out suicidal thoughts than those adult participants with anorexia.

The National Eating Disorders Association (NEDA) notes that research examining the severity of EDNOS/OSFED conditions demonstrates that a disorder of this nature is equally as severe as other disorders.

Children hospitalized for EDNOS/OSFED experience as many clinical complications as others admitted for anorexia. Adults suffering from "atypical" anorexia and/or bulimia experience similarly high levels of eating disorder thoughts and behaviors as those diagnosed with anorexia and/or bulimia. Lastly, individuals living with EDNOS/OSFED have as much likelihood of dying from the disorder as those with anorexia or bulimia.

Getting Help for Clients

It is not possible to out-exercise poor nutritional choices; therefore, we have a duty of care to assist our clients in developing skills and tools to balance intake. That said, fitness professionals do not possess the scope of practice necessary to diagnose or counsel a client with a suspected eating disorder.

As a fitness professional, you can closely and mindfully track your clients' nutritional intake and engage in open conversations about their eating styles. In doing so, you have a unique opportunity to intervene and refer a client with a suspected issue to the appropriate professional (such as a registered dietitian or mental health expert).

10 Action Steps for Personal Trainers to Address DE:

1. Get and stay educated about eating disorders and EDNOS/OSFED
2. Emphasize the value of activity and healthy eating in terms of how it makes a client feel vs. look
3. Display "real people" in marketing materials to take the focus off of weight and image
4. Make connections with a registered dietitian and mental health professional and involve them in your professional network.
5. Use the Academy of Nutrition and Dietetics "Find an Expert" link
6. Download NEDA's Coach and Trainer Toolkit (note: this toolkit speaks more directly to coaches and athletic trainers; however, the information is useful for all fitness professionals)
7. Ask clients to submit food logs on a regular basis
8. Closely monitor changes in behavior, mood, and client complaints/comments – document these in your session notes and review them
9. If necessary, reach out to the appropriate professionals in your network (without violating client-trainer confidentiality) and ask for guidance
10. *Talk* to your client

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Medication and Exercise: Interactions and Implications

Millions of Americans currently take prescribed medications to manage various chronic conditions making it imperative for personal trainers to understand medication side effects and how they can affect a client's ability to exercise both safely and effectively.

According to data released in 2012 by the National Center for Health Statistics, 30% of adults ages 65 and older are currently taking beta blockers for heart disease; over 40% regularly rely on cholesterol-lowering medications; 15% are medicated in an effort to keep diabetes under control. It is inevitable that trainers will encounter clients living with health conditions that require maintenance drugs.

Understanding the Bounds of Beta Blockers

The therapeutic effect provided by beta-blockers tends to create an altered physiological response to exercise. The mechanism of this medication blunts the usual increases in heart rate and blood pressure that accompany higher intensity workloads.

The fact that beta-blockers attenuate the heart rate response to exercise means traditional methods for establishing target heart rate are likely to be invalid. Therefore, the most important program component for individuals taking a beta-blocker is the use of an alternative method for setting target intensity.

The rate of perceived exertion (RPE) scale is an excellent option. Likewise, because beta-blockers can mask the usual symptoms of hypoglycemia in individuals with diabetes, it is incumbent upon trainers to strongly encourage these clients to regularly check blood glucose values prior to beginning a workout session to ensure levels are in a safe range.

Diabetic clients may carry portable glucometers with them at the gym, checking blood sugar levels during and after training. These periodic readings can indicate how the client's system is responding to the volume and intensity of the exercise program. Once you both get a feel for how much blood glucose values fluctuate depending on the format of the session, monitoring may not be required quite as often.

Paying Attention to Pain Management

Muscle relaxers are another commonly prescribed class of medications. Many individuals rely heavily upon these drugs to make conditions such as fibromyalgia and rheumatoid arthritis more manageable. Understanding how challenging it is for these clients to even attempt exercise while living with chronic pain is key when designing training programs.

While most of the medications in this category are highly effective for pain, muscle relaxers come with potentially serious side effects. Blurry vision, "brain fog", and a very dry mouth are often reported. If a client seems more dehydrated than usual while exercising, he may find it challenging to push himself to the level of your expectations. Rather than allowing him to leave the gym feeling inadequate, knowledge of this potential pitfall can enable you to make time for frequent hydration breaks during the hour session.

Blurred vision can hamper coordination, an important consideration when performing lateral movement patterns or lifting weights. Periodically checking in with the client to assess his comfort level with the workout design allows the trainer to make any necessary on-the-spot alterations.

Hormones and Energy

Female clients who use birth control pills or hormone replacement therapy may be unaware of hidden side effects that interfere with the body's response to exercise. Ongoing use of female hormones often causes a drop in blood levels of B vitamins. This, in turn, has a direct impact on the body's liver function, energy systems, and lactate production, all of which serve a vital role in exercise performance and recovery. While many women may not disclose such information in their new- client assessment, lower energy levels than typically expected might be a red warning flag to decrease intensity or volume.

Cholesterol Conundrum

Statins are by far the most commonly prescribed medication for treating high cholesterol. Such maintenance drugs bring on the age-old debate of which is worse, the situation being treated or the medication's side effects? Cholesterol-lowering drugs are notorious for causing muscle aches, even in the absence of a significant workout session. Clients who choose to soldier on might need reminding that they can likely experience more discomfort during a workout, plus increasingly sore muscle groups during recovery. While the client's first inclination is to ease back on his efforts in the gym, a well-informed personal trainer can create programs that are challenging enough to effect success while leaving ample time for extended cool-down stretches at the end of the hour.

Danger To The Kidneys

Occasionally, statins have been associated with *exertional rhabdomyolysis,* a condition in which damaged muscle tissue releases protein myoglobin into the bloodstream upon being broken down, posing a significant threat to kidney function.

Cases of exertional rhabdomyolysis are most often observed in deconditioned individuals who attempt to engage in high-intensity resistance training and eccentric exercises, especially when performed in a hot, humid environment such as a summer outdoor Boot Camp class.

Ways to help clients on statins avoid exertional rhabdomyolysis:
Embark upon aerobics and strength training at a reasonable pace for deconditioned clients, observing their reactions and progressing gradually and appropriately.
Talk to clients about the signs and symptoms of exertional rhabdomyolysis, most notably muscle stiffness/pain, atypical fatigue and very dark, almost brown, urine.
Schedule any summer outdoor training sessions in the early morning or later in the evening, when temperatures are coolest.

As always, encourage clients to adequately hydrate before and during training, continuing to drink fluids later in the day.

How Innocuous is Aspirin?

The commonly held yet dangerously false public perception regarding the safety of over-the-counter (OTC) medications often leads to overdosing. While we know that prescription drugs are designed to be taken exactly as prescribed, many athletes suffering sore muscles or clients with chronic pain are inclined to up the ante when medicating with acetaminophen or aspirin-containing products. This is why aspirin is the leading cause of liver toxicity in the United States.

Organ poisoning is not the only reason for concern. Excess consumption of OTC painkillers containing these ingredients may adversely affect a workout session. Aspirin interferes with the body's natural clotting process, presenting a problem in the case of an injury sustained while training or participating in contact sports.Aspirin also blocks the brain's pain signaling mechanism. In so doing, a pulled muscle or fractured bone may not register as serious enough to seek treatment; thus, continuing the workout session can take a minor injury to a significantly higher level.

Be Prepared For Balance Issues

Medications that are prescribed in the treatment of depression and anxiety often interfere with one's ability to successfully engage in strength training. While highly effective, once again we see side effects serious enough to warrant discussion. According to the CDC, the most commonly reported side effects of such drugs include dizziness, impaired judgment, fatigue, and lightheadedness. All of these can throw off a client's sense of balance, which is a necessary part of many standing exercises in a typical strength-training workout.

If a client has disclosed this aspect of his medical history, a program can be designed which makes more use of machines than free weights and excludes exercises that place him in an inverted position, either supine or prone.

Part of being a quality personal trainer is doing the work required to truly get to know your clients, *before* initiating training. By familiarizing yourself with his health history and especially any maintenance drugs he takes, you can design safe, effective workouts while keeping a careful eye on potential side effects.

Check out this link for an in-depth look at exertional rhabdomyolysis.

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Chronic Fatigue Syndrome – What Fitness Professionals Need to Know

Because the symptoms of Chronic Fatigue Syndrome, or myalgic encephalomyelitis (ME/CFS), can be exacerbated by exertion, there are key points every fitness professional can keep in mind in order to better serve clients who may be sufferers.

ME/CFS is a serious chronic condition that affects the body systemically (CDC, 2018). Individuals who suffer from this disease face extreme challenges in performing normal everyday activities. Ultimately, their quality of life diminishes as they battle a myriad of symptoms.

Over 800,000 individuals suffer from ME/CFS and about 90 percent have not been diagnosed (IOM, 2015). It's possible one or more of your fitness clients fit into this category. While it is not within the scope of practice of a fitness professional to diagnose any condition, it is our responsibility to understand special populations and the impact exercise has on certain conditions.

Symptoms of ME/CFS

Knowing what to look for and what questions to ask about potential symptoms outside of a training session is a great place to start with a client who has been diagnosed.

Even without a diagnosis, familiarizing yourself with the following symptoms may alert you to refer your client who may be suffering from ME/CFS:

- Sleep disturbances. Individuals who experience ME/CFS may not ever feel rested even after a full night of quality sleep.
- Cognitive processing and memory issues.
- Orthostatic intolerance. ME/CFS sufferers often experience dizziness, weakness, and lightheadedness that may worsen upon standing or sitting up.
- Worsening of symptoms after mental or physical activity. This is referred to as post-exertional malaise (PEM).
- A significant drop in the person's ability to perform normal activities prior to the illness lasting six months or longer.
- Extreme fatigue that can be severe, is not a result of unusually difficult activity, is not relieved by sleep or rest, and has not been lifelong.
- Muscle aches and pains.
- Tender lymph nodes.
- Digestive issues.
- Chills or night sweats.
- Headaches – new or worsening.

When working with fitness clients, monitoring long-term health is equally as important as the pre-exercise screening process. Continually check in with clients to note any gradual or alarming changes in their health status or anecdotal comments. If you suspect something gravely concerning is occurring, refer the client to his or her primary care provider for further examination.

Difficult to Diagnose

ME/CFS isn't an obvious condition and is challenging to pinpoint. Doctors must rule out a number of other potential illnesses and causes for the symptoms before a diagnosis can be reached. Consequently, achieving a diagnosis of ME/CFS can be arduous and time-consuming (ACE, 2014; CDC, 2018). To read more about the lengthy process, refer to the Institute of Medicine's report on the diagnosis process of this condition.

How Exercise Impacts ME/CFS

For those who experience ME/CFS, the symptoms aren't just obnoxious, they are crippling. Exercise doesn't seem to be a relief or treatment as was once believed. Previous information about this condition has perpetuated a misconception that exercise is a way out of the confines of ME/CFS (Science Daily, 2017). The disease itself was previously believed to be rooted psychological influences, which has since been discredited (Wessely, David, Butler, & Chalder, 1989; Science Daily, 2017).

In other words, encouraging ME/CFS patients to engage in exercise was believed to be an effective treatment. Research now tells us that is no longer the case. Here's what you need to know as a fitness professional:

- More exercise is not better nor does it lessen the impact of the disease.
- Activity can worsen the symptoms and cause Post-Exertional Malaise (PEM), thus magnifying the fatigue associated with the disease.
- Exercise should be done in conjunction with doctor's supervision
- The goal of any activity should be to improve the quality of life of the ME/CFS individual rather than being performance focused.

Because the guidelines previously associated with managing and treating ME/CFS are being updated and new research is being conducted, there are no specific "do this or don't do that rules" that help fitness professionals or patients with the condition navigate its complexity. As more research is released, this is likely to change.

For now, fitness professionals can work with an ME/CFS patient's physician to create a balanced plan that doesn't exacerbate the fatigue or worse the symptoms. Try approaching any activity with a "less is more" perspective.

Here are some ideas to try/suggest:
Restorative Yoga
Flexibility
Meditation
Light walks
Water activities

If symptoms worsen or become exaggerated, clients are encouraged to return to the most recent manageable level of physical activity tolerated.

ME/CFS is still a mysterious disease that the medical world has not yet been able to solve or cure. It's frustrating and debilitating to those who are afflicted by it. Fitness professionals have a responsibility to monitor client progress and determine when a referral is necessary. If you currently have clients suffering from a diagnosed case of ME/CFS, work closely with the client's physician in order to determine the best course of action.

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Training the Diabetic Client

The effects of diabetes may be ameliorated by a well-designed exercise program, giving personal trainers an opportunity to do more for these clients than improving their fitness. By learning how to tailor programs to meet a diabetic's needs, we can enhance quality of life and help effect changes in various health outcomes.

Diabetes is a disease that affects the body's ability to produce or use insulin, the hormone responsible for transferring glucose from the blood to the cells. In the absence of insulin, or in cases of insulin resistance, excess sugar builds up in the bloodstream, setting off a cascade of potentially life-threatening situations.

The term *Type 1 diabetes* is used to describe a condition in which one's pancreas does not produce any insulin at all. *Type 2 diabetes* occurs when insufficient insulin is released, or when one's cells are insulin resistant and therefore unable to turn food into a necessary energy source.

Exercise is Key

Studies of individuals with Type 2 diabetes indicate that only about 38% participate in regular physical activity, compared with 58 % of healthy Americans. Sheri Colberg-Ochs, Ph.D., founder of the *Diabetes Motion Academy* in Santa Barbara, California and professor emerita of Exercise Science at *Old Dominion University* in Norfolk, VA underscores the impact of exercise on the diabetic patient: engaging in regular moderate exercise can help increase the body's insulin action and keep blood sugar levels steady.

Type 2 diabetes responds to exercise on more than the level of blood glucose regulation: it can mitigate comorbid ailments often found in diabetic patients–cardiovascular conditions and obesity being the most profound. The potential to delay or even prevent the occurrence of Type 2 diabetes with exercise has been promoted by the medical community for decades. Regular workouts also afford the opportunity for improved balance among those diagnosed with Type 2 diabetes who are often considered "fall risks".

Notably, exercise has also shown to help those with Type 1 diabetes lead healthier and more productive lives. For this patient, exercise increases insulin sensitivity, meaning less is required post-workout to process carbohydrates. Less insulin required equals fewer injections and improved functionality.

How Exercise Affects Diabetes

Moderate exercise causes an elevation in heart rate and respiration. Throughout this process, muscles utilize more of the glucose circulating in the bloodstream. Over time, this can lower blood sugar levels. With consistent workouts, the body's response to insulin becomes more adept. Such benefits may last as long as 24 hours after a workout has been completed.

Two randomized trials each found that lifestyle interventions of ~150 min/week of physical activity, when coupled with calorie counting and weight loss, lowered the risk of progression from glucose resistance to Type 2 diabetes by ~58%. In addition, a cluster-randomized trial found that diet alone,

exercise alone, and a combination were equally effective in reducing this progression. Researchers hence conclude that increased physical activity and modest weight loss decrease the likelihood of increased diabetic conditions.

The Fitness Professional's Role

Before engaging in a program of activity more vigorous than brisk walking, clients with diabetes should be carefully assessed by the personal trainer, keeping in mind that diabetics live with an increased likelihood of cardiovascular disease.

Careful exercise selection is key since a significant number of diabetics have a predisposition to injury. Ailments such as severe autonomic neuropathy, severe peripheral neuropathy, and proliferative retinopathy are a few of the more common roadblocks to progress. Learning the client's age and physical activity history will help when designing a safe and effective training protocol.

It is important to inform clients that any variety of exercise is beneficial, but most individuals will stick with activities that they find enjoyable.

Here are a few suggestions to present to new or deconditioned diabetic clients:
Walking, either outdoors or indoors on a track
Participating in a dance class
Cycling, outdoors or on a stationary bike
Swimming/ water aerobics
Stretch/balance classes
Pilates, yoga or tai chi
Tennis
Aerobics/fitness class
Engaging in household/ yard chores or gardening
Resistance training with light weights or elastic bands

Dangers of Hyperglycemia

When individuals with Type 1 diabetes are deprived of sufficient insulin for 12–48 hours and have entered into a ketotic state, exercise can actually aggravate high blood sugar, or *hyperglycemia*. There is delicate balance to be monitored so it is important for the trainer to inquire about insulin injections before exercising.

Low insulin levels coupled with strenuous physical activity, promotes secretion of other hormones such as norepinephrine, epinephrine, glucagon and cortisol. Together, these substances cause the liver to release more glucose into the blood, thereby elevating blood sugar rather than promoting the desired lowering. This is particularly the case after an intense workout.

In the past, the American Diabetes Association had suggested that physical activity be avoided at fasting glucose levels >13.9 mmol/l (>250 mg/dl) and ketosis is present. Today, the position has been revised to state that, in the absence of very severe insulin deficiency, light- or moderate-intensity exercise still has the potential to decrease blood glucose.

It becomes the trainer's job to ascertain whether the client feels well, is adequately hydrated, and is not showing overt signs of ketoacidosis:
Excessive thirst
Frequent urination
Vomiting
Weakness
Shortness of breath
Fruity-smelling breath
Confusion

If the situation is deemed relatively safe enough for the client's comfort level, it is not necessary to postpone exercise based solely on hyperglycemia.

Dangers of Hypoglycemia

The risk of potentially dangerous *low* blood sugar, or *hypoglycemia*, during or after exercise is elevated in the case of insulin deficiency. If a client is insulin-dependent, physical activity may lead to severe hypoglycemia if medication dosage or carbohydrate consumption is not altered in accordance with the intensity of exercise.

Type 2 diabetics run a slightly increased risk of developing hypoglycemia during or after exercise, although not to the extent of individuals reliant on insulin treatment. Since glucose is the body's preferred energy source, a deficit of glucose renders the cells unable to function properly. For those diabetics on particular medications, even a short-term reduction in blood sugar can result in a cascade of complications. Blood sugar is considered low when it drops below 70 mg/dL. Immediate treatment for this situation will prevent more serious symptoms from developing.

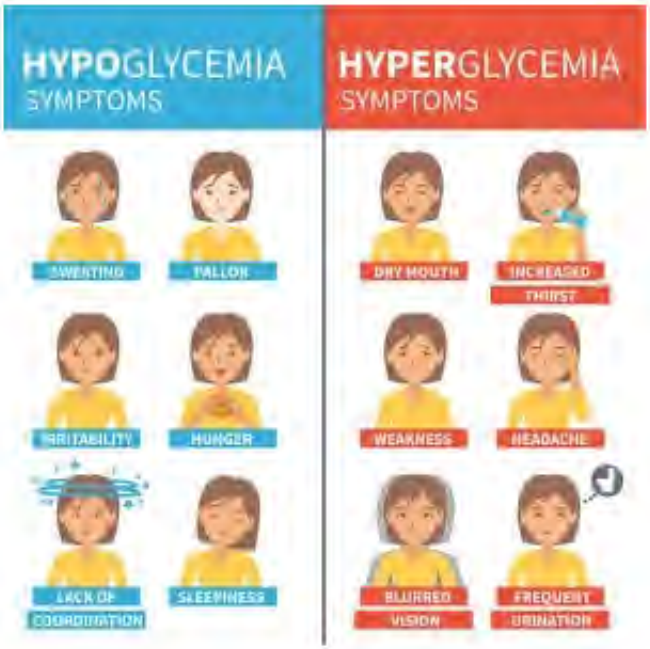
Commonly exhibited symptoms of dangerously low blood sugar include the following:
Blurry vision
Rapid heartbeat
Sudden mood changes
Sudden nervousness
Unexplained fatigue
Pale skin
Headache
Hunger
Shaking
Dizziness
Sweating
Difficulty sleeping
Skin tingling
Trouble thinking clearly or concentrating
Loss of consciousness, seizure, coma

Skipping meals, eating less than normal, or taking medication on time but eating a meal *later* than usual often lead to a precipitous drop in blood sugar levels. Something as simple as engaging in

unplanned physical activity without sufficient nutrient consumption can also cause blood sugar levels to dip below an acceptable range.

Trainers might consider sending a text or email reminding a diabetic client to assess his blood sugar one to two hours before exercise, ensuring that it is within his normal target range at the time of training. If the level is below normal, consuming a small meal or snack rich in carbohydrates prior to the gym can be all that is necessary.

If a training session has been designed to extend for an hour or more, the consumption of additional carbohydrates during the workout can help thwart any problems. Exercise gels, sports drinks, fresh fruit or granola bars can provide a quick burst of necessary glucose during exercise. Remind the client to monitor his blood sugar immediately after exercise and every 2-4 hours afterward up until bedtime. For this reason, intense physical exercise immediately prior to retiring for the night is never recommended for diabetic clients.



Impact of Aerobic Exercise on Diabetes

Aerobic training increases insulin sensitivity, lung function, immune function, and cardiac output. Moderate to high volumes of aerobic activity are associated with lower cardiovascular risks in the healthy population, and the same holds true for those living with diabetes. Type 1 diabetics typically react to aerobic training with an increase in cardiorespiratory fitness, decreased insulin resistance, improvement in lipid levels, reduction A1C, triglycerides, and blood pressure.

Research published in *Diabetes Care* suggests that aerobic activity between 30 and 90 minutes has a positive effect on blood sugar, with more benefit seen with longer exercise sessions. Start out slowly for new or deconditioned clients, with an initial goal of 10-30 minutes of moderate physical activity, 5-7 days/week. As endurance builds, workouts may be extended incrementally.

Resistance Training and Reduction in Hypoglycemia

Diabetes is an independent risk factor for low muscular strength and an accelerated decline in muscle function. The health benefits of resistance training include improvements in muscle mass, body composition, strength, mental health, bone density, blood pressure and cardiovascular health. "If you lose muscle mass, you have a lot harder time maintaining your blood sugar," Colberg-Ochs says.

While the effect of resistance exercise on glycemic control in Type 1 diabetes is not yet fully understood, it may assist in minimizing the risk of exercise-induced hypoglycemia. When designing workouts, starting with resistance exercises results in fewer reported episodes of hypoglycemia than when aerobic exercise is performed first.

Each session should include 5-10 different types of lifts involving the major muscle groups. For optimal strength gains, encourage the client to work up to 3-4 sets of 10-15 reps for each exercise. Programs for these clients may include weight training at least twice a week as part of their management plan — 3x is ideal, but always include a rest day between weight workouts. This is the time when they can engage in the other activities listed above.

Addressing Fall Risks

Similar to their healthy counterparts, flexibility and balance exercises are important for older adults with diabetes. Limited joint mobility is frequently present resulting in part from the normal aging process, but accelerated by hyperglycemia.

"I fully recommend that anyone over 40 with diabetes include balance training as part of their weekly routine, at least 2- 3 days/week," says Dr. Colberg-Ochs. "It can be as simple as practicing balancing on one leg at a time, or more complex like tai chi exercises. Lower body and core resistance exercises also double as balance training."

Balance training can reduce falls by 28%–29% as well as fostering improvements in gait, even when peripheral neuropathy is present. Stretching increases range of motion and flexibility around joints. Yoga has the potential of improving glycemic control, lipid levels, and body composition in clients with Type 2 diabetes. Tai chi training eases balance and neuropathic symptoms in adults with diabetes and neuropathy. Additional studies on this training would prove helpful.

Helpful Hints for Diabetic Clients

Regardless of the type of training planned for a personal training session, remind clients of the following:

- Wear well-fitting, comfortable shoes and cotton socks. Proper footwear can prevent blisters, which often lead to serious infections for many diabetics.
- Carry a snack or glucose tablets in case blood sugar bottoms out.
- Hydrate well before, during and after the workout.
- Always wear a diabetes ID necklace or bracelet while exercising.

While some of the challenges related to blood glucose management are universal in terms of the type of exercise involved, medication prescribed, and the presence/absence of diabetes-related

comorbidity, many will vary from person to person. Thus, as with any of our clients, physical activity and exercise recommendations should be tailored to meet the specific needs of each individual.

Our goal is to help diabetic clients understand and incorporate moderate mindful movement into their daily lives, and develop strategies to avoid the potential complications of exercise. With the client's permission, work with his medical team to determine the right program for his specific needs. Keep these professionals posted periodically on the patient's workout progress and corresponding blood glucose levels.

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What's More Important for Hypertrophy: Protein or Total Calories?

There seem to be conflicting opinions about what's most important to grow muscles: protein or caloric surplus. The answer is complex and shouldn't point to one or the other, but the correct combination of both.

The process of building muscle is referred to as *muscle protein synthesis*. According to Jessica Spendlove, Sports Dietitian and nutrition consultant, "There are two important stages in muscle protein synthesis — the breakdown phase, which occurs when you train…and then the growth or synthesis phase, which is caused by ingesting food, in particular, protein-based foods."
Muscle *strength* can be acquired simply by engaging in resistance exercises. However, weight training comprises only part of the equation. Successful *muscle mass gains* require placing the body in an energy surplus, a mindful and prudent total caloric increase.

Eating for Results

Chloe McLeod, a Sports Dietitian from Australia, suggests the following: "I usually look at around an extra 500 calories per day, so there's an excess amount of energy available for the muscles to grow." If you have been certified through the NFPT, then this is a point you already understand. McLeod further points out the need to supply these extra calories both before and after exercise. "Fueling the weight training session beforehand but also having the energy availability right after…allows the muscles to recover and growth to occur."

Spendlove talks about taking a broad view of the dietary component. "The overall process of determining how much food is required to build muscle mass generally involves comparing an individual's current eating patterns (which includes what, when and how much they are currently eating) with their current training regime, and then looking at what is happening with their body mass and composition."

The key macronutrient involved in muscle growth is protein. If calories are not being restricted, scientists believe that serious bodybuilders should aim for 1.2-2.0 g protein per kg of body weight (or .8 to 1 gram/lb of body weight) per day.

Clarifying Calories

When debating the importance of protein intake versus overall calorie consumption for building lean muscle tissue, most professionals advise prioritizing calories first and protein second. While both adequate protein and calories are vital in order to *maximize* muscle hypertrophy, it may still be possible to *build* muscle with adequate calories and somewhat lower protein intake than recommended *compared* to meal plans favoring higher protein consumption but fewer calories. Calories are the body's primary source of energy. Through evolution, the human body has become adept at avoiding death during a famine or caloric scarcity. In order to remain functional in such situations, the body lowers its metabolic rate, thereby utilizing fewer calories to sustain itself. Over time, the body will begin to shrink, further lessening the caloric demand necessary for survival.

Many bodybuilders maintain that protein intake is more important than total calories. In the presence of adequate protein but reduced calories, most individuals will lose weight, but the resulting loss comes from fat tissue, while muscle mass is spared. As time goes on, a calorie-restricted diet will only net mediocre hypertrophy gains, since both energy and recovery material will be lacking. Once the body attains a certain level of extreme leanness, a caloric deficit will render it virtually impossible to build additional muscle. In the absence of sufficient fats, the body must prioritize life functions over hypertrophy.

Eating By The Clock

The *timing* of protein ingestion is also key in cultivating hypertrophy, as well as the type of protein consumed. In general, protein supplementation pre- and post-workout increases physical performance, strength, hypertrophy and also facilitates recovery.

Recent research indicates that consuming a generous serving of protein immediately before bedtime may yield significant increases in strength and muscular hypertrophy. Bodies are unique, both in terms of resistance training protocols and metabolism, and therefore individual protein needs will differ. However, in anticipation of a heavy strength training morning (such as working quads or other large muscle groups), such protein and complex carbohydrate needs overnight are significant, in order to create ample glycogen stores/recovery material.

In an attempt to further clarify nutrient timing, researchers compared three different protein dosing scenarios in an effort to determine which regimen resulted in the maximum sustained muscle protein synthesis, or MPS. Each protocol called for a total consumption of 80 g of protein per day. The options were 20 grams of protein every 3 hours for 12 hours, 10 grams of protein every 1.5 hours for 12 hours, or 40 grams of protein every 6 hours for 12 hours.
The 20-gram dose every 3 hours was shown to yield the best results. This is exactly in line with a typical bodybuilder plan of 4 meals equally spaced throughout the day. Of course, the addition of significant resistance training alongside such a protein dosing protocol will accelerate the accompanying gains in lean muscle tissue.

Consider the Building Blocks of Protein

Specific mass gains differ based upon one's choice of protein type. Studies have demonstrated that the ingestion of fat-free milk post-workout is highly effective at promoting lean body mass gains, strength, and a reduction in overall body fat.

Specifically, the leucine content of a protein source has a large impact on protein synthesis. Consumption of 3–4 g of leucine following an intense weightlifting session promotes maximum protein synthesis. A combination of a fast-acting simple carbohydrate source, such as glucose in the form of honey or fresh fruit, should ideally be consumed in tandem with the protein, as leucine cannot modulate protein synthesis as effectively without a slight insulin spike.

To facilitate an increase in muscle mass without the addition of pure fat mass, men typically aim for a caloric surplus of 500 calories/day; 300 extra calories/day is suggested for women. Increasing intake by dividing the calories over three meals is more achievable than adding an extra meal. This

can be achieved by adding an extra egg at breakfast, 3 ounces of chicken at the midday meal, and ¼ cup of mixed nuts with ½ cup of 2% cottage cheese as a snack.

By experimenting with food swaps, most individuals eventually settle upon a routine that easily and comfortably affords them the calories necessary for muscle growth.

Consuming Cautiously

For every bit of good news, medical research also provides the downsides, and protein consumption is no exception. Dr. Gail Butterfield, Director of Nutrition Studies at the Palo Alto Veterans' Administration Medical Center, says consuming more than 30% of the day's total calories from protein could have deleterious effects.

A diet containing too much protein, especially while *not* increasing intensity of exercise, may place other bodily systems under stress. In addition, a 1992 study published in the Journal of the American Geriatrics Society asserts that this practice will have an undesirable aesthetic outcome as well: too much protein will accumulate equal amounts of muscle mass *and* fat, not ideal for the professional athlete.

The assumption that a majority of the protein we consume is immediately available to the muscle tissues might be slightly misguided. A more accurate scenario is rooted in the often-overlooked science behind macronutrient breakdown.

For every 20 grams of protein ingested during a meal, the cells of the small intestine and the liver (among the most metabolically active tissues in the body) consume about 10 grams of that ingested dose. Of the remaining available 10 grams, approximately 8 grams will be used by other tissues for energy, to produce urea, and for synthesis of neurotransmitters and enzymes.

Under normal conditions, only about 2 grams of what remains is available for muscle protein synthesis. While this seems like a paltry amount, consider this: if only 1 gram of protein per meal gets utilized for muscle synthesis, and an athlete consumes four meals per day, the total adds up to a yearly net gain of just over three pounds. This breakdown clearly illustrates why a gain of 4-5 lbs. of muscle mass per year represents tremendous growth for drug- free bodybuilders.

Whether your client base includes avid strength trainers, marathon runners, or just average exercisers, a balanced diet rich in fruits, vegetables, whole grains, lean meats, fish, and complex carbohydrates is what most sports nutritionists recommend. While respecting the boundaries of a personal trainer's scope of practice, you can always feel comfortable extolling the virtues of a clean, healthy meal plan.

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Fitness Fights Age-Related Cognitive Decline

Exercise is known to have numerous neuroprotective and cognitive benefits, affecting domains from memory to learning processes. In a society where one new case of age-related dementia is detected every four seconds and scientists predict that over 115 million individuals worldwide will suffer from some form of cognitive decline in 30 years, fitness professionals are in a unique position to help promote exercise as a preventive tool for dementia.

From Fitness To Function

Scientists have recently honed in on *exercise-mediated hippocampal neurogenesis*, the process by which new neurons are generated and incorporated into hippocampal circuits. A key molecule, called brain-derived neurotrophic factor (BDNF), appears to mediate this process.

According to research study author Moses V. Chao, Ph.D. at New York University, "BDNF spurs the creation of new brain cells, helps nerve cells communicate, and strengthens brain synapses to improve reaction time, memory and decision-making."

Brain Size Matters

A joint investigation by research teams from the University of Illinois and the University of Pittsburgh measured cardiorespiratory fitness of 165 male and female adults between the ages of 59 and 81. Using magnetic resonance imaging (MRI scanning), they assessed the volume of both the left and right sides of the hippocampus along with numerous aspects of spatial reasoning. A significant correlation was revealed between a subject's level of fitness and his/her performance on spatial memory tests, as was a direct link between fitness and hippocampus size.

A deteriorating hippocampus can be blamed for the memory loss and disorientation often suffered by older adults. Researchers in Australia discovered that adults who engage in aerobic exercise exhibit a larger left portion left of the hippocampus, the area of the brain responsible for the formation of new memories as well as transferring information from short-term to long-term memory. It is interesting to note that resistance training and balance exercises did not yield the same results. Aerobic workouts increased hippocampal volume by 2%, effectively shaving 1-2 years off of typical age-related losses.

"The higher fit people have a bigger hippocampus, and the people that have more tissue in the hippocampus have a better spatial memory," said U. of I. Psychology professor Art Kramer, who led the study jointly with Pittsburgh Psychology professor Kirk Erickson. "This is really a clinically significant finding because it supports the notion that your lifestyle choices and behaviors may influence brain shrinkage in old age," Erickson said. "Basically, if you stay fit, you retain key regions of your brain involved in learning and memory."

Bonus Benefits

The direct effect aerobic exercise has on both memory and cognitive reasoning most likely arises from lowering the body's resistance to insulin, reducing inflammation and stimulating growth factors that keep brain cells healthy. Indirectly, exercise improves mood, sleep patterns, and lowers stress and anxiety, common factors that may contribute to cognitive impairment. Post-mortem

tissue analysis of fitness buffs and non-exercisers alike suggests that the hippocampus possesses the ability to generate new neurons in adulthood. However, neurogenesis seems greatly increased among those individuals who engage in regular aerobic workouts.

Weights Work Too

Although no previous research found support for resistance training to have a positive impact on the hippocampus, that doesn't mean there isn't brain benefit garnered from weight training. A study conducted in 2011 found that senior women who engaged in low rep-range resistance training (2 sets of 6-8 reps per exercise) twice a week for a year changed function in the region of the cortex associated with response inhibition (*the suppression of actions that are inappropriate in a given context and that interfere with goal-driven behavior*) when compared to controls and a group who exercised only one day a week.

The researchers also found that task performance in two areas improved with regard to response inhibition concurrently with the functional changes in the brain. This is a strong argument to include strength training along with aerobic exercise to both prevent and improve brain health, especially in seniors.

Fit For Long Life

The standard recommended 30 minutes of moderate physical activity 5 days/week, or 150 minutes/week, seems effective at holding dementia at bay. If your clients simply cannot make that happen, either due to strict time constraints or physical inabilities, encourage them to at least get started on a healthy aerobic exercise habit. Even deconditioned clients can begin with as few as 10 minutes/day, record their weekly progress, and increase workout time by 5-10 minutes/week until they reach their goal. You can function as an ally in their lifelong quest of cultivating cognitively strong "golden years".

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Symbiosis of Maximizing Size and Strength

Growing muscles and gaining strength are not necessarily achieved by the same means. Strength is the foundation of everyday acts of athleticism, as well as all fitness-related activities and technical skills. Muscle Size is often highly acclaimed and desired, especially by more advanced lifters and clients. Can trainers meet both goals simultaneously?

Software Versus Hardware

When training for strength, the general consensus is to design a program consisting of low reps and relatively heavy resistance. True low-rep strength work is considered neuromuscular. Considering the human body as a computer, strength training is about upgrading "software", the central nervous system (CNS). Strength training is about teaching the CNS to increase motor unit recruitment.

Building strength requires proper application of a few basic principles:
Specificity: choosing exercises specific to the client's goals
Overload: performing more work over time to make progress
Fatigue Management: training to maximize fitness while minimizing fatigue
Strength is about increasing force production. *Size,* however*, is* about achieving that highly-desirable "pump" and creating microscopic damage to the muscle. With proper rest and nutrition, muscle tissue can repair and grow larger: hypertrophy in a nutshell.

Unlike building strength, training for size is more physiological in nature. It involves upgrading and building the body's "hardware" (bones, connective tissues, and muscles), thereby forcing them to grow. Still, training for size increases the amount of weight one can lift while still remaining in the slightly higher rep ranges geared toward hypertrophy (muscle growth).

Tandem Training

In at least two specific ways, pursuing the duality of strength and hypertrophy is *superior* to training each of these goals independently. Strength and hypertrophy training do not detract from each other, but rather forge a symbiotic relationship over time.

A thicker muscle fiber can generate more force than a thinner fiber. Think of this as analogous to a car's engine: a racecar driver seeks the competitive edge conferred by a big engine, while ensuring that the engine fires smoothly. This is similar to how larger, more adept muscle tissue can produce greater force.

The second rationale for concurrent strength and hypertrophy training relates to fatigue specificity: the level of exhaustion or depletion generated from one type of activity/body region has a greater negative effect on subsequent *similar* activities than it has for *differing* activities.

An upper body workout aimed at maximizing strength will negatively affect a subsequent upper body maximum strength workout more than an intense lower body session. If a client engages solely in upper-body hypertrophy workouts, training frequency becomes limited by fatigue specificity. However, by teaching her the advantages of alternating upper body strength *and* upper body hypertrophy sessions, she can train more frequently and still see progress.

If your program design also incorporates lower body sessions for strength and hypertrophy, she can train even more often while continuing to demonstrate growth. Trainers can help clients optimize this by making each workout as dissimilar as possible from the one that preceded it and the one that will follow.

Time Under Tension

While these two entities are distinct, muscle mass *does* correspond to muscular strength. Conventional wisdom holds that in order to grow lean muscle tissue, one must concurrently get stronger. This is where we need to recognize the one major drawback to low-rep training: muscle-fiber stimulation, and thus growth, is correlated closely to the amount of time a muscle is under tension. Short but intense sets lasting 15 seconds or less will develop strength, but prove ineffective at encouraging muscle growth. Hypertrophy results from performing sets that last 30 seconds to a minute in duration.

This theory of time-under-tension (TUT) points to an ideal training scheme of 8-12 repetitions. A cadence of two seconds for the concentric (lifting) action and two seconds for the eccentric (lowering) part of a movement lands right in the middle of the optimum 30- second-to-a-minute range for a given set of exercise.

Why is this so important? A set lasting longer than a few seconds forces the body to rely on its glycolytic-energy system, leading to the formation of lactic acid. Although it ignites temporary soreness, lactic acid proves vital to the production of new muscle tissue. When lactic acid is present in large amounts, it induces a surge in anabolic hormone levels within the body, most notably testosterone, long considered a highly potent player in hypertrophy. If a client's goal is more muscle, this is the state for which to strive. The increased TUT leads to more muscle damage, also imperative for growth.

Creating "The Pump"

The moderate-rep range, when coupled with a challenging weight, tends to elicit the highly coveted muscle pump. Studies have demonstrated that the physiological conditions which lead to a pump can activate protein synthesis while limiting protein breakdown.

In terms of post-workout nutrition, which we know plays a key role in achieving one's goals, more of the protein consumed at mealtime goes toward muscle construction instead of being burned as energy. Fast-twitch fibers draw the biggest benefit from this phenomenon. Sets that stretch past 15 reps typically mean that the amount of weight the average client can handle is not sufficiently heavy to recruit fast-twitch type-2 muscle fibers. These fibers are where the potential for growth resides, and they respond best to loads of at least 75% of a one-rep max.

To improve muscle size, you can help a client maximize TUT on every rep:
Insist on strict form
Facilitate controlled eccentric (lowering) movements of at least three seconds but up to 10
Appeal to the body-mind connection – focus on muscles being worked, squeezing them at the peak of contraction

Variety and Periodization

Adaptation leads to training plateaus; trainers, therefore, must introduce variety into a client's training paradigm. Try cycling periods of low-rep training with high-rep workouts while paying attention to progressively increasing loads, always executed with good form.

A typical periodization plan usually consists of a few phases:
Hypertrophy, or growth, consisting of high volume (eight to 12 reps, three to five sets) and moderate resistance (50-75% of one-rep max);
Strength, which consists of moderate volume (five or six reps, three to five sets) and heavy resistance (80-88% of one-rep max);
Power, usually reserved for Olympic lifters, involves low volume (two to four reps, three to five sets) and very heavy resistance (90-95% of one-rep max) moved explosively. Strength + Speed = Power.
For the average client, the first 2 phases can usually suffice. Devote at least one month to each phase, followed by 2-3 weeks of active rest.

The Role of Stress

Countless studies have demonstrated that exercise-induced mechanical stress serves as a stimulus to muscle hypertrophy. Mechanical tension refers to heavy lifting, generating the largest muscle force possible through a full range of motion.

There is, however, some fault in the theory that the heavier one lifts, the more mechanical tension produced. A 2013 study by Pinto, et al. found that muscle activation in an isometric bench press peaked at 90% of maximal voluntary contraction, suggesting that most lifters have a "sweet spot" below the one-rep max for which mechanical effort is at its highest. Adding weight past this point fails to increase mechanical tension, and has the potential to shift it away from the desired muscles and onto more passive structures. Based on this knowledge, clients would benefit more by working at 90% of their max. More reps can be successfully achieved, thereby ensuring that all-important time under tension.

To help a client maximize mechanical tension, build strategic pauses into the workout plan, such as at the bottom position of a bench press, immediately following lift-off when executing a deadlift, and at the endpoint of a hip thrust.

Here are some suggested parameters for mechanical tension:
Sets: 3-8
Reps: 3-8 or 5-12 (depending on the muscle being targeted as well as the lifter's level of experience)
Rest Interval: 2-3 minutes

Work Backwards to Propel Forward

On a personal note, I tend to favor what experts call "the backwards workout". Instead of having a client perform 4 sets of 10 repetitions, suggest 10 sets of 4 reps. Mathematically the number of reps remains identical. However, by executing only 4 reps within each set, a much heavier weight load can be safely handled. This tends to yield a long and exhausting workout, but one that has proven to be highly effective at building both size and strength.

Remember to choose a weight that brings each set close to failure while maintaining strict form. In the final analysis, evidence indicates that training in a moderate-rep range provides a client's greatest chances of successfully cultivating muscle mass. It increases hormone response, spares protein, and provides the necessary TUT to spark muscle damage. These benefits work in unison to achieve the goal of strength as well as hypertrophy.

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Training Young Athletes: What a Fitness Professional Should Know

Coaches working with young athletes can strongly influence whether or not the child's future gets monopolized by training and competing, literally defining his or her formative years. The knowledge base of the coach, as well as his or her approach and experiences, are of utmost importance to ensure a young athlete receives the training necessary, while still preserving the purity of childhood experience.

Starting with the End in Mind

A good athlete exhibits a combination of athleticism and sport-specific skills. When parents seek out a coach to cultivate an innate talent for a chosen sport, understanding the differences between these two factors is critical. Are they looking to recruit a *skill-specific coach*–specialists in building the tools required for the child's single interest?

Alternatively, they may wish to begin with a *strength and conditioning* coach–one who excels in making an athlete faster, stronger, more flexible, etc. Often well-meaning parents want a single individual who, naturally, can optimize all of these factors for their child. However, this may be an untenable and unrealistic goal.

Budding young athletes perform best when participating in training that begins with general physical skill development. *"Physically fit"* athletes demonstrate basic levels of aerobic conditioning, coordination, mobility, flexibility and balance–a strong foundation upon which to build. By introducing these young athletes to cross-training that runs the gamut of general athleticism to highly sports-specific, young clients may develop aspects of fitness which they may not have considered relevant. This involves combining components such as balance, flexibility, speed, strength and stamina with the skills that will then propel them towards a more advanced level.
A dedicated youth coach prioritizes patience over a demanding, punitive training style. They focus rather on the positive skills the client exhibits, encourages young athletes to have fun, and teaches how to minimize the importance of winning as well as graciously accepting defeat.

When embarking upon an intensive training protocol for a new athletically-inclined client, one who may choose to engage in competitive sports for several years, coaches face many unique challenges.

Here we present some of the most critical aspects for trainers/coaches to consider before taking on a serious young athlete:

Not every top athlete ought to coach children

While many professional athletes-turned-coaches certainly have "walked the walk", they may not have encountered an opportunity, and therefore may lack the necessary skills, to train a budding athlete. Being sensitive to a developing personality may be an innate instinct, but for many who went through a "tough love" athletic beginning, he or she may be unwilling to acknowledge that their experience was not the most ideal to pass along.

Not every dedicated parent can excel at coaching children

Frequently, parents who show up to every practice and competition end up getting recruited as coaches. While proceeding with the best intentions, they often make crucial mistakes in evaluating and executing appropriate training protocols. Dedication simply cannot take the place of experience, technical drills, nutritional planning and sports psychology.

Overly-ambitious coaches often cause athlete burnout

This type of coach focuses on immediate performance, often neglecting to realize and therefore respect the age of the child. Once a young athlete shows real promise and seeks to specialize her focus (pitching versus overall baseball skills, for example; breaststroke in place of general lap-swimming), this approach is valuable; but up until that point, purely supportive, safe and respectful training paves the way for an ideal sports experience.

Manipulating the child as a vehicle for fulfilling parents' dreams

A frequently observed phenomenon involves parents pushing a child toward achieving what they themselves missed out on during their younger athletic years. When such parents find themselves "participating in the competition", young athletes feel pressured to perform, quite possibly beyond their abilities or desires. A quality coach knows how to spot this and intervene appropriately so as to avoid injury, whether physical or emotional, to his charge.

The coach demonstrates awareness of a sport's potential for harm

Over the course of childhood/pre-teen development, bodies often meet with specific challenges due to excessive training loads. Parents can keep an eye out for scoliosis, fatigue, stress fractures, and nutritional deficiencies. On an emotional level, setbacks and championship losses may lead to burnout and/depression, particularly in a driven and over-achieving young athlete. Coaches, therefore, must either have undergone training specifically geared toward addressing these issues or have a list of sports psychologists to whom they can refer the families.

The coach forges a healthy relationship between the athlete and his or her sport

The reality of competitive sports is that not every child reaches an elite level, regardless of his determination and hours of training. Armed with this truth, a quality coach must attempt to create a lifelong love of physical activity first and foremost, helping to cultivate a more realistic and wholesome outlook and habit as the child proceeds through adulthood.

The coach strives to create stable foundations upon which the child can build as he or she readies themself to advance

Sports training must be focused on managing basic tenets as a springboard for successful competition. This requires teaching technique, rules, standards of behavior, and the tactical procedures necessary to excel, while keeping in mind age-and level-appropriate motor skill development.

Safety, Health, and Biomechanics

Athletes as young as seven years old can safely embark upon a strength training routine. A well-prepared coach will indicate the importance of first consulting with the child's physician, especially if there is a familial history or current evidence of ailments such as a heart condition, high blood pressure or seizures.

Most highly sought-after gyms use specialized youth-sized strength training equipment. A trainer/coach who demonstrates proficiency at utilizing such machines, as well as the patience and knowledge required to properly teach young athletes, will always set himself apart from the masses.

Unfortunately, a majority of parents fail to take into consideration the principles of sports biomechanics as they apply to young active bodies. They simply want the child to engage in training that *looks like* his or her sport of choice. The demands of any competitive sport place considerable stressors on the body. A quality coach recognizes the need to prepare the body for such demands and eases into training and skill-building on an appropriate timeline.

Personality, Perspective, and Group Dynamics

Just as we acknowledge that no two adult clients possess the same goals/abilities, the same holds true when coaching young athletic teams. Getting to know the players, both as a collective as well as individuals, can foster a deeper understanding of how each learns/processes new tasks and skills. The process takes time, patience and trust, but is well worth the effort. Only in this manner can a true leader understand what best motivates the team, thereby allowing each athlete to reach his or her full potential.

Team-building opportunities help players bond; this, in turn, fosters an internal structure of support for each individual. Successful youth coaches/trainers find ways to promote confidence and unity, all while enabling each young person to find their "physical voice" and rise to the level of their strengths. Coaches can cultivate parents' trust by setting aside time to meet, listening with a non-judgmental ear and always pointing them in a direction best suited for the abilities of each child. The trainer who chooses the path of youth coaching can find personal fulfillment in shaping a budding athlete's competitive sports success. Attending competitions, and witnessing those moments of glory firsthand, is a lifelong win-win for both parties.

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The Impact of Hormonal Birth Control on Exercise

As fitness professionals we need to be aware of the deleterious effect hormones, that are often unknown or undiscussed, may have on a client's workout. The majority of personal trainers cultivate friendships, even a closeness, with long-standing clients. Some sessions end up with just as much talking and sharing as weight training. No matter how close we may feel to these individuals, there are often unspoken boundaries when it comes to certain topics. Birth control can fall into this category; once we fully understand the possible effects hormonal contraception can have on a woman's ability to exercise, how do we broach the topic if we suspect that impact is manifesting?

Acknowledging a Hormonal Hindrance

We already know that hormones like testosterone play a role in how we exercise, grow muscles and age. But there are more hormones at play that we typically don't think about. Progesterone is a hormone found in pregnant women as well as a multitude of birth control devices. A normal part of a woman's menstrual cycle, progesterone typically does not cause any problems. As with most generalities, though, there are exceptions to this.

A personal trainer and seasoned veteran of both aerobic and resistance training exercises shared her personal journey of discovery. She noticed serious changes in her workouts when she began using either the patch or the ring as methods of birth control. Unusual and significant fatigue seemed to overtake her while engaging in HIIT or circuit training. Her heart rate and respiration skyrocketed; while she was accustomed to experiencing an RPE of 5 or 6 during these times, she found herself closer to an RPE of 9.

In an effort to conceive, the young woman discontinued all birth control, only to find that her former level of energy instantly returned. However, within the first month of her pregnancy, the exhaustion and labored breathing commenced. After researching the phenomenon, she realized what may be responsible for these changes was progesterone. If a trainer notices any new or suspect shift in a highly conditioned client, hormonal fluctuations may be the culprit.

The Science/Action of Progesterone

During a woman's premenstrual phase, progesterone stimulates respiration through a variety of peripheral chemoreceptors. This leads to greater energy consumption by respiratory muscles that would otherwise be utilized for different muscular activities. Studies have proven how hormonal fluctuations have the potential to alter a female's airways as well as the inflammatory responses of her lungs. As hormones rise and fall during a typical cycle, new blood vessels in the lungs form and disappear, affecting the lungs' ability to take in oxygen.

Immediately following ovulation and during the premenstrual phase of the female cycle, pulse rates do tend to elevate. An uptick in circulating blood volume brought on by the thermogenic action of progesterone could be the reason for this increase.

The female hormone progesterone works as an antagonist, countering some of the effects of estrogen, another hormone of significance in a woman's cycle. In theory, one might expect endurance to be greater in the latter part of a menstrual cycle, when estrogen levels enable the body to utilize fat as an energy source while sparing carbohydrates. However, many women

experience a significant decrease in athletic performance during this time of the month. Scientists have noted that elevated levels of progesterone may actually act against the estrogen in women who are more sensitive to their bodies' subtle shifts. It is believed that this comes about due to an increase in core body temperature.

Sensitive Bodies Exhibit Powerful Reactions

Hormone-based birth control methods work in part by mimicking the effects of early pregnancy. As it happens, a surplus of progesterone is present in a woman's body during the first trimester, in order to build and sustain a thick uterine lining for the newly formed zygote. Many women experience bouts of labored breathing during these early weeks. As mentioned earlier, progesterone increases the amount of air inhaled and exhaled, which brings on this sensation.
As effectively as these birth control methods work, medical professionals often fail to inform patients of potential hazards associated with use. According to reports by Drugs.com and MedlinePlus, tachycardia, the medical term for a rapid heart rate, can occur as a serious side effect of progesterone therapy. A faster than normal heart rate has the potential of increasing the pressure of the blood as it travels through the cardiovascular system. Hypertension can produce life-threatening results, such as a stroke or heart attack. Progesterone use has also been reported to elicit a pounding sensation of the heart.

Recognizing Dangerous Symptoms

Trainers are accustomed to working with clients who suffer from hypertension, COPD, and sometimes arrhythmias. We would never hesitate to inquire about such medical conditions prior to taking on such a client. We know how to recognize potentially dangerous symptoms and take appropriate action. However, when such symptoms occur in an apparently healthy female who has disclosed that she is free of any cardiorespiratory complications, we typically would not think to consider birth control methods as the root cause.

Asthma, too, can be a hormone-related health issue. Hormones travel through the bloodstream as messengers. In proper balance, they help the body communicate and thrive. However, when hormone levels rise excessively in an otherwise healthy and fit woman, either due to early pregnancy or progesterone therapy, even well-controlled asthma can quickly turn into a medical emergency. We must be prepared to take action. If a new client reveals that she has asthma, suggest she carry her rescue inhaler with her during the workout.

While cases of cardiorespiratory challenges due to progesterone are rare, a little knowledge keeps trainers on their toes. The more we can learn about uncommon situations, the better we can deliver successful services to all of our clients.

Amending the Initial Assessment

Going forward with new clients may be an easier assessment adjustment to make. Our initial intake involves inquiring about medical history and medication. To avoid sounding invasive, you might consider adding a short blurb about how hormonal contraception containing estrogen may cause increased respiration and heart rate, and exacerbate symptoms of asthma. A yes or no answer to whether or not a female client is currently taking such hormonal birth control will then certainly be warranted.

For established clients who you may noted exhibit more labored breathing or elevated heart rate than you expect for their level conditioning, you might share with them an article cited below or verbally mention how you have recently learned of this connection between hormonal therapies and exercise. Without out-right asking if she is on birth control, you can alert her to the potential side effects that she otherwise may not have recognized.

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SELF TEST: June 2019

1. To start to adopt the barefoot training mechanics, spend about 5 minutes:
    a. Walking with your shoes on and then take shoes off and run for about 3 minutes
    b. Performing basic trigger point release in the foot
    c. Using ice to numb the arch of the foot
    d. All of the above

2. The following technique should be engaged during all barefoot movements:
    a. Short foot
    b. Relaxed foot
    c. Trigger foot
    d. Strong foot

3. The Lymphatic System has the following function:
    a. Tissue regeneration
    b. Mental concentration
    c. Fluid concentration
    d. All of the above are functions

4. The only means of returning fluids and plasma proteins back to the blood are through:
    a. Lymphatic vessels
    b. Lymphatic arteries
    c. Cardio-lymph regulators
    d. Cardiac muscles

5. Lymphedema is caused by:
    a. The use of faulty silicone implants during mastectomy with immediate reconstruction
    b. The removal or damage to axillary lymph nodes, or other lymphatic vessels, during breast cancer surgery and/or radiation treatment
    c. Chemotherapy and radiation treatments that lead to excess fluid build up which collects in the remaining lymph vessels/nodes
    d. Breast cancer

6. Research indicates that lymphedema symptoms are best lessened by:
    a. Protecting the involved arm/s/
    b. Consistent programming with Pilates and/or Yoga
    c. Exercising the arm/s/ with progressive weight training
    d. Regularly taking anti-inflammatory medications

7. Participants in a sleep:appetite study show that:
    a. When getting too much sleep, participants eat more calories and choose foods richer in carbohydrates
    b. When not getting enough sleep, participants eat more calories and choose foods richer in carbohydrates
    c. When not getting enough sleep, participants eat less calories and choose more nutrient-rich foods
    d. There is no correlation between sleep and appetite

8. When a person doesn't get enough sleep:
    a. Leptin decreases
    b. Ghrelin increases
    c. Endocannabinoids increase
    d. All of the above occur with a lack of sleep

9. Which of the following best defines 'proprioception':
    a. The ability to sense the body's position relative to space
    b. A technique used to test balance and stability
    c. A sense of imbalance and/or instability
    d. The connection of nervous system function to balance

10. Which of the following can be conditions which impair balance?
    a. Inner ear complications
    b. Circulation/Cardiac disorders
    c. Diabetes-related neuropathy
    d. All are conditions that may impair balance

11. How many total number of muscles are working when we breathe?
    a. 6
    b. 12
    c. 18
    d. 24

12. The muscles used with inhalation all attach from the _____ to another anchoring bone.
    a. sternum
    b. ribs
    c. clavicles
    d. diaphragm

13. Which of the following is NOT a Breathing Training technique:
    a. Stretching
    b. Relaxation
    c. Rapid Release
    d. Body Awareness

14. Exercise Induced Asthma (EIA) occurs when:
    a. There is a high pollen count
    b. Mold is present in the air
    c. Participating in strenuous exercise
    d. All of the above cause EIA

15. Studies show that, in colder months, hospital admissions for asthma:
    a. Increased
    b. Decreased
    c. Showed no change
    d. No correlation study has been done

16. Which of the following are muscles of the core:
    a. Rectus Abdominus, Transverse Abdominus, Obliques
    b. Multifidus, Longissimus, Serratus Posterior
    c. Rectus Abdominus, Serratus Posterior, Transverse Abdominus
    d. All of the above are muscles of the core

17. This muscle is often described as the ‘six pack muscle’ is the:
    a. Transverse Abdominus
    b. Rectus Abdominus
    c. Interior Obliques
    d. Multifidus

18. Training the core abdominal muscles:
    a. Should be incorporated depending on client's goals and abilities
    b. Should be done with the plank in every training session
    c. Should only be done if client wants a six pack
    d. Should be done with isolation to train each muscle separately

19. Regardless of gender, testosterone plays a key role in:
    a. Development of muscle mass
    b. Maintenance of energy levels
    c. Red blood cell production
    d. All of these

20. The best way to maximize hormone production potential during the aging process is:
    a. Supplemental hormones
    b. Hormone replacement therapy
    c. Consistent weight training
    d. A combination of all of these

21. When using a sports drink, it is best used during:
    a. Sustained high intensity activity
    b. Low intensity aerobic activity
    c. Any activity lasting less than 30 minutes
    d. Any activity lasting more than 30 minutes

22. Consuming sports drinks mindfully is important because:
    a. There are adverse effects when using sports drink in the absence of strenuous activity
    b. There are excess calories, sugars and sodium in sports drinks
    c. Drinking water is priority for hydration
    d. All of these are important reasons to be mindful of regularly drinking sports drinks

23. Disordered Eating is:
    a. Any irregular eating behavior and/or pattern
    b. Anorexia
    c. Bulimia
    d. All of these are examples of Disordered Eating

24. Personal Trainers should consider taking the following action/s/ to address Disordered Eating:
    a. Get educated about disordered eating, eating disorders, and their signs
    b. Display 'real people' in marketing materials
    c. Emphasize the value of activity and healthy eating in terms of how it can make your client feel vs look
    d. Use all of these as action steps to address disordered eating

25. If your client is using a beta-blocker, it is important to:
    a. No longer work with them as a client
    b. Use RPE or other alternative method to setting target intensity
    c. Recommend that they stop using them as they work your program
    d. Recommend the use of muscle relaxers in addition to current medication

26. Cholesterol-lowering drugs are notorious for causing:
    a. Elevated heart rate
    b. Dizziness
    c. Muscle aches
    d. Energy spikes

27. Research tells us that trainers who have clients with Chronic Fatigue Syndrome (CFS) should know that:
    a. More exercise lessens the impact of the disease
    b. More exercise does not lessen the impact of the disease
    c. CFS is rooted in psychological influences
    d. There is no activity that will help CFS sufferers

28. Which of the following is a suggested idea for working with a client who has CFS:
    a. Progressive weight training
    b. Obstacle courses
    c. High speed walking
    d. Water activities

29. Type I Diabetes describes a condition whereby:
    a. One's pancreas does not produce insulin at all
    b. One's pancreas produces insulin but does not release it to cells
    c. One's liver does not uptake insulin or glucose
    d. None of these describes Type I Diabetes

30. The following are exercise suggestions for trainers working with a new or deconditioned diabetic client:
    a. Walking
    b. Aerobics
    c. Light weight resistance training
    d. All of the above are good suggestions

31. A condition of high blood sugar is called _____; whereas low blood sugar is _____.
    a. Hyperglycemia; Hypoglycemia
    b. Hypoglycemia; Hyperglycemia
    c. Type I Diabetes; Type II Diabetes
    d. Type II Diabetes; Type I Diabetes

32. A symptom of Hypoglycemia is:
    a. Weakness
    b. Dry mouth
    c. Hunger
    d. Blurred vision

33. The process of building muscle is referred to as:
    a. Regenerative Hypotrophic Synthesis
    b. Muscle Protein Synthesis
    c. Muscle Hypotrophic Regeneration
    d. Protein Synthetic Breakdown

34. The key macronutrient involved in muscle growth is:
    a. Calories
    b. Carbohydrates
    c. Water
    d. Protein

35. _____ are the body's primary sources of energy:
    a. Calories
    b. Carbohydrates
    c. Water
    d. Protein

36. A diet of too much protein, when not increasing exercise, can:
    a. Add additional muscle building gains
    b. Place other bodily systems under stress
    c. Increase functionality of other bodily systems
    d. Cause decrease in appetite and atrophy

37. The process by which new neurons are generated and incorporated into hippocampal circuits is known as:
    a. Brain stimulated neuropathy
    b. Exercise induced neurogenic stimulus
    c. Exercise mediated hippocampus neurogenesis
    d. Hippocampus brainstem stimulus

38. When training for strength, the general consensus is to work a program of:
    a. Low reps and relatively high resistance
    b. High reps and relatively low resistance
    c. High reps and relatively high resistance
    d. Low reps and relatively low resistance

39. 'Hypertrophy' training is another way of saying:
    a. Strength training
    b. Size training
    c. Endurance training
    d. Weight training

40. Muscle fiber stimulation/growth is correlated closely to time under tension, as in:
    a. Shorter more intense sets of 15 seconds or less
    b. Shorter less intense sets of 15 seconds or less
    c. Longer more intense sets of 30 seconds to 1 minute
    d. Longer less intense sets of 30 seconds to 1 minute

41. Training a client in a moderate rep range that brings each set close to failure while maintaining strict form, results in:
    a. Greater success for cultivating muscle mass
    b. Increases in hormone response
    c. Provides for the most optimal time under tension results
    d. All of the above

42. The following people are great for being youth athlete coaches:
    a. Top athletes who have 'walked the walk'
    b. Dedicated parents of young athletes
    c. People who know manipulation techniques
    d. None of these type of people innately make for a good youth coach

43. A significant priority of youth coaches is to:
    a. Recognize biomechanics as they apply to youth athletes and prepare their bodies for sport-specific demands by easing into training and skill building on an appropriate timeline
    b. When a young athlete shows real promise and interest in their sport, hit it hard with an ambitious and strictly sports-specific training that exceeds their current abilities
    c. Get the parents involved in a plan for behavior modification that keeps the child engaged and working aggressively towards their goals for excelling and winning in their sport
    d. None of these are priorities and/or good coaching technique

44. This stimulates respiration leading to greater energy consumption by respiratory muscles that could/would otherwise be utilized for different muscular activities:
    a. Testosterone
    b. Peptin
    c. Progesterone
    d. Lectin

45. In order to alert your female clients to the potential side effects of birth control, you can:
    a. Do not alert her as this is not part of your scope
    b. Add a short and general blurb about the side effects
    c. Ask her if she's on birth control and list the side effects if she is
    d. Only alert her if it comes up and/or if you notice these side effects

RESCORE | MARK ✓ | TOTAL ONLY/BOTH SIDES

	T	F
1	A	B C D E
2	A	B C D E
3	A	B C D E
4	A	B C D E
5	A	B C D E
6	A	B C D E
7	A	B C D E
8	A	B C D E
9	A	B C D E
10	A	B C D E
11	A	B C D E
12	A	B C D E
13	A	B C D E
14	A	B C D E
15	A	B C D E
16	A	B C D E
17	A	B C D E
18	A	B C D E
19	A	B C D E
20	A	B C D E
21	A	B C D E
22	A	B C D E
23	A	B C D E
24	A	B C D E
25	A	B C D E

	T	F
26	A	B C D E
27	A	B C D E
28	A	B C D E
29	A	B C D E
30	A	B C D E
31	A	B C D E
32	A	B C D E
33	A	B C D E
34	A	B C D E
35	A	B C D E
36	A	B C D E
37	A	B C D E
38	A	B C D E
39	A	B C D E
40	A	B C D E
41	A	B C D E
42	A	B C D E
43	A	B C D E
44	A	B C D E
45	A	B C D E
46	A	B C D E
47	A	B C D E
48	A	B C D E
49	A	B C D E
50	A	B C D E

KEY ITEM COUNT

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

FEED THIS DIRECTION

NFPT ID

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

MARKING INSTRUCTIONS

Use a No. 2 Pencil

A ● C D E
Fill circle completely

A B C D E
Erase cleanly

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SCORE		# CORRECT
		% CORRECT
RESCORE		# CORRECT
		% CORRECT
ROSTER NUMBER		SCORE
		RESCORE

NAME _____

SUBJECT JUNE 2019 SELF-TEST

PERIOD _____ DATE _____

TEST ANSWER SHEET B
Form No. 19641

NCS Pearson

tape here

tape here

tape here

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www.nfpt.com
800.729.6378
info@nfpt.com