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CEC Self-Test Packet

Amino Acids and Muscle Tissue: What Trainers Need To Know

WIND SPRINTS:

How to Effectively Train Your Clients for Speed

Keys to Success for Coaching Body Awareness in Your Training Clients

BIANNUAL EDITION: June 2024

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

National Federation of Professional Trainers

NFPT SELF - TEST

JUNE 2024 EDITION

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VERTICAL PUSH: FUNDAMENTAL TECHNIQUE, VARIATIONS, CUEING, AND MODIFICATIONS

Vertical push exercises command attention, both in the gym and beyond, for their ability to strengthen shoulders, fortify cores, increase confidence overhead, and instill a sense of power. In this article, we take a deep dive into this classification of human movement, the nuances, and the undeniable benefits of overhead pressing exercises.

Why Vertical Push?

Training the vertical push not only increases upper body strength and performance but also has a dramatic benefit to activities of daily living. As a fundamental movement, the vertical push is an important component of many training programs but requires adequate shoulder mobility and core bracing to perform a safe and effective repetition. Here are some important characteristics of the vertical push, also known as the overhead press:

- A fundamental movement pattern with movement in the shoulder and elbow joints in the overhead position (Kroell & Mike 2017)
- Relative to the spine, loading is in line, or parallel, with the spine
- As a multi-joint exercise, "it has the potential to use a high external load due to the cooperation of many muscle groups" (Błażkiewicz & Hadamus, 2022)
- Most variations are open-kinetic chain, however, some closed-chain variations exist
- There are endless unilateral and bilateral variations in the three planes of motion (Kroell and Mike 2017)

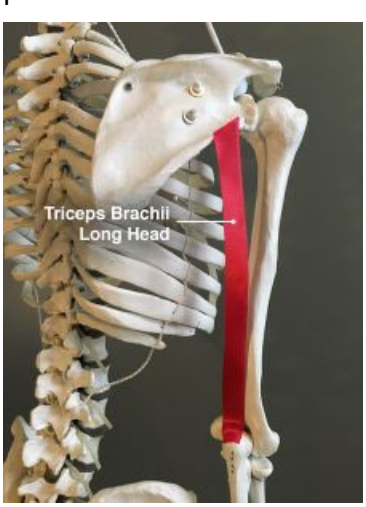
This article aims to help personal trainers understand the vertical push in order to help them make better programming decisions. This article will discuss **the vertical push as a fundamental movement pattern**, not a specific variation of the overhead press. **It is not within the scope of this article to discuss shoulder mobility requirements, assessments, warm-ups, or corrective exercises.**

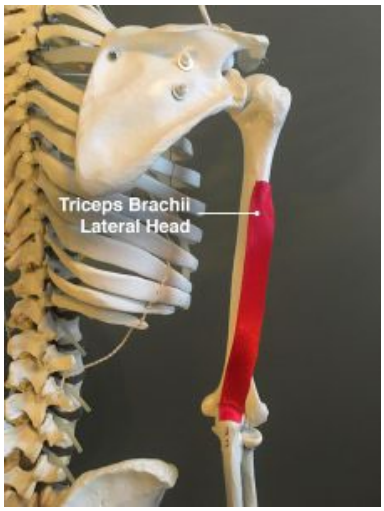
This article will however empower personal trainers to *supercharge* their impact on clients' fitness journeys by exploring key points widely applicable to various types of vertical pushes, regardless of the variation being performed. The following main points will be covered:

- Anatomy and Biomechanics
- Proper form
- Common Variations
- Cueing
- Modifications

Anatomy and Biomechanics

The muscles involved in vertical pushing movements consist of a large portion of the trunk and upper extremities, with contributions provided by the lower body during standing variations (Kroell & Mike, 2017). A*nterior* and *medial* deltoids along with the *triceps brachii* are prime movers in the movement, while the scapula and trunk muscles provide proximal stability





The first phase of the vertical push involves flexion and internal rotation of the shoulder joint. concentric work of the clavicular head of the *pectoralis major, coracobrachialis,* and *anterior deltoid* muscles. The degree of internal rotation is concentrically initiated by the *infraspinatus* and *teres minor* muscles (Escamilla et al, 2009).

Extension of the elbow joint is resultant of the concentric contraction of the *triceps* muscle and the *ulnar* muscle, the latter of which is an active stabilizer of the elbow joint. When flexion exceeds 60°, the *serratus anterior*, lower, and upper *trapezius* muscles **move the scapula externally by creating a "co-activation"** (Escamilla et al, 2009).

The shoulder girdle is active from about 80–90° of shoulder flexion, including up to 30° of rotation in clavicle joints. After exceeding 90° flexion, ***trapezius, pectoralis minor,*** and ***rhomboid muscles*** **are activated to provide necessary stabilization** of the scapula (Anderson et al, 2012).

Shoulder abduction and stabilization during the articulation at the glenohumeral joint is brought about by (Anderson et al, 2012; Kroell & Mike, 2017):

- Supraspinatus, infraspinatus, teres minor, and subscapularis (rotator cuff)
- Serratus anterior
- Lower, middle, and upper trapezius
- Levator scapulae
- Rhomboids

The thoracic spine experiences both flexion and extension throughout the range of motion of a vertical push(Kroell & Mike, 2017). Since the spine is loaded directly through vertical pushing, spinal stability is crucial. This requires bracing the trunk to generate **sufficient intra-abdominal pressure**, including (Kroell & Mike, 2017):

- Transverse abdominis
- Rectus abdominis
- External and internal oblique
- Diaphragm
- Spinal erectors

Proper Form for a Vertical Push

With the variety of vertical push exercises, it is not within the scope of this article to discuss the nuanced differences in form across different vertical pushing variations. Therefore, a bird's eye view will be taken that can be generally applied.

Pre-Ascent

Before the ascent, the trunk should be stabilized with a **co-contraction of the glutes and abdominals** to ensure the hips do not have excessive anterior pelvic tilt (Kroell & Mike, 2017). In many exercises, trunk stabilization is often achieved through overcompensation of the spinal erectors which places the lumbar spine in excessive lordosis (Ulm 2023).

Next, the elbows should be pointed somewhere between the frontal plane and the sagittal plane. **The scapular plane, or around 30 degrees of abduction, is encouraged by literature because it has been shown to increase the stability** of the humeral head in the glenoid fossa by increasing the activity of the rotator cuff muscles (Reinold et al, 2009.

Keep the scapulae depressed and retracted to ensure they have proximal stability for the muscles to create distal forces. One common error is to begin with the hands positioned too far down which internally rotates and anteriorly tilts the shoulder, causing a loss in stability.

Lastly, position the wrist over the elbow for maximum stability. Ensure that the wrists do not move medially towards one another in the frontal plane.

Vertical shoulder press

In summary, here is the setup before ascending the load:

1. Stabilize hips and spine
2. Point elbows slightly forward and down towards the ground, but not *straight* down
3. Stabilize scapulae
4. Maintain wrists over the elbows, without moving laterally or medially in the frontal plane

Ascent and Descent

The movement is initiated by the prime movers. Push the load vertically while maintaining stability in the scapulae, glenohumeral joints, and spine. Ensure *full* elbow extension and shoulder flexion at the end of the ascent, and then lower the load back to the starting position.

The path of the load or hand holding the load should be relatively straight up. During the last part of the ascent, ensure that there is no excessive thoracic extension (rib flair) or no excessive lumbar lordosis (low back arching). The more stable the spine is, the more stable the platform is to produce overhead force (McKean & Burkett, 2015).

In summary, here are the steps for the ascent and descent:

1. Push the load straight up while maintaining stability in the hips, spine, and shoulders
2. Achieve full elbow extension and shoulder flexion at the top of the movement
3. Avoid any unwanted movement, such as excessive thoracic kyphosis and lumbar lordosis.

Common Variations

Vertical push exercise variations can be done with relatively the same technique (Waller et al, 2009). The differences arise from the variations being unilateral instead of bilateral, or the hands being connected by the load, which changes the mobility and stability demands of the shoulder (Waller et al, 2009).

One study in 2022 concluded that different variations provide different stimuli to the muscles and may be used accordingly during the training routine (Coratella et al, 2022). Note, that different techniques can affect the sequence of muscle activation and the magnitude of stress forces in ligaments and tendons (Błażkiewicz & Hadamus, 2022).

[Barbell Overhead Press]

- Heaviest loading potential of all free-weight variations due to the stability provided by the nature of the bar (Błażkiewicz & Hadamus, 2022)
- The most technical of the non-power-based vertical pushing variations, but the least technical variation compared to the snatch, push press, or jerk (Kroell & Mike, 2017)

- A study in 2010 compared EMG activity between barbell overhead press and dumbbell overhead press and reported similar EMG activity in the anterior and medial deltoid despite that the dumbbell load was only ~86% of the barbell load (Kohler et al, 2010)

Dumbbell Overhead Press

- Multiple hand positions, such as a pronated grip or a neutral grip
- A greater degree of freedom of abduction in the glenohumeral joint
- Bilateral and unilateral variations
- A study in 2020 compared EMG activity between standing and sitting overhead pressing (dumbbells and barbells) and found that standing elicited higher EMG activity despite less load compared to sitting (Saeterbakken & Fimland, 2013)

Kettlebell Overhead Press (bottom-up included)

- When pressing a kettlebell, its center of mass is behind the elbow joint rather than in line
- A 2022 study found that the kettlebell overhead press resulted in slightly higher muscle activation than the dumbbell counterpart (Błażkiewicz & Hadamus, 2022)
- In the bottom-up position, there is a greater stimulus to actively control the load from flopping over to the side
- In the bottom-up position, the intense gripping increases rotator cuff recruitment while also improving grip strength

Landmine Shoulder Press

- Less overhead mobility required
- Great at cueing stability
- It resembles more closely to an incline press since the movement isn't pure overhead
- Immense customization with stance, attachments, and more
- Often used with clients with shoulder considerations

Machines or Plate-Loaded Devices

- Compared to free-weight standing exercises, "sitting in a chair will spread the forces into the back pad and seat, thus adding support to help stabilize the body" (Waller et al, 2009)
- "The added stabilizing effect of the seat may allow a person to press slightly greater loads because of the reduction in recruitment of other muscles (leg muscles) needed for stabilization in an overhead press" (Waller et al, 2009)

Cueing

Shoulders

During most exercises, we want *proximal* stability during *distal* mobility. This means that while the weight is being moved vertically by the arms, there should be stability at the attachment point of the arms, such as the scapulae and glenohumeral joint. **One common problem during the vertical push is failure to stabilize unwanted movement in the scapulae.**

This often occurs as the upper traps shrug or the shoulders internally rotate or roll forward. Another issue is the elbows flaring laterally, as a result of shoulder instability. Shoulder instability can also result from too narrow of a grip or the forearms internally rotating medially. A lack of control in the posterior and external rotator muscles of the shoulders can cause this. **Try these cues to coach your clients' shoulders:**

- "Shoulders down and back"
- "Maintain a long neck- don't let the shoulders elevate"
- "Elbows pointed forward as if they were lasers shining on an object"
- "Wrists over elbows"

Spine and Core

Everything in the body is connected to the spine. A potential issue in the spine or core area in the vertical push is ***core instability***. Excessive arching in the back (hyperlodosis) or rounding of the back (hyperkyphosis) are the most common issues. If these are not chronic issues, but instead are due to a lack of connecting with the proper musculature, **cueing the glutes and abdominals will be instrumental in reducing these issues.**

- "Keep your spine as still as possible during the exercise"
- "Lower your rib cage by contracting your abs"
- "Make your core a cylinder like this foam roller"

If these cues fail to correct the movement patterns, corrective work at the shoulder and core may be necessary.

Modifications

Sometimes making training modifications can lead to a dilemma: **does this modification continue to reinforce a deficiency?** Can the deficiency be addressed during another part of the workout so the training can continue? Does this modification's benefits outweigh its cons? These are all important decisions to consider when making a modification in your clients' training program, including in their vertical push exercises.

The goal of the modification is to remove a barrier holding the client back. Modifications can be used to either provide more of a challenge or simplify the exercise to allow for better form. Below are some modifications that can help with common needs that come up when training the vertical push.

Shoulder Instability during Vertical Push

If your client is having difficulty with instability in the core or shoulders, you can make their base of support more stable by changing their stance or supporting their core. Aim for the next most "functional" position when choosing a modified stance. If instability still presents, try the next most stable option.

Standing Position or Stance

- Split stance or single kneeling
- Sit on a bench with the feet pushing into the floor
- Bring the client down to the floor to sit or have them sit on a couple of mats or pads
- Sit on a chair

Modality

- Alternating reps, such as one arm lift at a time
- Unilateral vertical pushes
- Machine vertical pushes

Difficulty with Overhead Mobility

- Landmine press
- Incline bench set at less than 90 degrees

Increase Core Challenge

- Sit flat on the floor in different positions, such as hips at 90-90 or legs abducted, knees extended, and toes dorsiflexed
- Heavy unilateral pushes

- Use less stable loads such as sandbags, hanging weights from bands, or using an unstable bar

Conclusion

In conclusion, **vertical pushing exercises are essential components of any well-rounded fitness program**, and they should hold a special place in every personal trainer's toolbox. These movements not only help develop strong and sculpted shoulders but also contribute to overall upper body strength and stability.

From the classic standing barbell press to variations like dumbbell presses, seated presses, and even handstand push-ups, **there a myriad of options to cater to various fitness levels and goals.**

As personal trainers, we must educate our clients about the significance of vertical pushing exercises, ensuring they perform them with optimal form and technique to maximize their benefits and minimize the risk of injury. These movements not only enhance aesthetic appeal but also improve functional fitness, **making everyday activities easier and injury-free.**

So, let's continue to inspire and educate our clients, helping them build stronger, healthier, and more resilient bodies through the power of vertical pushing. **Together, we can elevate their fitness experience and lead them toward a happier, more active life.**

WIND SPRINTS: HOW TO EFFECTIVELY TRAIN PERSONAL TRAINING CLIENTS FOR SPEED

Wind sprints have secured a prominent place among today's vast array of personal training options. Consisting of a series of top-speed running spurts, followed by "recovery" walking, wind sprints offer a multitude of benefits. Changing particular variables of the exercise can help tailor it to any athletic discipline. Learn how and when to incorporate wind sprints into your clients' workout sessions.

Why Speed Work?

In sports that involve sudden changes in direction and reaction to ever-changing stimuli – or "chaos sports"– you never know what is coming. These sports include tennis, soccer, baseball, football, basketball, volleyball, and any other sport requiring rapid reaction to unpredictable stimuli, including emergency situations in real life.

These sports require what are called "open skills"; you must react in the quickest time possible in any number of ways. A variety of responses may be required. For instance, if you are returning a serve in tennis, you might have to move left or right, forward or back, react to a flat ball or spin, and react to different speeds. Speed, reaction time, and agility can make a significant difference in your performance in open-skill sports.

In contrast, "closed skill" sports are activities like a 100-meter dash that have identical rules and characteristics every time that they are performed. Closed skills are rehearsed skills with an expected response to a cue. The distance is identical every time and everyone tries to achieve the end goal the same way every time (e.g. run as quickly as possible from point A to point B). **In closed-skill-dominated sports, speed also makes a significant difference, especially with tasks requiring the athlete to accelerate quickly and efficiently.**

Speed is a learnable motor skill that can be improved with proper practice and efficient technique. There are three things about speed that you should know:

1. Speed is a basic bio-motor skill.
2. Speed is highly trainable.
3. Speed is highly improvable.

Everyone can get faster. Can everyone make the Olympics? No. Can everyone take a second or two off their 40-yard time? No. But with proper training, just about everyone can improve their 40-yard time.

Similarly, everyone can improve their ***agility***—**the ability to perform various foot movement rhythms while simultaneously demonstrating balance and body awareness.**

Factors Influential in Speed Improvements

There are a few factors that determine how much of an improvement an athlete can make in his speed and agility. First, the younger the chronological age of the athlete, the more improvements can be made. The younger person hopefully hasn't developed improper or inefficient motor patterns yet.

Also, a number of Eastern European sports scientists have identified specific ages when male and female youngsters have an optimal "window" to develop speed and other motor skills.

According to the article “Sensitive Periods in Physical Development” by Loki et al., these windows include:

- **Static strength.** Ages 13-16 for boys, and 11-13 for girls.
- **Leg power**. Ages 13-17 for boys and 10-12 for girls.
- **Arm power.** Ages 13-17 for boys and 10-13 for girls.
- **Running speed.** Ages 12-17 for boys and 10-13 for girls.

A second factor that influences athletic development is training age. The training age can be thought of as the length of time that an athlete has been training properly in the development of physical skills and basic biomotor quality enhancement. This training age also determines how much improvement an athlete can make in his speed and agility.

A 12-year-old boy with no prior formal speed training has a great deal of room for improving their speed. His training age may be low, but his chronological age is at an optimum level for speed development. Training age also influences the number and complexity of the types of exercises and drills that can be performed.

A third and related factor that influences an athlete’s ability to improve speed is their level of proficiency and training/competition history. The higher the level of the athlete, the lower the degree of potential improvement. This is due to the law of diminishing returns. Nevertheless, even a small change in the speed of the high-level athlete can be extremely valuable. If you think that the time difference between a first-place medal and third-place medal in the Olympic 100-meter sprint is often measured in hundredths of seconds, it is easy to see that even small improvements could be the difference between gold and bronze.

Most fitness trainers will find a receptive audience for speed and agility training in youth and children. These individuals have a young chronological age, typically have a young training age, and are not yet high-level athletes. Therefore, you can help them make excellent gains in speed and make a huge difference in the lives of your clients.

That in no way means you should neglect or lose hope on older clients, especially general fitness clients. Anyone who has not trained for speed in the past will most certainly see improvements if you hone in on this skill development.

Speed and agility are also influenced by other physical qualities:

- strength
- power
- flexibility
- mobility
- coordination
- reaction time

For this reason, anyone looking to work on speed and agility with a client must assess these factors first. By identifying weaknesses or potential muscle imbalances, tightness (shortness),

and restriction, or even a lack of structural strength, the speed and agility coach can target his or her training program to improve these qualities and thus prepare the athlete for potential improvement.

We have seen athletes improve their 10-yard dash times and thus their 40 yard times simply by increasing their base strength and stability levels. For instance, if you help an athlete develop the ability to put more force into the ground via enhanced strength and power in the triple joint extension action of hip, knee and ankle, you will potentially help him or her to run faster. Add to this an improved structural base level of core abdominal, low back and glute stability and you will have a more explosive, faster athlete, assuming that his or her running mechanics are sound.

Putting the Wind Sprints to Work

One excellent way to improve speed as well as challenge the overall fitness of your clients is utilizing the versatility of wind sprints.

If we consider the mechanics of a heavy lift (bench press, for example), we know it requires a short burst of powerful energy to enact the concentric portion of the move. Such a dynamic parallels what one experiences during a wind sprint: short bursts of all-out power, followed by a brief respite (the eccentric half of the bench press).

Basic Mechanics of Wind Sprints

A properly executed wind sprint finds the well-conditioned athlete reaching close to 90% of maximum effort, over a set distance or time. **The first phase of the wind sprint should reach an aerobic heart rate range (50-80% of max); the runner will reach an anaerobic level by the end of the sprint.** During recovery, the heart's bpm should return to around 50% of max heart rate before engaging in the next sprint.

**It's important to note that one should not attempt maximum intensity when beginning a sprinting routine, but instead, should step up intensity over the course of the training program.*

Sprinting can tax the body significantly more than other modes of training. As such, adequate rest intervals play a key role in the success of this type of workout. For this reason, most athletes choose to perform wind sprints on days planned for resting or strength training, as opposed to cardio days.

By definition, wind sprints do not add significant time to one's current training. As an example, one can sprint for 15 seconds, then walk for 45 seconds. After four such sets and a rest period, the athlete then sprints for 30 seconds followed by 30 seconds of walking recovery. Once again, after completing four sets and a brief rest, the last two sets in this particular protocol call for a 60-second sprint followed by an equally long recovery. This training amounts to less than 20 minutes.

Proper Warm-Up

A study published in the *International Journal of Sports Physical Therapy* described an experiment where researchers separated 25 recreational runners into four groups. Each group engaged in various stretches prior to sprinting: ballistic, dynamic, static, and a control group that sprinted without any prior stretching.

Data showed a significant and perhaps unanticipated correlation between stretching and sprint times. The control group, who did not stretch at all, demonstrated the greatest sprinting improvement. **While stretching post-exercise remains valid and essential, a few minutes of a simple walk or jog should prove sufficient as a warm-up prior to wind sprint training.**

Building Muscle and Power

As sprinting puts an athlete temporarily into an anaerobic phase, it facilitates anabolism in much the same way as weight training. However, while weight training hones in on one body part at a time, sprinting requires the combined simultaneous effort of multiple muscles, making it a favorite in terms of complete muscle training exercises.

Studies have proven that sprinting can enhance protein synthesis pathways, particularly those that facilitate protein breakdown, by as much as 230%. With proper nutrition and recovery, sprinting can actually promote lean muscle mass. Sprinting also boosts the body's production of human growth hormone and improves insulin sensitivity.

The act of wind sprinting increases the proportion of type II "fast twitch" muscle fibers in the legs; these typically align with increased muscle mass and strength in the glutes and hamstrings. For the majority of runners, power hinges on these two muscles.

To HIIT or Not To HIIT?

Nicholas Rizzo, a fitness researcher for RunRepeat, analyzed over 70 scientific studies in an effort to compare the effects of conventional high-intensity interval training (HIIT), sprint interval training (SIT), and moderate-intensity continuous training (MICT). Despite spending 60% less time exercising, SIT participants experienced a 39.6% higher reduction in body fat percentage than participants who performed conventional HIIT.

Likewise, in comparison to MICT, SIT resulted in a 91.8% higher reduction in body fat percentage while requiring 71.1% less time exercising. Perhaps this knowledge will enable trainers to safely encourage clients obsessed with HIIT training to try SIT as a complement to their current workout regimen.

Proper Rest Periods

By definition, sprinting involves alternating work and rest, but how much rest is necessary? One study compared the effects of 30-second, 60-second, and 90-second rest intervals on "Peak Power (PPO), Mean Power (MPO), "total work" in the form of calorie expenditure, performance decrement, repetitions over 95% PPO, blood lactate, and RPE. Results indicated that longer rest periods were associated with greater power and caloric output than shorter rest periods. Concurrently, RPE was inversely related to rest period, indicating that your client's perception of recovery and exertion are very important to take into account.

Also important to consider is total training time. Certainly, a higher intensity activity sustained for a longer period of time will prevent adequate recovery for muscles to perform again at optimal levels; allow for longer rest periods if the training session has been long and intense.

Variations on a Theme

To help alleviate the repetitive tedium of regularly performing wind sprints, consider the inclusion of exercises that focus on improving form. In this manner, the trainer can add a modicum of variety to the sprint.

Consider adding the following when designing a sprint-based workout protocol:

- **High Knees Sprint:** Improves the knee drive component of the leg cycle.
- **Straight Leg Striking Sprint:** Focuses on key speed mechanics during the pulling/cycling pattern of foot strike.
- **Butt Kick Sprint:** Improves speed by shortening the lever arm of the leg.
- **Power Skips Sprint:** Focuses on the pre-loading and unloading phases of the knee drive.
- **Forward Bounding Sprint:** Ideal for foot strike power production, and also forces up to 3x the average extension while accelerating.
- **Downhill Sprints:** Classified as “overspeed training”, sprinting downhill builds the ability for faster and more expedient leg cycling. Over time, as the athlete experiences a faster turnover/stride frequency, he also cultivates power and speed.

Using Wind Sprints with Clients

When you decide to become a personal trainer, expect to meet clients who seek to improve speed, agility, power, or overall strength. Wind sprints or sprint intervals can add a unique dimension to most training programs. Requiring a small-to-moderate time commitment, the payoff speaks for itself. With so much variety from which to choose, wind sprints may become a personal trainer’s new favorite tool for taking clients to the next level of athleticism.

TOP 2024 HEALTH AND FITNESS TRENDS: EMBRACING HOLISTIC WELLNESS

As we step into 2024, the landscape of health and fitness continues to evolve, driven by a growing awareness of holistic well-being and technological advancements. The fusion of ancient practices with modern innovations is reshaping how we approach our health. Let's explore some of the top 2024 health and fitness trends that are set to make waves, to share with our personal training clients.

8 Top 2024 Health and Fitness Trends

Mindful Movement

In a world buzzing with constant activity, the importance of mindful movement is gaining prominence. Fitness enthusiasts are shifting their focus from intense, high-impact workouts to more ***mindful practices like yoga, tai chi, and Pilates***. These exercises not only improve physical strength but also enhance mental clarity, promoting a balanced and centered approach to fitness.

Tech-Infused Workouts

The integration of technology into fitness routines is taking center stage in 2024. From augmented reality workouts to virtual reality fitness experiences, technology is making exercise more engaging and personalized. ***Smart equipment, wearables, and apps are providing real-time feedback, tracking progress, and customizing workouts,*** *empowering individuals to take control of their fitness journeys.*

Nutrigenomics and Personalized Nutrition

Understanding the intricate relationship between genetics and nutrition, nutrigenomics is emerging as a key player in shaping personalized dietary plans. With advancements in genetic testing, ***individuals can now receive tailored nutritional advice based on their unique genetic makeup.*** This trend is not only revolutionizing weight management but also addressing specific health concerns and optimizing overall well-being.

Sustainable Fitness

In an era marked by environmental consciousness, sustainable fitness is gaining traction. From eco-friendly workout gear to fitness facilities designed with sustainability in mind, individuals are choosing ***health and fitness-related products and services that contribute positively to both personal health and the planet.*** Plant-based diets and cruelty-free supplements are also becoming more popular, aligning with the broader movement towards sustainable living.

Recovery as a Priority

Recognizing the importance of recovery in a well-rounded fitness routine, 2024 sees a shift toward prioritizing rest and recuperation. From advanced recovery technologies such as cryotherapy and compression therapy to ancient practices like meditation and mindfulness, individuals are incorporating ***various strategies to optimize recovery, reduce stress, and prevent burnout. Rest is a right, not a reward.***

Holistic Health Apps

The digital realm is witnessing an influx of holistic health apps that cater to the mind, body, and soul. These apps go beyond traditional fitness tracking, offering features such as ***guided meditation, sleep optimization, and mental health support.*** As individuals seek comprehensive wellness solutions, these apps serve as valuable companions on their journey to holistic health.

Group Fitness Reinvented

Group fitness experiences are evolving to become more immersive and collaborative. Virtual group workouts, where participants can connect from different locations, are on the rise. These experiences foster a sense of community and accountability, making fitness more enjoyable and social even in a digital space.

Mental Health Integration

2024 marks a significant step towards recognizing the inseparable connection between physical and mental health. Fitness routines are now designed not only to sculpt the body but also to support mental well-being. Exercise is increasingly being prescribed as a complementary therapy for mental health conditions, and fitness professionals are incorporating mindfulness practices into their training programs.

As we navigate the health and fitness landscape in 2024, the emphasis on holistic well-being is clear. The convergence of ancient wisdom, cutting-edge technology, and a growing environmental consciousness is shaping a new era of wellness. Whether it's through mindful movement, personalized nutrition, or sustainable fitness practices, individuals are embracing a holistic approach that encompasses the body, mind, and spirit.

As these 2024 health and fitness trends continue to unfold, the journey toward optimal health becomes not just a physical endeavor but a transformative and enriching experience for the whole self.

COACHING BODY AWARENESS FOR PERSONAL TRAINING CLIENTS: A SECRET TO SUCCESS

What has helped me to be successful as a coach from the beginning of my 20+ years career as a personal trainer, despite inexperience or even misguided training techniques, is prioritizing and coaching body awareness. Insisting that my clients develop a higher level of body awareness increases both confidence and success.

I am often struck by how disconnected folks are from their own bodies. When I start working with someone new, I pay attention to how well they seem attuned to their body. Here is how to determine how well your clients are connected to their bodies and how to coach body awareness.

What is Body Awareness?

No deep mysteries here—**body awareness is one's ability to sense how active, passive, tense, uncomfortable, or any other number of perceptible sensations a certain part of their body is.** For personal trainers, helping clients develop body awareness can be a valuable tool for improving their exercise form, preventing injuries, and achieving their fitness goals.

Body awareness is a complex concept that encompasses a variety of different skills. Some of the key components of body awareness include:

- **Proprioception:** The ability to sense the position and movement of one's body in space.
- **Interoception:** The ability to sense the internal state of one's body, such as heart rate, breathing, and muscle tension.
- **Kinesthetic sense:** The ability to coordinate and control one's body movements.

Why is Body Awareness Important?

Body awareness can help to:

- **Improve exercise form:** When clients are aware of their body's position and movement, they can better control their form and avoid injuries.
- **Prevent injuries:** Body awareness can help clients to recognize and avoid situations that could lead to injury.
- **Improve athletic performance:** Athletes who have a high level of body awareness are often able to perform better in their sport.
- **Increase self-confidence:** Body awareness can help clients to feel more confident in their bodies and their abilities.
- **Reduce stress:** Body awareness can help to reduce stress and anxiety by helping clients to become more attuned to their bodies and their needs.

Tips for Coaching Body Awareness

There are several different ways to coach body awareness. Some of the most effective techniques include:

- **Focus on the present moment:** Encourage clients to focus on their bodies and their sensations in the present moment. This can be done through mindfulness exercises, such as body scans or meditation.
- **Pay attention to breath:** Encourage clients to pay attention to their breath, as this can help to anchor them in the present moment and increase their awareness of their bodies.
- **Use imagery:** Use imagery to help clients visualize their bodies and their movements. This can be a helpful way to improve their body awareness and control.
- **Provide feedback:** Provide clients with feedback on their body awareness and form. This feedback should be specific and constructive.
- **Use props:** Use props, such as yoga blocks or foam rollers, to help clients develop their body awareness.
- Employ **Progressive Muscle Relaxation**: Instructing your client to tense and relax specific muscles will help them to become attuned to specific muscles and more aware of which ones are contracting and which moment.
- **Be patient:** It takes time to develop body awareness. Be patient with your clients and encourage them to practice regularly.
- **Make it fun:** Find ways to make body awareness exercises fun and engaging. This will help your clients to stick with it.
- **Individualize your approach:** Tailor your approach to each client's individual needs and goals.
- **Be mindful of your language:** Use positive and encouraging language when coaching body awareness.

By coaching body awareness in your personal training sessions, you can help your clients to develop a stronger connection with their bodies, which will, in turn, improve their overall health and well-being and improve exercise outcomes.

WHAT IS THE OPTIMAL TRAINING VOLUME AND INTENSITY FOR STRENGTH GAINS? IS MORE ACTUALLY LESS?

Volume, frequency, and load all factor into a successful resistance training program. Many personal training clients ask how often they should work out, how intensely, balancing cardio and weight training…but so much more comes into play. The gaining of lean muscle mass, or hypertrophy, does not proceed along a "cookie-cutter" format for all of our clients. Similarly, no one-size-fits-all recommendation exists for an ideal number of sets to execute, regardless of the workout regimen. Below we will discuss the most recent research on the impact of training volume on muscle growth to better inform your programming options for your personal training clients.

What's the Lifter's Level of Experience?

Muscle growth requires the interplay of many factors, according to Dr. Brad Schoenfeld, head of the Human Performance Laboratory at Lehman College in the Bronx. Genetics serves a key role, as well as the specific type of training, years of experience, and the individual's unique response to the workout and overload.

A dedicated novice in the weight room may see muscle mass gains of 2-3 pounds in the first month. However, the seasoned athlete lifting for 20 years may only add 2 pounds of muscle *each year*. An average lifter who falls in between these two extremes can perhaps add 1-2 pounds a month.

Current analytical research suggests that different population groups show distinctive muscular adaptations. **For novice and intermediate male trainees, low-frequency volume does not lead to strength gains nearly as much when compared with medium or high weekly strength training.** For individuals well-versed and experienced in strength training, the use of either medium or high-frequency training programs may be sufficient to produce strength gains.

How Much Training Volume Is Too Much?

Trainers sometimes may need to temper some clients' enthusiasm. "If you train too heavy all the time, it can harm your joints and other soft tissue structures," says Schoenfeld. This can lead to injury and overtraining, both of which negatively affect one's ability to build muscle.

Recently, a research article purported that the training paradigm demonstrating the highest possible hypertrophy results came in at **50 *sets*** per muscle group. That's sets, not reps! Dr. Mike Israetel, a sports physiologist, along with sports scientist Dr. Milo Wolf, published the results of their study in the journal *Medicine & Science in Sports and Exercise.* Focusing on quadriceps training accomplished largely with squats, leg presses, and leg extensions, the study compared three training volumes:

- **Group 1 (Low Volume):** 22 sets of quad training per week, split evenly over 2 workouts
- **Group 2 (Medium Volume):** 22 sets of quad training, adding 4 sets of additional weekly training every 2 weeks, culminating in 42 sets per week (or an average of 32 sets per week for the 12-week study)

- **Group 3 (High Volume):** 22 sets of quad training, adding 6 sets of additional weekly training every 2 weeks, culminating in 52 sets per week (or an average of 38 sets per week for the 12-week study)

The results suggest that *progressively adding four to six sets per week every two weeks elicited greater lower-limb strength in resistance-trained individuals over the 12-week duration* of the study. While acknowledging a potentially small benefit for higher volume conditions, the limited and questionable accuracy of the findings indicates the need for more research.

Not every athlete can add more volume to his regular training, especially to this extent. The time commitment involved in putting such a program into motion for every single body part would undoubtedly tax the average individual. Doing so would also likely mean sacrificing adequate recovery, thereby increasing the risk of injury. Furthermore, this short-term study cannot speak to how this approach would affect one after a year of this high-volume training. One may focus on gradually increasing overall weekly training volume, making sure to work close to or at failure by the completion of all sets.

Adding Volume Judiciously

The findings of yet another well-cited study, results of which appeared in the *Journal of Sports Science, revealed* that 10 sets per muscle group per week elicited greater hypertrophy than any lesser number of sets. Scientists suggested athletes use this as a starting point, increasing weekly sets gradually as strength gains manifest.

Current evidence indicates that training twice a week promotes superior hypertrophic outcomes versus hitting the gym only once a week. To determine whether training a muscle group three times per week yields superior outcomes, more research and testing will prove useful.

Accounting For Frequency and Age

Following a systematic search of 25 studies, scientists noted no significant difference in muscular hypertrophy between higher and lower frequency on a *volume-equated basis*. Once a coach and client decide upon a certain training volume, the client can choose his weekly training frequency per muscle group based on preference/schedules/time allowances.

When considering results, we might also choose to look at more specific analyses. It seems that higher training frequencies result in greater gains in muscular strength *on multi-joint exercises in the upper body*. When considering the differences between age demographics, young individuals seem to respond more positively to greater training frequencies than their older adult athletic counterparts.

Programs Can and Should Vary

Many bodybuilders find that having some lighter load workouts—in the 15 to 20 rep range—also delivers positive hypertrophy gains. Building a week of this form of training into one's workout program can help alleviate overuse injuries, while also fostering a fuller recovery.

Brad Schoenfeld, a certified personal trainer, has risen as an expert in the areas of fitness and sports nutrition. He owns/operates the highly-touted Personal Training Center for Women in

Scarsdale, N.Y. Schoenfeld believes “there is some evidence that light loads target type I (slow-twitch) muscle fibers and that heavier loads target type II (fast-twitch)”. This would indicate a benefit to combining repetition ranges to optimize muscle response while maximizing growth.

Mixing It Up

Trainers can reassure their more skeptical lifters that many training paradigms can have places within their workouts. “Research has shown that on average, 10 sets per muscle group per week seems to be the lower threshold at which muscle growth is maximized,” says Schoenfeld. However, consider shaking things up by occasionally having a microcycle of working at 3-5 reps (near maximal loads), followed by a return to the original plan. Just as we work one muscle group several different ways to keep it growing and able to respond to new demands, training programs derive this same benefit by trying various set/rep ranges.

BALANCING THE OMEGA FATTY ACID RATIO IN THE STANDARD AMERICAN DIET

Most health and fitness professionals have come to accept the premise that more omega-3 fatty acids in the diet can help control inflammation and heart health. However, the picture gets muddied when we consider that the average American ingests more omega-6 fatty acids than omega-3s, which may spell trouble for heart health. Balancing this omega fatty acid ratio plays a key role for our personal training clients as they strive to achieve maximal health and longevity benefits from these nutritional compounds.

Health Benefits of Omega-3

It may help clients to understand just how much omega-3 fatty acids contribute, not only to overall well-being but also in terms of combatting many significant health concerns. Nutritional and/or supplemental omega-3 might help in the following ways ~

- may help treat and/or prevent depression/anxiety
- the omega-3 fatty acid known as DHA, a major structural component of the retina, may help prevent macular degeneration, a serious condition that may lead to vision impairment/ blindness.
- may help reduce symptoms of ADHD in children.
- may offer numerous benefits for individuals living with metabolic syndrome, including improvements in blood sugar levels as well as mitigating several heart disease risk factors.
- may help treat and/or prevent several autoimmune diseases, including type 1 diabetes, rheumatoid arthritis, ulcerative colitis, Crohn's disease, and psoriasis.
- omega-3 consumption seems to improve symptoms of mental disorders, as these individuals often present with lower circulating levels of omega-3 fatty acids.
- may decrease the risk of some types of cancer, including colon, prostate, and breast cancer.
- linked to a lower risk of asthma in children.
- may help reduce liver fat in people diagnosed with non-alcoholic fatty liver disease.
- DHA may improve quality and quantity of sleep

The "SAD" State of our Dietary Habits

In modern society, our Westernized Standard American Diet (SAD) reflects lower consumption of the omega-3 fatty acid *docosahexaenoic acid* DHA when compared to our traditional, hunter-gatherer ancestors. The omega-6 to omega-3 ratio of the SAD diet varies anywhere from 10:1

to 25:1, whereas the ratio of the long-ago foragers' diet brings the balance closer to 1:1 to 2:1. **This means we currently consume 10 to 25 times more omega-6 than omega-3's when our intake should more closely approximate an equal ratio.**

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

Health Hazards of an Imbalanced Omega Fatty Acid Ratio

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

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

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

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

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

Careful Nutritional Planning to Optimize Omega Fatty Acids

Research indicates that the average American consumer ingests large amounts of processed seed-derived and vegetable oils, many of which pack a significant omega-6 punch. These fats can potentially alter the health of the body's cell membranes. In addition to sidestepping these

oils for cooking or in recipes, experts stress the importance of also watching the consumption of processed foods that may contain sunflower, corn, soybean, cottonseed, and peanut oils.

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

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

The Opposing Viewpoint

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

Yet another study, the results of which appeared in the *American Journal of Clinical Medicine*, revealed that simply replacing saturated fats in one's diet with *any* polyunsaturated fats – omega-6 or omega-3 – could reduce the risk of heart disease. Does this speak of a referendum on the evils of saturated fat, or more along the lines of extolling the virtues of omega-6?

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

An article published in the journal *Circulation* back in 2009 quoted Dr. Dariush Mozaffarian, Assistant Professor of Medicine at Harvard's Brigham Women's Hospital: "Omega-6 fats are not only safe but they are also beneficial for the heart and circulation," says the coauthor.
The *American Heart Association* findings revealed that rates of heart disease lessened as consumption of omega-6 fatty acids increased.

While we can ideally try to bring these fats into a better balance, the expert opinion now states that we should accomplish this not by drastically reducing consumption of healthy omega-6 fats, but rather by incorporating additional sources of omega-3 fatty acids.

Enter Omega-9 Fatty Acids

As we can tell from the information above, research on the health benefits of omega-3 and omega-6 fatty acids leaves little doubt as to their importance in one's diet. **However, omega-9 fatty acids have recently garnered a great deal of attention due to newly emerging studies uncovering the biological benefits and risks.**

Omega-9 fats, considered “nonessential fats” since the human body *can* manufacture them, fall under the classification of *monounsaturated*, meaning they contain only a single double bond, located nine carbons from the omega end of the molecule.

Oleic acid ranks as the most common omega-9 fatty acid as well as the most ubiquitous in today’s diet. Consuming foods rich in omega-9 fatty acids in place of other types of fat may offer certain health benefits. Various animal and plant sources, including olive oil, cod oil, corn oil, and palm oil, boast high levels of oleic acid. The often-cited Mediterranean diet supports liberal use of olive oil, one of the best sources of oleic acid. In addition, oleic acid exists endogenously as a component of hormones production and cellular membranes.

Anti-inflammatory and Anti-cancer benefits

A diet rich in oleic acid offers some encouraging news for those individuals living with inflammatory-related disorders. Oleic acid modulates the immune system by activating various immune-competent cell pathways. Oleic acid likewise demonstrates the ability to inhibit cellular proliferation in several tumor cell lines, most notably the overexpression of *HER2*, a well-known oncogene involved in the development and metastasis of numerous human cancers. Within a cancer cell, oleic acid plays a significant role in the intracellular calcium-signaling pathways related to cell growth and apoptosis.

At this time, clinical studies into the anti-inflammatory and anti-cancer capabilities of omega-9 fatty acids other than oleic acid still remain scarce. Further research will hopefully provide more conclusive data about their therapeutic value in both of these widespread disorders.

Nutritionally Ubiquitous

Common nutritional sources of omega-9 fatty acids abound on our supermarket shelves. Foods rich in omega 9 fatty acids include:

- Avocados and avocado oil
- Almonds and almond oil
- Pecans
- Cashews
- Hazelnuts
- Rapeseed
- Mustard seed
- Olives
- Macadamia nuts

- *One or two tablespoons of extra virgin olive oil per day provides enough oleic acid for adults. However, this dosage should be divided up throughout the day. It is much more beneficial to the body to take olive oil like a time-released supplement rather than consuming the entire daily amount in a single dosage.*

A Note Regarding Supplementation

Many health-forward individuals opt for supplementation of omega fatty acids for a variety of reasons. Combined omega-3-6-9 supplements have gained in popularity, but they generally provide no additional benefit over taking omega-3 alone. If a client shows an interest in consuming omega-9 in supplement form, professionals suggest choosing a supplement that also contains omega-3 fatty acids.

Ultimately, the correct ratio of omega-3s, 6s, and 9s in one's diet remains the key to optimal health; overconsumption would likely trigger adverse side effects.

Avoiding Excesses

If an individual consumes too much omega-9 oil for the body to break down, which would occur in the presence of a diet rich in fats and cholesterol, a build-up of oil occurs, made worse in the absence of sufficient amounts of omega-3. Such conditions can significantly increase the risk of obesity as well as cardiovascular diseases.

Once again, we can see the importance of a proper delicate balance of omegas in the body. Not only might an excess of omega-9 fatty acids affect weight/heart health, such a situation may place one's body under an increased amount of pressure to even try to continue to function properly.

Optimal Balancing Act

As health professionals, personal trainers must always recognize the importance of clearly conveying information to our clients. The omega group of fatty acids often causes confusion. **Any** oil or fat (saturated or unsaturated) can cause health issues if over-consumed regularly, negatively impacting organs, blood sugar, and even cholesterol. Therefore, like calories in general, *balancing intake of oils and fats remains key*; they can offer great health benefits to the body if consumed correctly as a part of a varied diet.

While we may never re-establish the ideal omega fatty acid ratio that perhaps our forefathers took for granted, striving for a more ideal balance continues to prove immensely critical for our overall health. How would you guide your clients on this topic?

BLOOD CLOTS AND ANTICOAGULANTS: TRAINING CLIENTS ON BLOOD THINNERS

As personal trainers, our training renders us well-versed in the subtleties of tweaking clients' workouts to accommodate a variety of chronic health issues, of which understanding and recognizing the signs of blood clots is included. While some health situations can be easily observed, others are much more difficult to identify or recognize. As such, it is incumbent upon us to perform our "due diligence" and ascertain any potential health-related pitfalls during an initial client assessment. Blood clots and pulmonary emboli, for example, typically remain masked and silent until they become dangerous and/or a life-threatening situation presents itself. ***Unless a client reveals that they regularly take blood thinners, it often does not occur to us to ask.***

What is a Blood Clot

A blood clot is a cluster formed by platelets in blood plasma that function as little more than a seal to ease bleeding from wounds, internal or external. While we count on them to stem the tide when we incur a cut or more serious injury, unwelcome blood clots can also block blood vessels, thereby impeding or stopping the flow of blood to vital organs such as the brain, heart, or lungs. Often referred to as blood thinners, *anticoagulant* medications work by interrupting the process of blood clot formation. Classified as a group of pharmaceutical drugs that help prevent blood clots, physicians often prescribe *anticoagulants* for individuals at a higher risk of developing *clots*, or to reduce their chances of suffering strokes and/or heart attacks.

The Hazards of Thinning Blood

Patients generally take such prescribed medications daily. Though viewed as life-affirming and often lifesaving, **this course of treatment does place the user at an increased risk of heavily bleeding from what others may consider to be an incident requiring minor first aid.** Given the injury potential of many sports, trainers and coaches must remain aware not only of a client's health history, but also manage to plan careful, yet effective, workout programs for such individuals.

Falls or injuries that occur during vigorous exercise can cause serious internal bleeding for a client on an anticoagulant. Blows to the head or body can quickly proceed in a dangerous direction. Symptoms of internal bleeding include dizziness, weakness, unusual bruising, bleeding from the nose and gums, or black stool, according to the *Agency for Healthcare Research and Quality*. Understanding the potential health risks that could accompany such symptoms, personal trainers may wish to exercise caution and steer such clients away from contact sports (such as wrestling, boxing, football, hockey, and even basketball).

Safer options may include swimming, walking, jogging, and resistance-training under a watchful eye. Furthermore, some aspects of personal training program may post more risk than benefit in such cases; plyometric box jumps can be substituted with simply modified squat jumps; bodyweight TRX movements may be more safely applied with a similar cable motion. Use your best judgment to determine what exercises or activities might potentially result in some injury.

Understanding the Etiology of Prescription

Another important consideration lies in determining the reason a client takes an anticoagulant medication. This can run the gamut from preventing strokes/heart attacks/blood clots to having had a history of *deep vein thrombosis* (blood clots that form in the large veins of the limbs), *pulmonary embolus* (a clot that travels to/develops within the lungs), *atrial fibrillation* (irregular heartbeat) or after having received an artificial heart valve. In such cases, a cardiologist may have recommended that his client remain active enough to cultivate or maintain a healthy cardiovascular system.

Options for effective exercise do indeed exist, such as swapping rides on a rough-terrain mountain bike for a stationary cycle or a Spin class. If the client received medical clearance to cycle outdoors, a prudent trainer will remind him of the importance of wearing a helmet (and potentially elbow and knee support), whether or not he resides in a state requiring the use of protective headgear.

Risks Transcend the Age Range

While we may typically see such situations with our elderly and non-athletic population, these same risks have also been observed in younger, healthy, and generally athletic individuals. The lifestyle of an athlete might seem to paint "the picture of health"; yet several mechanisms do exist that could potentially place them at "higher risk" for developing a clot:

- A disparity between the two systems that balance the clotting process ~ either excessive activity of the proteins and blood platelets that form clots (the procoagulant system), or a dearth of activity within the system that dissolves blood clots as they form (the fibrinolytic system);
- Trauma to the blood vessel wall, which may occur after a bone fracture, not uncommon in athletes;
- Dehydration, which renders the blood "thicker" than usual.

Unfortunately, few studies currently investigate the influence of physical training on blood clot formation and dissolution. We know that anatomically, blood levels of the clotting protein *"factor VIII"* increase with exercise and persist during recovery. Theoretically, while this could lead to an increased risk of blood clots in athletes, data also indicate that the fibrinolytic system dissolving any potential blood clots also remains in overdrive for avid exercisers. Such arduous activity may confer some protection from developing clots. The net effect of these changes remains in dispute, pending further research and study.

Warning Signs of Blood Clots During Exercise

During a typical hour-long session with a client, the trainer may observe signs that the exercises seem successful. Sometimes, though, a client will begin to complain about some aspects of discomfort (being tired, muscles feeling sore, etc.) While fairly common, especially for a dedicated, hard-working client, keep in mind that the following can also warn of an imminent deep-vein thrombosis or pulmonary embolism:

- Swelling, usually in the leg (can also occur in the arm, especially in weight-lifters, gymnasts, rowers, etc.)
- Leg (or arm) pain or tenderness, usually described as a cramp
- Reddish or bluish skin discoloration
- Leg warm to the touch
- Sudden shortness of breath
- Stabbing chest pain that may worsen with deep breaths
- Rapid heart rate
- Fainting
- Unexplained cough, sometimes accompanied by bloody mucus

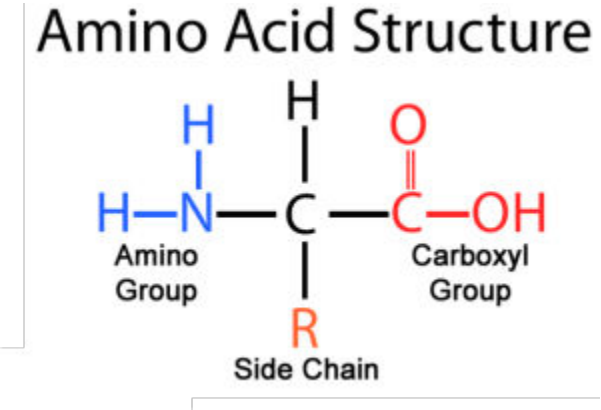
We must remain vigilant to these cues, especially in clients whom we know live with a regimen of daily anticoagulant medication. Armed with knowledge, we can feel reassured in assisting such individuals and helping them lead a healthy, confident life.

AMINO ACIDS AND MUSCLE TISSUE: WHAT PERSONAL TRAINERS NEED TO KNOW

Amino acids, often referred to as the "building blocks of protein" are abundant in nature and in the foods we eat. While the term itself may be familiar, every personal trainer who is well-versed in how they are utilized in protein synthesis and muscle growth will be better equipped to advise their clients.

Amino Acids Fundamentals

An amino acid is "any of a group of organic molecules that consist of a basic amino group (—NH_2), an acidic carboxyl group (—COOH), a hydrogen atom (H) and an organic *R* group (or side chain) that is unique to each amino acid." Central to these groups is one carbon atom.[1]



After amino acids have been taken up into muscle tissue, they serve two basic purposes in hypertrophy.

The first, and most essential, is to become cellular catalysts. Such catalysts are used at the intracellular level, such as transcribing proteins. Their rate of depletion is directly associated with both the amount and the duration of the cellular work they perform.

Without these catalysts, muscle fibers would be unable to function. In any of a group of organic molecules that consist of a basic amino group (—NH_2), an acidic carboxyl group (—COOH), and an organic *R* group (or side chain) that is unique to each amino acid. order of precedence, then, the body values amino acids as catalyst replacements over their use as material for tissue repair.

It is this secondary function, that of the body's use of "surplus" amino acids as building blocks to fashion and repair bodily tissues, that is achieved through the process of *protein synthesis*.

Amino Acids: The Basics of Protein

Proteins are often referred to as the "building blocks" of the body, and for good reason. Unlike other macronutrients that can be "turned over" internally, there needs to be an incoming supply of this raw material to make up any amount lost through the process of degradation. Since the body cannot store the individual amino acids that make up proteins, it collects them and exchanges them among the liver, the blood, and in the spaces surrounding individual muscle fibers, known as interstitial spaces.

Protein Structure

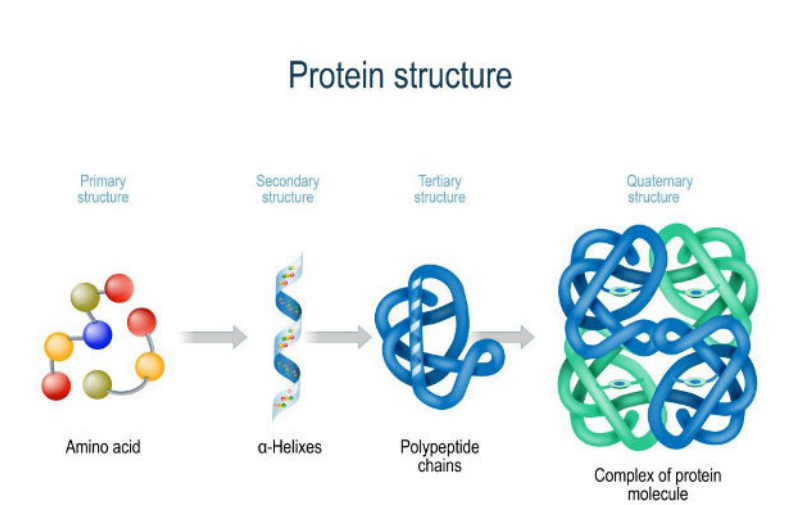
Amino acids rarely serve a function on their own and are most often put to work in combinations. From a chemical standpoint, all of them contain an amino group (NH_2) with an acid end (COOH), and some component that sets them apart from each other. Some of these latter components include glucogenic groups, some contain sulfur and some are known as branched-chain aminos, based on their chemical structure. While there have been 300 amino acids identified, there are 20 unique amino acids present in the human body and utilized for protein synthesis, ten of which are essential for bodily function in adults and cannot be synthesized by the body[2].

These 10 are:

- Phenylalanine
- Valine
- Threonine
- Tryptophan
- Isoleucine
- Methionine
- Histidine
- Arginine
- Leucine
- Lysine

As a practical matter, histidine and arginine are required by infants and growing children. The amino acids leucine, isoleucine, and valine are believed to account for approximately 60% of muscle tissue. Consequently, it is believed that it is these amino acids that are most readily taken up and converted into catalysts, sparing other amino acids in the process for use in protein synthesis and in energy production.

A protein containing essential amino acids is known as a "*complete protein*". If one or more of those amino acids are missing, it is known as an "*incomplete protein*".



Levels of protein structure from amino acids to Complex of protein molecule. Protein is a polymer (polypeptide) that forms from sequences of amino acids. Levels of protein structure: Primary, Secondary, Tertiary, and Quaternary

While many people are concerned about the ratio of complete proteins in their meals or the ratio of complementary proteins, it is important to realize the body can draw from a pool of amino acids within a given muscle.

Exercise Duration & Catalyst Depletion

If a given exercise lasts too long, the supply of ready-formed catalysts is exhausted and the cells turn to converting amino acids that had been previously destined for use in protein synthesis. This is because the catalyst function is necessary for survival, while protein synthesis can wait as far as the body is concerned. In other words, the body will preferentially utilize amino acids for essential functions, versus non-essential functions.

The amino acids that have already been absorbed in the tissues are the first up for use as catalysts. If there is an insufficient amount of amino acids, the muscle tissue itself will be used through a process known as *gluconeogenesis*. From a training perspective, this constitutes overtraining and an effort should be made to avoid it.

Avoiding Catalyst Depletion

Perhaps the easiest way to sidestep the issue of catalyst depletion altogether is ensure that your personal training client consumes an adequate amount of calories every 3 to 4 hours. Since the body's "go-to" source of energy is carbohydrates, it is important that he or she consumes an amount of carbohydrate sufficient to spare protein.

If adequate protein is not consumed, which is often the case among clients and especially women, 19% of whom underconsume recommended amounts of protein[3], studies indicate that supplementing with amino acids can reduce exercise-induced fatigue, and presumably, the catabolism associated with gluconeogenesis; specifically, L-arginine, L-valine and L-serine supplementation in this case.

As a calorie-free and purportedly more bioavailable than protein shakes, i.e., the amino acids are more readily absorbed than those in a protein shake, amino acid supplements are widely available to the public such as Perfect Amino*. I and several of my clients who have taken these supplements report increased energy during workouts and recovery time post-workout when taking this product. It is worth noting that their blend is proprietary and the ratio of amino acids listed is unknown.

In addition to nutritive considerations, the workout itself should not be overly exertive. This will allow for the availability of sufficient post-workout recovery catalysts and energy being the process of anabolism in which the body grows new cells and maintains tissues, and slows the process of continued catabolism, or tissue breakdown.

Certainly, post-workout nutrition is important to take into consideration and should be explored with each training client based on their personal lifestyle needs.

SELF TEST

1. The vertical push is also known as the:
    a. Bicep curl
    b. Overhead press
    c. Skull crusher
    d. Triceps dip

2. An important characteristic of the vertical push is:
    a. It is a single-joint exercise in the frontal plane
    b. There are three variations in one plane of motion at the humeral articulation
    c. It is a movement pattern of the shoulder and elbow joint in the overhead position
    d. All of these are characteristic of the vertical push

3. What are the prime movers in the vertical push?
    a. Deltoids and Triceps
    b. Scapula and Core
    c. Deltoids and Scapula
    d. Triceps and Core

4. The thoracic spine experiences both _____ and _____ throughout the range of motion of a vertical push.
    a. Rotation and circumduction
    b. Flexion and extension
    c. Extension and rotation
    d. Hinging and rotation

5. During a vertical push, a common error is to position the hands too far down, causing:
    a. Internal rotation of the shoulder
    b. Anterior tilt of the shoulder
    c. Loss in stability
    d. All of these

6. Fill in the blank. During the last part of the ascent of a vertical push, ensure that there is no excessive thoracic extension (or, _____) and no excessive lumbar lordosis (or, _____).
    a. Upper back arching ; rib flair
    b. Lower back arching ; shoulder rotation
    c. Rib flair ; lower back arching
    d. Shoulder rotation ; upper back arching

7. Which of the following variations of the vertical push has the heaviest loading potential of all free-weight variations?
    a. Dumbbell Overhead Press
    b. Kettlebell Overhead Press
    c. Barbell Overhead Press
    d. Landmine Shoulder Press

8. Which of the following variations of the vertical push is great at cueing stability and most resembles the incline press?
    a. Dumbbell Overhead Press
    b. Kettlebell Overhead Press
    c. Barbell Overhead Press
    d. Landmine Shoulder Press

9. Which of these is a proper cue for good form when performing vertical push?
    a. “shoulders up and forward”
    b. “elbows over wrists”
    c. “Maintain a long neck – don’t let the shoulders elevate”
    d. All of these are good cues for proper form

10. Modifications cam be used to either provide more of a challenge OR to simplify the exercise to allow for better form.
    a. TRUE
    b. FALSE

11. Sports that involve sudden changes in direction and reaction to ever-changing stimuli are called:
    a. Chaos sports
    b. Endurance sports
    c. Closed skill sports
    d. Dash sports

12. The 100 meter dash is characteristic of a sports activity which has identical rules every time that they are performed, these are known as:
    a. Chaos sports
    b. Endurance sports
    c. Closed skills sports
    d. Open skills sports

13. Speed is:
    a. a basic bio-motor skill
    b. highly trainable
    c. highly improvable
    d. all of these

14. the ability to perform various foot movement rhythms while simultaneously demonstrating balance and body awareness is known as:
    a. power
    b. balance
    c. agility
    d. strength

15. According to studies, scientists have identified specific ages when male and female youngsters have an optimal 'window' to develop speed and other motor skills. This window for running speed is:
    a. Ages 12-17 for boys and 10-13 for girls
    b. Ages 13-16 for boys and 11-13 for girls
    c. Ages 13-17 for boys and 10-12 for girls
    d. None of these are optimal ages for optimizing running speed

16. The Law of Diminishing Returns, as it relates to sports activity and performance, states that:
    a. The higher the level of athlete, the lower the degree of potential improvement
    b. The lower the level of athlete, the higher the degree of potential improvement

17. A properly executed wind sprint finds the well-conditioned athlete reaching no more than 60% of maximum effort, over a set distance or time.
    a. True
    b. False

18. During an athlete's wind sprint recovery, their heart's bpm should return to around ____ of max heart rate before engaging in the next sprint.
    a. 10%
    b. 30%
    c. 50%
    d. 80%

19. A study in the 'International Journal of Sports Physical Therapy' shows a correlation between stretching and sprinting that suggest which of the following is the best warm-up for sprint training?
    a. 10 minutes of lower body resistance
    b. 20-30 minutes of static stretching
    c. A few minutes of simple walking or jogging
    d. Some ballistics stretching with explosive movements

20. Which of the following exercises should be considered when designing a sprint-based workout:
    a. Butt kick sprints
    b. Power kick sprints
    c. Downhill sprints
    d. All of these should be considered as part of a sprint-based workout protocol

21. According to the Top Trends Report article for 2024, which of the following would fall into the category of ‘Mindful Movement’?
    a. Recovery
    b. Eco-friendly fitness
    c. Yoga and Pilates
    d. Group Fitness

22. An emphasis on mind, body and soul fitness are parts of an encompassing approach to fitness known as:
    a. Nutrigenomics
    b. Recovery fitness
    c. Holistic health
    d. Mindful movement

23. Fitness routines are now designed not only to sculpt the body but also to support:
    a. Relationship building
    b. Mental well-being
    c. Genetic responsiveness
    d. Tech-fitness knowledge

24. Body awareness is one’s ability to sense which of the following?
    a. how active or passive one is
    b. how tense or uncomfortable one is
    c. the internal state of one’s body
    d. it is all of these and any other perceptible sense of one’s body

25. Which of the following sense is described as the ‘ability to coordinate and control one’s body movements?
    a. Proprioception
    b. Interoception
    c. Kinesthetic sense
    d. Coordinative sense

26. Which of the following is the MOST effective technique to coach body awareness?
    a. Focus on past moments and how the body could have been positioned better
    b. Use props, like foam rollers or yoga blocks, to develop and enhance body awareness
    c. Remove imagery and props so that the client can only engage with their own body
    d. Be spontaneous in both communication and workout settings to require body adaptation

27. A 12 week study of high volume, resistance trained individuals, shows that progressively adding 4-6 sets per week every two weeks elicited greater lower-limb strength.
    a. TRUE
    b. FALSE

28. Scientists suggest that which of the following provides for the greatest hypertrophy and should be the place to start for athletes.
    a. 10 sets per muscle group per week
    b. 1-3 sets of 1RM per muscle group per workout
    c. 20 sets per muscle group and no cardio for the first 12 weeks
    d. 50% set intensity with equal parts of cardio and resistance

29. Bodybuilders find that having some lighter load workouts in the 15 to 20 rep range, will:
    a. deliver positive hypotrophy gains
    b. help alleviate overuse injuries
    c. foster a fuller recovery
    d. help with all of the above and should be built into the workout program

30. Omega-3 fatty acids can help with the treatment and/or prevention of which of the following:
    a. Depression and anxiety
    b. Auto-immune diseases
    c. Fatty liver disease
    d. Omega-3s may help treat or prevent each of these

31. The Omega-3s derived from fish oil excel at reducing problematic skin irritation.
    a. TRUE
    b. FALSE

32. Omega-9 fats are considered:
    a. Nonessential fats
    b. Polysaturated
    c. Triple-double bonded
    d. All of these are characteristic of Omega-9s

33. A blood clot is:
    a. A cluster formed by platelets in blood plasma that functions as a seal to ease bleeding
    b. A deadly form of inflamed blood cells that attack a weak area of the body
    c. Residue of blood formation left in the arteries due to overuse of anticoagulants
    d. Formation of blood vessels in the heart which break off and enter the blood stream

34. A pulmonary embolus is a:
    a. Blood clot that forms in the large veins of the limbs
    b. Blood clot that causes/leads to an irregular heart beat
    c. Blood clot that travels to/develops within the lungs
    d. All of these can describe a pulmonary embolus

35. Which of the following can be a warning of a blood clot occurrence:
    a. Stabbing chest pain that worsens with deep breaths
    b. Reddish or bluish skin discoloration
    c. Swelling, usually in the leg
    d. All of these can be warnings of a blood clot

36. The 'building blocks of proteins' are known as:
    a. Carbohydrates
    b. Fatty Acids
    c. Amino Acids
    d. Mitochondria

37. Which of the following is central to any group of organic molecules that make up an amino acid structure?
    a. Carbon atom
    b. Organic side chain
    c. Hydrogen atom
    d. None of these are part of amino acid structure

38. After amino acids have been taken up into muscle tissue, their most essential purpose in hypertrophy is:
    a. to release lactic acid
    b. to become cellular catalysts
    c. to replenish protein deficits
    d. to stabilize hormone imbalance

39. From a training perspective, gluconeogenesis constitutes:
    a. the peak performance metric, indicating that training intensity is optimal
    b. a sign of undertraining, there should be a reassessment to increase intensity
    c. indication of overtraining, and an effort should be made to avoid it
    d. gluconeogenesis is not indicative of any of these as it occurs all of the time

40. It is believed that the following amino acids account for approximately 60% of muscle tissue:
    a. Threonine, histidine, lysine
    b. Leucine, valine, isoleucine
    c. Isoleucine, threonine, valine
    d. Histidine, methionine, leucine

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SIDE 1

○ RESCORE | ○ MARK ✓ ○ TOTAL ONLY/BOTH SIDES

Trans-Optic® forms by NCS Pearson MM19641-2 654321

	T	F
1	A	B C D E
2	A	B C D E
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	T	F
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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

NFPT ID

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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
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MARKING INSTRUCTIONS

Use a No. 2 Pencil

Ⓐ ● Ⓒ Ⓓ Ⓔ
Fill circle completely

Ⓐ Ⓑ Ⓒ Ⓓ Ⓔ
Erase cleanly

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

NAME _____

SUBJECT **JUNE 2024 CEC Self Test**

PERIOD _____ DATE _____

TEST ANSWER SHEET B
Form No. 19641

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