



TRACK COACH

2026 / ISSUE 255



YEARS

1960 - 2026

A tribute to the legends and leaders who shaped our sport and profession.

TRACK COACH

Spring 2026 — 255



The official technical
publication of
USA Track & Field

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TRACK COACH

FORMERLY TRACK TECHNIQUE

255 — SPRING 2026



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FROM THE EDITOR

JASON KARP

PHD, MBA



Imagine

Many years ago, as a personal trainer in a gym, I was talking to one of the gym's members as she rode a stationary bike alongside her workout buddies. While I was explaining how she and her friends could get better results from their workouts, I sensed she wasn't listening. Perhaps she didn't care for the advice of a young, scrawny-looking runner in cotton sweatpants.

A few days later, I saw her again when I was about to go for a run. Seeing me for the first time in my running shorts, she enthusiastically asked, "How can I get legs like yours?" Smiling, I joked, "So my legs got your attention rather than my mind?"

Differences in fitness aside, the body, for the most part, is the same for everyone and even for every other mammal. It's anatomy. It's biology. It's biochemistry. It's genetically granted. But your mind is different. Your mind is what sets you apart. Your mind is distinctly you. The mind you have is your mind; no one else can ever have the same experience of the mind, because your experiences, your external and internal sensory perceptions, and your brain's billions of neuronal connections are never the same as anyone else's. Your mind is not genetically granted in completed form. You can enhance it; you can *change* it. I learned at a young age that training the body expands the mind, providing the forum for ideas to develop, manifest, and grow, offering a unique space of intellectual freedom.

What you experience in your mind doesn't just distinguish you from all other people. It distinguishes you from all other animals and even from all other living organisms. The major difference between you and a monkey is that you can *imagine*.

A monkey doesn't spend time thinking about who he or she is. He doesn't spend time thinking about being the best monkey he can be. He doesn't spend time thinking about whether or not he is living up to what it means to be a monkey. He doesn't manifest living in a big monkey house, winning a high school state or an NCAA monkey championship, or becoming head track and field coach of a monkey team.

Unlike any other animal, humans have a unique capacity to imagine ourselves different than we are, better than we are. We *imagine* a self we have yet to become. We *imagine*

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Editorial Column

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a future that does not yet exist. We *imagine* a life we have never lived. A female miler on your team can *imagine* a 4 on the stopwatch. A male pole vaulter can *imagine* an 18-foot vault.

But this unique human capacity to *imagine* is not always full of rainbows,

offering us an opportunity for self-betterment. Imagining a self you have not become can also be a curse because you are always haunted by a sense and desire of wanting more, of regret that you have not fulfilled your potential of being human. The monkey doesn't ask himself, "Am I fulfilled?" The internal conflict we all experience does not and cannot exist in any other species. Internal conflict is a uniquely human quality.

So, when your athletes imagine how close to their potential they can get and you as a coach ask the same question—"I wonder what I could be?"—that is the truly human question. It's the question at the heart—and the mind—of being human.

In this final issue of *Track Coach*, I urge you and your athletes to ask that question every day. And together, we can realize our human potential.

FROM THE PUBLISHER

ED FOX

END OF AN ERA

Back in the 1950s, the American distance runner Fred Wilt became concerned that the latest ideas on track & field technique and training were coming out of Europe and elsewhere, and he made it his mission to acquaint American coaches with these ideas, like periodization, fartlek, plyometrics, and so on. He suggested to *Track & Field News* publisher Bert Nelson that T&FN should publish a technical quarterly that he would edit and furnish articles for, and *Track Technique* was born: first issue September 1960. The first few years contained the ideas of the likes of Arthur Lydiard, Toni Nett,

Forbes Carlile, Woldemar Gerschler, Ernst Van Aaken, and other overseas thinkers. But it provided an outlet for researchers at American universities as well, people like Dick Ganslen, biomechanist Jim Hay, John Powell, and many more.

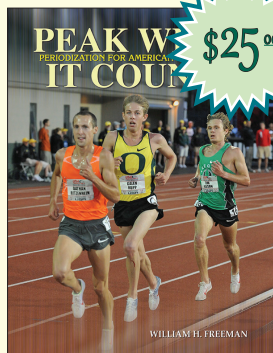
In 1970 or so, I became the periodical's publisher and, for my sins, I believe I've read every article in every issue since then; we changed the name to *Track Coach* somewhere along the way. Ollan Cassell, USATF's former head man, agreed in the 80s we could call it "the official technical periodical of USA Track & Field." That partnership deepened in recent years when we changed to an online publication only and received some financial support from USATF, and we happily included some pages on the governing body's activities. It's been

a good partnership and a good run, but after 65 years, for many reasons, we felt it was time to call it quits.

So, as we say—the end of an era. *Track & Field News* used to have a thriving book publishing arm—Tafnews Press. But that pretty much dried up with the advent of the Internet and almost unlimited free content for coaches. We shut that down in 2013 and now it's time for *Track Coach* to say goodbye. Finally, a thank you to the editors who followed Fred Wilt: Jed Goldfried, Kevin McGill, Russ Ebbets, and Jason Karp. It's been a pleasure working with you.

And a big thanks to Teresa Tam for 25 years of putting these issues together and preparing them for publication.

Ed Fox



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THE ROLE OF A DIRECTOR OF OPERATIONS IN TRACK AND FIELD

BY KIMBERLY KEENAN, JD

Kimberly Keenan currently holds the title of Director of Track & Field Operations. She has spent 32 years working in college athletics. An attorney for two years, she left the full-time practice of law to work with collegiate athletes as a coach and administrator. She has worked at all divisions of college athletics, from Division III to a power-four institution, now finding a home at Princeton University, enjoying the combination of academic and athletic excellence. She has served as a coach and manager on two U.S. Olympic staffs and has held several other national coaching and managerial positions.

When asked what I do as director of track and field operations, I often joke that I do all the things coaches don't want to do. My days revolve around the needs of our coaches and student-athletes.

A few years ago, the position of director of operations did not exist. It began to emerge in sports like football and basketball and has spread to other college sports. Now, most larger collegiate programs have one or more directors of operations, which allow

the coaches to focus on coaching. Over time, the role of a college coach has grown to include compliance responsibilities, travel details, uniform needs, fundraising, and meet management. At schools with a director of operations, these responsibilities fall to that position so the coaches can focus on recruiting and coaching their athletes.

Before landing in this role, I had the privilege of wearing many hats at the collegiate level. My start

began as a Division III cross-country coach and business manager and ended as a small Division I track and cross-country coach. The middle years were spent in administration at all levels of collegiate athletics. While my path to my current position at Princeton University is not a normal one, it gave me a more diverse perspective than most.

During my time as an administrator, I have seen directors of operations who were at the top

of their game. They were super organized, in sync with their head coach, able to anticipate the needs of a program before the coaching staff, and always in the shadows, helping guide a team more than anyone realized. I have also seen the flip side, where a director of operations made poor planning choices that cost teams a win or an athlete a chance to perform at his or her best.

I have had the privilege to serve as head and assistant team manager on U.S. Olympic and World Championship staffs. These experiences have taught me how to be my best with little sleep and under extreme pressure. You don't want to be the reason why an athlete does not bring home an Olympic medal. You are called upon to do many things that might not seem to be part of the role, but if it helps an athlete perform at his or her best, that is what you do. Similarly, with the director of operations jobs, you will perform "other duties as assigned," which is a popular catch-all phrase for the myriad of unexpected things that come up in athletic job descriptions.

The most important quality or skill of someone in this role is organization. The second key trait is being able to handle chaos on the fly and stay cool. The more organized you are, the more chaos you can prevent. However, there will be several things not within your control that you will have to handle, and that is when keeping your cool makes things go smoother.

Some basic tenants of being organized involve keeping an annual "to do" list to help as a guide for all the reoccurring events. This is especially helpful in working with

my athletic communications staff to help them remember when we need to do nominations for coaches and athlete awards. For myself, one of my lists will include all the due dates of all the entries for each meet and all the due dates for room lists and names for airline flights. I include in annual dates such things as when to order senior awards, reserve rooms for banquets or team meetings, plan break housing, or meal needs. I keep most of my documents in a Google doc format so I can have access to them from my phone at all times.

College track and field staffs consist of up to six coaches per gender if the director of operations has a spilt program. High school programs will have one head coach and possibly one or two part-time coaches, so it becomes more challenging as a head coach to coach and handle the administrative responsibilities that come with the job. Each team has up to seven different disciplines. The jumps coach may need tape for marking take-off spots, the vault coach may need the poles shipped two days before a competition, and the throws coach may have overweight luggage to be handled at the airport when traveling with implements. You need to make sure you prioritize what needs to be taken care of first and always keep the head coach at the front of the list. Being in sync with your head coach (or coaches) helps you anticipate his or her needs and know what to expect.

The next area that helps ensure success is communication. In any type of program, the head coach needs to communicate with his or her staff. The director of operations

or assistant coaches are not mind readers and cannot operate at their best when missing vital bits of information. Multiple parties need to be in the loop at all times. The athletes are important, and the key is to make sure they will use the mode of communication you are using. If you are using email, text, TeamWorks, or WhatsApp and they don't check that mode, things may be missed. The team around the athletes also needs to know what the program is doing. That can include the athletic trainers, athletic communication staff, strength and conditioning staff, business office, travel office, administrator, athletic director, and facilities staff. It is helpful to have these individuals saved as a group text so you can include them in all your messaging.

THE MOST IMPORTANT QUALITY OR SKILL OF SOMEONE IN THIS ROLE IS ORGANIZATION.

Another effective way to ensure strong communication is by having a staff meeting on Monday or Tuesday each week. This allows you and the staff to be on the same page. A detailed agenda is helpful to keep on track and make sure your head and assistant coaches know the issues that need to be addressed each week. It is also key to plan one to two weeks ahead. At this meeting, feel free to delegate some of the essential tasks, when necessary. For high school programs, even a 15-minute meeting at the beginning of your week will help guide your staff to a smoother performance. From here, make sure to build the weekend's itinerary in consultation with your head coach.

There are plenty of times when I wish I could clone myself when the men's and women's teams, which operate separately, want multiple things at the same time. When the teams travel to meets, we often stay in different hotels, and I may be shuttling athletes to the same or even different tracks from the same or different hotels, which also requires time (and traffic) management. When working with programs with two head coaches, their ability to collaborate will help you do your job more effectively.

Meet management is another hat that many directors of operations wear. This allows the coaches to focus on their athletes' performances as you put out fires all along the way. Are the officials all here? Did the student volunteers show up? Is lunch arriving on time? Did you order enough vegetarian meals? Are the steeple barriers at the right height? All these issues can occur at the same time and it typically falls on you to handle them. Having a good plan to deal with the potential issues and having a worst-case scenario plan is important to have with your facilities staff and head coaches. What if the power goes out? Do

your timers have a generator? Can the lights on the track be turned back on? What about a traumatic injury? These are all things that should be reviewed before your hosting duties start. When hosting meets, make sure you know where the extra high jump or pole vault crossbar is, extra stopwatches for high school programs that don't use automatic timing systems, and make sure to take care of your officials by feeding them well and preparing for excessive cold- or heat-related issues.

If your role includes keeping track of equipment, gear, and uniforms, make sure you are prepared and organized. You don't want your future conference champion to not have a new pair of spikes when his or her current pair pops the week of the championship. Keeping at least one uniform in your backpack will come in handy when you get to your destination and someone forgets his or her uniform. While you don't need to travel with every size, a medium or large size for men and a small or large size for women will cover most needs.

Also squeezed in my backpack are spikes of all sizes, wrenches,

batons, athletic tape, stopwatches, pins, nutrition bars, hair ties, and \$200 in cash, just in case a coach needs to file a protest on the conference or NCAA level. I have seen many coaches running around frantically looking for someone with cash on hand, so I always make sure I have that, if ever needed.

When thinking about taking on a position as a director of operations, you need to be willing to "get your hands dirty." This is not a glamorous job. But it is a job for which, if things go well, you know you have helped your athletes and coaches reach their true potential. It can be rewarding to know you have played a small role in their success. Getting to know your head coaches and being able to anticipate their needs will make this job easier.

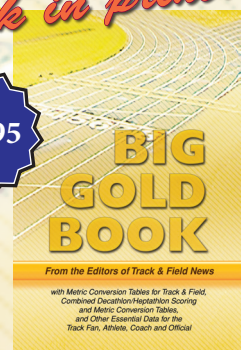
This is a position in which you can grow each year and get better at your job, which will open other doors. Some individuals transition to a coaching position while others move into college administration. No matter the path you take, the hard work you put into this position will be rewarded when your student-athletes and coaches reach their potential.

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THE INVISIBLE PHASE: REDEFINING THE TRIPLE JUMP STEP THROUGH THE “CYLINDER OF FORCE”

BY WILLIE BANKS

A former world-record holder and three-time Olympian, Willie Banks is a legendary triple jumper renowned for his innovative approach to the sport, including pioneering the rhythmic crowd clap that is now a global track and field tradition. A USATF Hall of Fame inductee and former Olympic Team Captain, he represented the U.S. in 18 international competitions, including as a silver medalist at the 1983 World Championships. He has dedicated his career to technical excellence, serving as a World Athletics Council Member and coaching elite athletes internationally. As the founder and CEO of World Record Camps, Banks leverages his expertise to train the next generation of jumpers, blending world-class performance insights with a deep commitment to athletic development.

The triple jump is a paradox of grace and violence. It is one of the most complex and dangerous events in athletics, in which physical forces of 12 to 15 times an athlete’s body weight collide with the human frame. After 53 years of jumping and 34 years of coaching, the event continues to baffle me. Even as a former world-record holder, I realized late in my career that my technique was insufficient because I had not mastered the step phase.

The following analysis breaks down the transition from the “pendulum” errors of the past to the “piston” efficiency of the future, utilizing research to justify why “attacking the ground” is the only way to survive the step. After all, the step is where the world record lives.

1. The Power Source: Why the Step Starts with the Run

It is unrealistic to expect an athlete to execute a technical step without

sustainable momentum. Much like a modern sprinter remains in a “pushing” phase out of the blocks, a triple jumper must build force. A sprinter typically begins to decelerate after 60 to 80 meters; the triple jumper’s approach must be designed to combat this inevitable loss of velocity.

The Justification:

Horizontal velocity is the single greatest predictor of triple jump

distance (Hay, 1993). Every ground contact disrupts the horizontal velocity, acting as a “brake.” Research on ground reaction force shows that if the approach is merely a “run” rather than a “momentum build,” the athlete enters the hop with insufficient kinetic energy to carry through the subsequent phases. To minimize the “negative impulse” (the slowing down), the athlete must get off the ground as quickly as possible. This requires an approach that transitions from powerful, pushing strides to high-frequency speed in the final six steps.

2. The Hop-Step Angle: The “Run-Off” Technique

The most common error in novices and youth is jumping “up” off the board. An elite takeoff angle is typically 12 to 14 degrees, significantly smaller than the 20+ degrees seen in the long jump. A high hop leads to a steep landing angle, which triggers a survival mechanism—the athlete sticks his or her foot out to prevent a face-plant, creating a massive braking force.

The Justification:

Studies by Yu & Hay (1996) demonstrate that a high vertical velocity at the board increases the landing impact of the hop to a point at which the human leg cannot structurally withstand the force. By “running off the board” and allowing the hips to pass the board before pushing, the athlete minimizes vertical oscillation. This preservation of horizontal velocity is critical for female and youth athletes who may lack the eccentric strength to “save” a jump once the vertical force becomes too high.

The “Controversial” Take:

I believe using the non-dominant (non-long jump) leg at the board is optimal. It prevents the athlete from jumping too high too early, saving the explosive “long-jump leg” for the final phase, during which velocity has dropped and a higher launch angle (15-22 degrees) is required.

***THE SHOULDER, HIP,
AND KNEES SHOULD
FORM A STRAIGHT
LINE—WHAT I CALL THE
“CYLINDER OF FORCE.”***

3. The Piston (Active Landing) Phase

For years, I believed the step was a “sweeping” action. My UCLA coach, Tom Tellez, corrected this by explaining the leg must act like a piston. Newton’s Third Law dictates that the force we exert on the ground is returned to us. If we “wait” for the ground, we absorb force (collapse); if we “attack” the ground, we redirect it.

The Justification:

The “active landing” or “pawing” action involves a downward and backward velocity of the foot relative to the hip just before touchdown. Biomechanical data indicate that elite jumpers exhibit a “negative horizontal velocity” of the foot at contact. This minimizes the distance between the foot and the center of mass at touchdown, reducing the braking impulse.

4. The Cylinder of Force: Knee Alignment

The most critical technical cue for the transition from hop to step is the position of the knees. At the moment of touchdown, the swing leg and jump leg knees must be within inches of each other. The shoulder, hip, and knees should form a straight line—what I call the “Cylinder of Force.”

The Justification:

This alignment is essential for minimizing the moment of inertia. When the limbs are compact and within the body’s center of gravity, the athlete can rotate the swing leg through the transition much faster. Research on the stretch-shortening cycle (Komi, 2000) shows that a “stiff” perpendicular landing enables the tendons to act like springs. If the swing leg is trailing (outside the “cylinder”), the athlete “mushes out,” increasing ground contact time and bleeding horizontal speed.

5. The “Lift” Before the Landing: The Ride Technique

The saddest part of watching modern triple jump is the lack of conversion into the final jump phase. Most athletes hold their thigh parallel during the “ride” of the step and then let it drop or move straight down into the final takeoff.

To maximize the jump phase, the athlete must raise the thigh slightly at the apex of the step ride. This “up and back” motion puts the leg in a position to “paw” the ground for the jump.

The Justification:

By the final jump phase, horizontal velocity has dropped significantly

(to ~5.75-7.0 meters/second). Because the speed is slower than it was prior to the hop and step, the athlete needs more airtime to cover distance, which necessitates a larger launch angle. Raising the thigh engages the hip flexors to “set up” the final piston strike. Without this slight lift, the athlete simply “falls” into the pit.

Conclusion: Fixing the Root Causes

The step phase fails in novice, youth, and female triple jumpers because it is often coached as a passive absorption. By implementing the piston technique and

maintaining the Cylinder of Force, we can move away from the “survival” jumps of the past.

Summary of the Elite Step Model:

- **The Run:** Build momentum for half, then transition to speed.
- **The Board:** “Run off” it at a low angle (12-14 degrees).
- **The Strike:** Attack the ground with a perpendicular, “pawing” action.
- **The Knees:** Keep them close at touchdown to preserve velocity.

- **The Ride:** Lift the thigh at the apex to prepare for the final jump.

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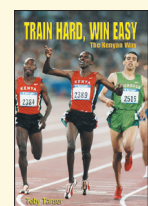
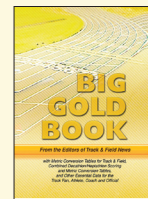
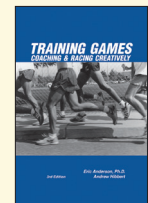
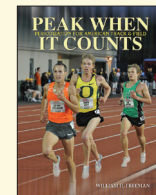
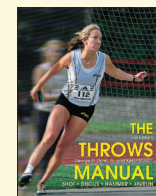
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THE SPEED RESERVE PARADIGM: A UNIFIED THEORY OF ELITE 800 METERS

BY MILTON MALLARD

Milton Mallard is the Associate Head Track & Field Coach at Arizona State University. With more than 30 years of elite-level experience as an athlete and coach, Coach Mallard has built a reputation for developing champions at the collegiate and international levels. His coaching record includes 9 NCAA National Champions, 46 All-Americans, and 27 Conference Champions. At the global level, he has coached five Olympic medalists (including three gold) and five World Championship medalists. Notably, he has coached world-class talents, including Athing Mu and Brandon Miller, applying the principles of the Speed Reserve Paradigm to achieve record-breaking results in the middle-distance events.

THE IDENTITY SHIFT OF THE 800 METERS

In the modern landscape of NCAA Division I middle-distance running, the 800 meters has undergone a clear identity shift. It is no longer accurately described as the shortest endurance event; in practice, it is the longest sprint. This evolution reflects the increasing depth of talent and the demands of championship racing—tactical surges,

physical positioning battles, and extreme closing speeds. These requirements expose the limitations of traditional aerobic-dominant models, which often fail in finals decided by positioning and fatigue resistance rather than maximal aerobic capacity.

This article defines the Speed Reserve Paradigm and translates it into coaching priorities and simple diagnostics. It contends that elite 800-meter performance is rarely

determined solely by the athlete with the greatest aerobic capacity. Instead, victory most often belongs to the athlete who possesses superior maximum velocity and the mechanical efficiency to preserve that velocity under extreme metabolic stress. The 800 meters is treated here not as a test of who can run the farthest, but as a challenge of who can manage the highest percentage of top speed for 105 to 110 seconds.

Physiology: The Energetic Side of the Middle-Distance Coin

The 800 meters exists at the Golden Training Divide, a physiological intersection at which the mechanical demands of maximal sprint speed collide with the energetics of long-distance running (Haugen et al., 2021). It is a high-intensity hybrid event, requiring the coordinated development of anaerobic power and aerobic efficiency. During an elite 800-meter run, the relative energy system contributions from aerobic metabolism—the body's energy-production processes—are reported to be 60-75%, while anaerobic contributions account for the remaining 25-40% (Haugen et al., 2021).

Success in this event requires not just a high maximal oxygen uptake ($VO_2\text{max}$), but also the capacity to operate at a peak VO_2 that reaches 100% $VO_2\text{max}$ during the race (Hanon & Thomas, 2011). Furthermore, the 800 meters produces some of the highest blood lactate concentrations in track and field, with values frequently exceeding 15 mmol/L. The magnitude of the decrease in velocity during the final stages of a race is often correlated with maximal blood lactate concentrations, as severe metabolic acidosis—a buildup of metabolites that can impair muscle function—begins to inhibit performance (Hanon & Thomas, 2011).

LACTATE MANAGEMENT AND THE SHUTTLE THEORY

This framework uses vertical integration—developing multiple performance qualities in parallel across the year, rather than isolating them into separate blocks—to

prevent speed decay. It also aligns with research on the lactate shuttle, treating lactate as a mobile fuel source rather than a waste product (Brooks, 2020). Training priorities include lactate transport—the ability to repurpose lactate during submaximal workout segments—and the ability to maintain power output despite extreme acidosis. This metabolic flexibility is critical during the final 200 meters of the race, when acute fatigue can influence running biomechanics and technique (Martínez-Álvarez et al., 2021).

**THIS FRAMEWORK
USES VERTICAL
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DEVELOPING MULTIPLE
PERFORMANCE
QUALITIES IN PARALLEL
ACROSS THE YEAR,
RATHER THAN
ISOLATING THEM INTO
SEPARATE BLOCKS—TO
PREVENT SPEED DECAY.**

The Speed Reserve Calculation: Raising the Ceiling

Central to this model is using speed reserve as a planning tool: when maximal velocity increases, the athlete can hold the same 800-meter pace at a lower percentage of top speed and often at a

lower relative metabolic cost—the physiological energy required to maintain a given speed. As a practical benchmark, historical data suggest world-class male 800-meter runners commonly can run 200 meters under 22.5 seconds (Haugen et al., 2021).

In practical terms, imagine two athletes with the same 800-meter goal pace, but different 400-meter personal bests. All else being equal (e.g., $VO_2\text{max}$, etc.), the athlete with the faster 400-meter time has a larger speed reserve and therefore can race at a lower percentage of top speed. That percentage is operating capacity—how much of max sprint speed the athlete must access to hold 800-meter pace (e.g., 53.0 seconds off a 46.5 PB equals 88%). A lower operating capacity generally means less early strain and a better chance of preserving mechanics late in the race.

In Table 1, Athlete A's larger speed reserve lowers operating capacity (the percentage of max speed required to hold goal 800-meter pace) and, together with endurance training, helps preserve efficiency deeper into the race.

Biomechanics: The Mechanics of Efficiency and Decay

Once the energetics are understood, the next question is whether

Table 1: Operating Capacity and the Speed Reserve

Metric	Athlete A (Speed Dominant)	Athlete B (Aerobic Dominant)
400m Personal Best	46.5 seconds	49.0 seconds
800m Goal Pace (per 400m)	53.0 seconds	53.0 seconds
Operating Capacity	87.7% of Max	92.4% of Max
Speed Reserve (Differential)	6.5 seconds	4.0 seconds

mechanics survive fatigue. In the 800 meters, technical failure frequently precedes physiological failure (Liu, 2025). These events assess the economy of gait cycles, including stride length, cadence, and foot-strike patterns.

THE METABOLIC COST OF ASYMMETRY

Biomechanical symmetry is a critical component of running economy. Research has shown that a 10% increase in foot contact time asymmetry results in a 7.8% increase in metabolic cost (Gao et al., 2022). Furthermore, a 10% increase in the asymmetry of mean ground reaction forces leads to a 3.5% increase in metabolic cost (Gao et al., 2022). Exercise-induced fatigue exacerbates these pre-existing limb asymmetries, leading to a deterioration in movement patterns due to poor neuromuscular control (Gao et al., 2022).

THE PILLARS OF BIOMECHANICAL EFFICIENCY

To combat mechanical decay, this model focuses on three primary anchors. First, it emphasizes front-side mechanics and vertical force, pushing the ground beneath the center of mass to maximize vertical force production. This running style contrasts with *back-side dominant* mechanics, characterized by an extended trailing leg at toe-off (triple extension) and large thigh separation angles at touchdown (Bramah et al., 2023). Triple extension at max velocity is considered a technical fault in this model because peak ground reaction force occurs in the first half of the stance phase; continuing past

this point increases stance time and reduces repositioning speed.

Second, pelvic stability and core integrity ensure that force is transferred directly into the track rather than dissipated through a swaying torso. Third, elastic energy storage and return maximizes the free energy returned by the tendons (Liu, 2025).

Training Program Design: The Vertical Integration Macrocycle

The seasonal progression integrates scientific theory and coaching practice. Annual running volume typically ranges from 50 to 120 km per week (Haugen et al., 2021).

General Preparation (12 weeks): Focuses on building the aerobic base while establishing the absolute speed ceiling.

Specific Preparation (8 weeks): Integrates 800-meter race pace with tactical simulations, utilizing velocities near 10 meters per second for world-class males (Haugen et al., 2021).

Competition Phase (6 weeks): Sharpening and tactical positioning to minimize velocity decay caused by a decrease in blood pH (Hanon & Thomas, 2011).

SAMPLE WORKOUTS FOR THE SPEED RESERVE

Workouts should challenge the athlete to maintain sprint mechanics under extreme metabolic stress:

The Velocity Builder: 3 sets of 3 x Fly-30m (sprints with a 20m fly-in to ensure maximal velocity enter-

ing the timing zone) at 95-100% intensity with full recovery (4-5 minutes) to target neuromuscular effectiveness (Liu, 2025).

The Slingshot Session: 1 x 600m (at 800m goal race pace), 10 minutes rest, then 2 x 200m at 400m goal race pace to simulate end-spurt challenges (Hanon & Thomas, 2011).

The Mechanical Robustness Block: 6 x 300m at 1,500m race pace with 60 seconds rest to build muscle coordination and joint synergy (Liu, 2025).

Team Culture: Excellence as a Daily Decision

Technical preparation must be paired with a culture of accountability and athlete buy-in. In this model, every repetition is a *deposit* into the athlete's speed reserve. Athletes learn that excellence is not a gear found on race day; it is a daily commitment to mechanical integrity and joint kinematics (Liu, 2025).

Diagnostic Application: Gait and Power Analysis

Middle-distance tests assess the body's mechanical health (Liu, 2025). Liu (2025) describes using quantum machine learning (Quantum ML) and large datasets to quantify biomechanical changes. Practically, coaches can get much of the same value by tracking post-fatigue video, split times, and simple symmetry checks to flag issues early (Gao et al., 2022). For example, an impaired sit-and-reach function could indicate posterior tightness, requiring specific mobility training (Liu, 2025).

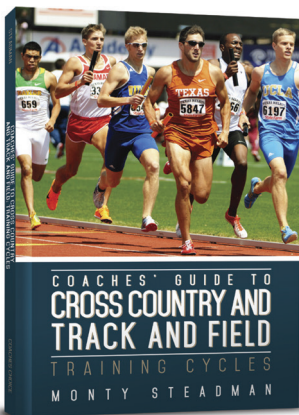
The Speed Reserve Paradigm provides a unified framework for the elite 800 meters. By focusing on the intersection of mechanics and energetics—the Golden Training Divide—this model prepares athletes for the demands of championship racing (Haugen et al., 2021). Success requires a commitment to raising the speed ceiling, maintaining biomechanical symmetry to reduce metabolic cost, and executing a tactical plan that capitalizes on the athlete’s reserve (Gao et al., 2022). In the final meters, the athlete who best preserves form despite metabolic acidosis is positioned to finish strongest (Hanon & Thomas, 2011; Liu, 2025).

PRACTICAL TAKEAWAYS FOR COACHES

- Coach the 800 meters as the longest sprint.
- Raise top-end speed to expand speed reserve.
- Train transportation of lactate and tolerance to metabolic acidosis.
- Protect mechanics under fatigue (front-side, pelvis, elasticity).
- Track symmetry and movement quality post-fatigue.
- Make daily technical standards non-negotiable.

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WHAT'S YOUR ZONE?

BY JASON R. KARP, PHD, MBA

Dr. Jason Karp is a coach, exercise and sport scientist, and author of 17 books and more than 400 articles. He has given hundreds of lectures across the U.S. and in 15 countries, has been an instructor for USATF's Level 3 certification, and is the physiology curriculum lead for USATF coaching education. He has won multiple awards for his work, including IDEA National Personal Trainer of the Year and President's Council on Sports, Fitness & Nutrition Community Leadership award. His run coaching certification was obtained by coaches in 26 countries before being acquired by International Sports Sciences Association. He has lived and coached in Kenya and has served as sports science/coach consultant to the Chinese Athletics Association. His TED Talk, *How Running Like an Animal Makes Us Human* is a unique look at the body-brain-mind connection. His books are available on Amazon.

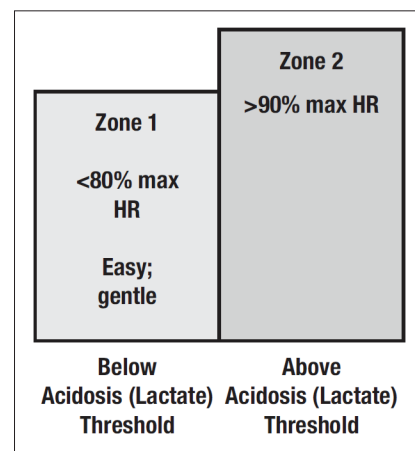
One of the “rules” of distance running is that runners must run many miles. Indeed, most runners link their fitness to the number of miles they run, invariably believing that more is better. While mileage is undoubtedly important, runners should train with the whole continuum of speeds, from very slow to very fast.

In an attempt to simplify the prescription of training intensity, several “zones” can be used that divide the intensity continuum based on physiological stress. The most

basic, and perhaps most meaningful, zone model is the two-zone model, with the acidosis (lactate) threshold as the dividing line. Zone 1 is below the threshold and zone 2 is above.

The acidosis threshold is an interesting physiological variable, demarcating the transition between running that is almost purely aerobic and running that includes significant oxygen-independent (anaerobic) metabolism. The speed at the acidosis threshold is the fastest speed that can be sustained

exclusively by aerobic means.



2-Zone Model of Training Intensity

(Since the development of metabolic acidosis begins when the lactate threshold is exceeded, I often refer to the threshold as the “acidosis threshold” to take the emphasis off the innocuous lactate and place it on the fatigue-inducing acidosis, which is the physiological marker of interest.) Thus, the acidosis threshold discerns sustainable, metabolically balanced workloads from non-sustainable, non-metabolically balanced workloads.

Knowing how much training runners do above and below their acidosis threshold gives you a good indication of the stress of training. But it doesn’t tell the whole story. The three-zone model includes the training at the acidosis threshold itself, giving us zone 1 below threshold, zone 2 at (or near) threshold, and zone 3 above threshold.

But that still doesn’t give the whole story, because there are many intensities above the acidosis threshold. So, the 5-zone model elucidates the entire spectrum of intensities, with zone 1 below acidosis threshold, zone 2 at (or near) threshold, zone 3 at (or near) VO_2 max, zone 4 at anaerobic capacity (speed endurance), and zone 5 at anaerobic power (sprinting; plyometrics).

Zone 1

In all zone models, zone 1 is aerobic training, which may be classified as any speed below the acidosis threshold, which is lower than about 80 to 85 percent max heart rate. In highly trained runners, the acidosis threshold can reach up to 90 percent max heart rate, making anything lower than that

intensity aerobic. All easy runs, recovery runs, and long runs fall into zone 1.

Zone 2

Zone 2 is acidosis threshold training, which represents the ceiling of steady-state aerobic running. Raising the threshold enables athletes to run faster before they fatigue because it enables them to run faster before oxygen-independent (anaerobic) metabolism (and, consequently, the development of acidosis) begins to play a significant role. With training, what was once an anaerobic pace becomes high-end aerobic.

The longer the race for which your athletes are training, the more important the acidosis threshold becomes because the more important it is to hold a faster aerobic pace for an extended period. The keys to success for longer races are (1) getting the acidosis threshold pace as fast as possible and (2) being able to run as close to acidosis threshold pace as possible for as long as possible.

Zone 2 threshold pace should feel comfortably hard, a lot faster than the easy pace of zone 1. Threshold runs are one of the most difficult types of workouts for most runners to run correctly—especially those who are young or inexperienced with these workouts—because they require holding back and not pushing the pace. That comfortably hard feeling requires practice to attain and hold. Threshold pace

for recreational and intermediate-level runners corresponds to the following:

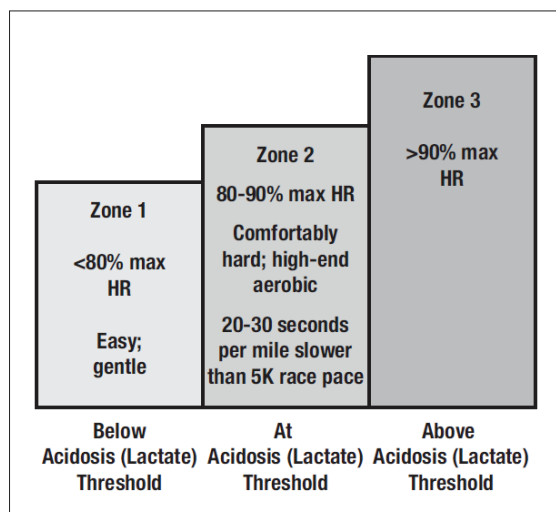
- About 10-15 seconds per mile slower than 5K race pace
- Equal or very close to 10K race pace (if slower than about 50 minutes for 10K, the pace will be slightly faster than 10K race pace)
- 80-85% max heart rate

Threshold pace for competitive and highly trained runners corresponds to the following:

- About 25-30 seconds per mile slower than 5K race pace
- About 15-20 seconds per mile slower than 10K race pace
- 85-90% max heart rate

Zone 3

Zone 3 is VO_2 max training, which targets the cardiovascular system’s ability to pump blood and oxygen to the working muscles. VO_2 max, which is the maximum volume of oxygen the muscles can consume per minute, is best trained with interval workouts, running hard for 3 to 5 minutes at or very near



3-Zone Model of Training Intensity

maximum heart rate, with jogging recovery intervals that are slightly less than or equal to the time of the reps.

The main reason to jog during the recovery intervals is to increase venous return (the return of blood back to the heart through the venous circulation) via the muscles' pumping action so the heart can receive and subsequently pump more blood with each beat (stroke volume). Jogging is also important (compared to standing still or walking) to keep oxygen consumption (VO_2) elevated throughout the workout. Thus, cardiac performance is enhanced during and because of the recovery intervals, which is why it is called an interval workout.

In comparison to zone 2 threshold training, which is mostly about what's happening in the athlete's legs, the site of adaptation of zone 3 VO_2 max training shifts from the skeletal muscles to the cardiovascular system. Zone 3 VO_2 max pace should feel hard but manageable, a lot faster than the threshold pace of zone 2. VO_2 max pace for recreational and intermediate runners corresponds to the following:

- Between 1.5-mile and 2-mile/3K race pace
- About 20-25 seconds per mile faster than 5K race pace
- About 40-45 seconds per mile faster than 10K race pace
- 95-100% max heart rate

VO_2 max pace for competitive and highly trained runners corresponds to the following:

- Equal or very close to 2-mile/3K race pace
- About 10-15 seconds per mile

faster than 5K race pace

- About 25-30 seconds per mile faster than 10K race pace
- 95-100% max heart rate

To determine max heart rate, have your athletes run one mile while wearing a chest-strap heart-rate monitor, starting at a comfortable pace and picking it up each lap of the track until running as fast as they can over the final lap. Have them check the heart-rate monitor a few times over the final lap. The highest number they see is their max heart rate.

Zone 4

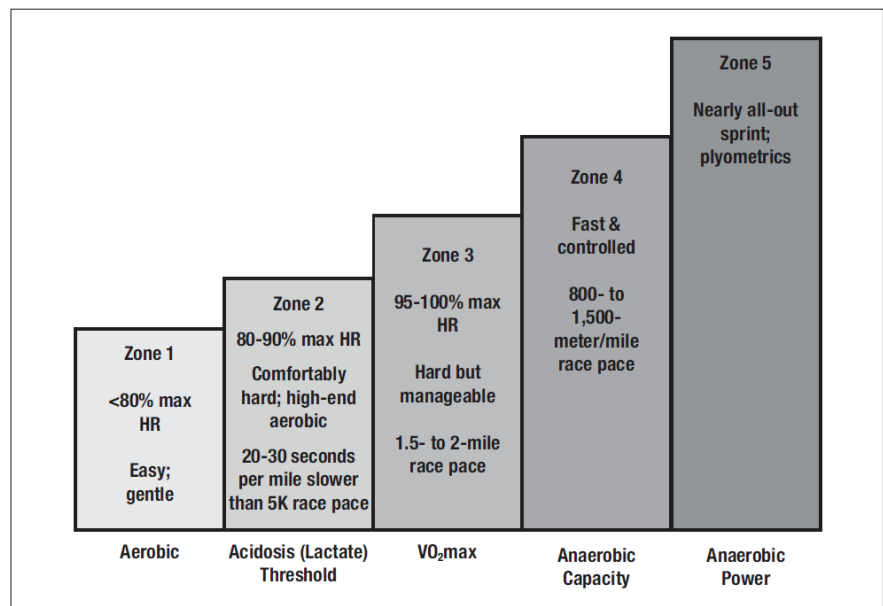
Zone 4 is anaerobic capacity (speed endurance) training, which targets anaerobic glycolysis (the breakdown of glucose) to regenerate energy (ATP). When your athletes' running pace exceeds the rate at which their heart and blood flow can provide oxygen to their muscles, anaerobic metabolism starts to kick into high gear to produce ATP for their muscles. Like zone 3, anaerobic capacity is

best trained with interval workouts, running fast reps for 30 seconds to 2 minutes, with jogging recovery intervals that are two to four times as long as the reps.

These workouts increase the enzymes involved in glycolysis, improve the ability to buffer muscle acidosis, and increase running speed by recruiting fast-twitch muscle fibers. When your athletes do anaerobic interval training, they should leave their heart-rate monitors at home, since heart rate does not adequately reflect the workout intensity. Anaerobic training is not about heart rate and oxygen delivery; it's about the metabolic activity going on inside their skeletal muscles.

Zone 5

Finally, zone 5 is anaerobic power (speed) training, which targets the phosphagen system to regenerate ATP. Like zones 3 and 4, anaerobic power is best trained with interval workouts, running very fast sprints for 5 to 15 seconds, with standing/



5-Zone Model of Training Intensity

walking recovery intervals of 3 to 5 minutes. Anaerobic power training can also be done with plyometrics. The relatively long recovery intervals between sprints enable creatine phosphate to be replenished in the muscles so that it can be used as fuel for the next rep. Although the phosphagen system plays a minor role in a distance runner's performance, it becomes more important the shorter the race. Even distance runners benefit from training anaerobic power and improving speed, through the recruitment of fast-twitch muscle fibers, the optimization of running technique, and the development of muscle force and power.

Less experienced runners tend to drift between intensity zones, running harder on days reserved for low intensity and not hard enough on days reserved for high intensity. Experienced runners have a slightly different problem—they often run faster on easy days *and* on hard days than what is appropriate for their performance level. Let's first take the problem of running too fast on easy days, since that is, perhaps, the biggest mistake runners make.

When I was a kid, I loved watching the TV sitcom, *I Love Lucy*, starring Lucille Ball. In one episode, Lucy and her friend Ethel work at an assembly line, where they were assigned to wrap pieces of chocolate as they came down the conveyor belt. At first, the job was easy. The chocolate pieces were coming down the belt at a slow enough speed that Lucy and Ethel could easily grab each piece of chocolate and wrap it.

Then, the speed of the conveyor belt quickened, and Lucy and Ethel

had their hands full. Literally. They couldn't wrap each piece of chocolate in time before the next piece was already passing them, so they grabbed handfuls of chocolate and shoved them in their pockets and in their mouths. It was hilarious, and that episode became a famous part of TV sitcom history.

Little did the director of that scene know that he revealed the secret to how to become a better distance runner.

Clearly, increasing the speed of the conveyor belt didn't work. Lucy and Ethel couldn't keep up with the pace of the belt. If the company that Lucy and Ethel worked for wanted to produce more wrapped chocolates in less time, they should have had more factories with more assembly lines and more workers, like Lucy and Ethel, wrapping chocolates traveling down the multiple conveyor belts.

Deep inside your athletes' muscle fibers, those factories are the mitochondria, and those workers—the Lucys and Ethels—are the enzymes that catalyze the chemical reactions involved in aerobic metabolism. The more mitochondria their muscles have, the greater their muscles' capacity to use oxygen and the faster pace they'll be able to sustain. The most efficient way to make more mitochondria—more factories, more assembly lines, and more workers—is to run more. And to run more, athletes must slow down their runs, because there is an inverse relationship between training intensity and duration.

The number and size of mitochondria in muscle fibers is sensitive to the volume of work performed.

When the factories are stressed because of greater demand, more and larger factories will be built to increase their supply to match the demand. If those pieces of chocolate kept traveling down the conveyor belt long after the 30-minute *I Love Lucy* episode was over, more conveyor belts, and more and larger factories to hold those conveyor belts, would have been built to keep up with the demand for chocolate.

By running faster on easy days, your athletes add unnecessary stress to their legs without any extra benefit and it will prevent them from adequately recovering in time for their harder days. Since many of the cellular adaptations associated with aerobic training are volume-dependent, not intensity-dependent, the speed of easy runs is not as important as their duration. Slowing down their easy runs has at least three benefits: (1) it decreases the chance of injury because of less physical stress, (2) it enables athletes to get more out of their harder days because they'll have less residual fatigue, and (3) it enables athletes to increase their overall training volume. Training is about *optimization*—obtaining the most benefit with the least amount of stress.

The other problem is running too slow on hard days, which, while not as detrimental as running too fast on easy days, is also not optimal because your athletes end up falling short of the intended purpose of the (high-intensity) workout. There are great physical and psychological benefits that come from running fast and holding those faster speeds for longer periods of time. While lower-intensity runs comprise a much larger percentage

of your athletes' training, when it's time to run fast, they better be ready for it.

In slower runners, the reason for not running fast enough on hard days may be due to the inexperience of workouts that are physically uncomfortable. It's tough for beginner (e.g., high school freshmen) and many recreational runners to push themselves; they feel like their lungs are going to explode and their legs are going to fall off. For faster, more competitive runners, the reason for not running fast enough on hard days is likely due to the accumulated fatigue from the problem of running too fast on easy days.

The other problem, which is mostly specific to headstrong runners, is running too fast on hard days, which happens when runners either don't fully understand and internalize the purpose of the workout, they lack self-control, or they think that to run faster in races, they need to run faster workouts. For example, say one of your athletes does an interval workout of 800-meter reps at $VO_2\text{max}$ pace at 6:00 per mile, or 3:00 for each 800-meter rep. If running each rep in 3:00 causes her to reach her $VO_2\text{max}$ during the rep (which is the goal of the workout), running each rep in 2:55 (5:50 pace) will certainly also cause her to reach $VO_2\text{max}$. But why run each rep in 2:55 when she can run it in 3:00 and still get the same benefit? To improve $VO_2\text{max}$, running faster than $VO_2\text{max}$ pace is not better than running at $VO_2\text{max}$ pace. All running faster does is add more stress and more fatigue to her legs without any extra benefit. For a distance runner, it's better to run more volume at the correct pace

than to run less volume at faster than the correct pace. The optimal way to do the workout is to run at the correct pace and either run more reps, increase the duration (distance) of each rep, or reduce the time of the recovery intervals between reps.

80/20, WHICH IS BASED ON ELITE ATHLETES WHO TRAIN 10 TO 14 TIMES, OR 10 TO 25 HOURS, PER WEEK, REALLY IS AN ARTIFACT OF THE INVERSE VOLUME-INTENSITY RELATIONSHIP RATHER THAN A TRUE REFLECTION OF HOW RUNNERS TRAIN.

How much training should your athletes do in each intensity zone? That's a tough question to answer and depends on many factors. Several research studies have tried to approach an answer to this question by documenting what elite distance runners typically do. Those studies have found that, using measurements of blood lactate levels, heart rate, and perceived exertion, elite distance runners run about 75 to 80 percent of their volume in zone 1 below acidosis threshold (low intensity) and about 20 to 25 percent at and above acidosis threshold (high intensity) (Enoksen et al., 2011; Seiler & Kjerland, 2006; Esteve-Lanao et al., 2005; Tønnessen et al., 2014; Seiler, 2010; Seiler, 2012).

Some research has narrowed in on the 20 percent at and above threshold, and has found that the three-zone training intensity dis-

tribution is about 75-80/5-10/15 percent for below, at, and above acidosis threshold (Seiler & Kjerland, 2006; Laursen, 2010). It seems that elite endurance athletes have settled on a training pattern that involves a large volume of work at low intensities (zone 1; less than 80% $VO_2\text{max}$) combined with a small amount of work at intensities higher than threshold (zone 3; greater than 90% $VO_2\text{max}$), with not much time spent in the middle at threshold (zone 2; 85-90% $VO_2\text{max}$). (This apparent lack of training at acidosis threshold is contrasted by elite Kenyan marathon runners, who do a considerable amount of training at or near acidosis threshold pace.)

While most research has quantified the intensity distribution based on time or distance in each zone, some research has quantified it based on the primary work portion of the session (instead of counting the low-intensity warm-up and cool-down before and after interval workouts and the jogging recovery intervals between reps, which would inflate the amount of low-intensity work). That research has shown that different methods of training intensity quantification impact the distribution quantification. For example, in elite endurance athletes, a 90/10 low/high intensity distribution based on the amount of time spent in each zone typically corresponds to an 80/20 distribution based on the type of workout, which equates to two to three workouts per week at acidosis threshold (zone 2) or at higher intensities (zones 3, 4, 5) for athletes training 10 to 14 times per week (Seiler, 2010).

When calculating the intensity distribution as a percentage of

distance or time run per week, the percentage of low-intensity training is always going to be much greater than the percentage of high-intensity training. Runners can run a lot more volume of easy than of hard. That's because of the inverse relationship between volume and intensity. The higher the intensity, the less work (time or distance) runners can do. Thus, 80/20, which is based on elite athletes who train 10 to 14 times, or 10 to 25 hours, per week, really is an artifact of the inverse volume-intensity relationship rather than a true reflection of how runners train. One of the reasons for skewing training to low intensity may be optimization. Low-intensity training may be the most optimal intensity at which to adapt because it comes with the least stressful work. Your athletes could get equal or even greater adaptation with higher-intensity work, but that comes at the price of a lot of fatigue and physiological stress, with large hormonal

disturbances and downregulation (reduced activity) of the sympathetic nervous system. When the amount of training in zone 3 is increased, for example, to a larger percentage of total training time, runners find it too demanding after just two to three weeks and show signs of overtraining (Esteve-Lanao et al., 2007).

Given the importance of both high-volume and high-intensity training, the art of distance running training, and of coaching, is the precise manipulation of the different training zones throughout the year and balancing them with adequate recovery. A big piece of the training puzzle is learning how and when to manipulate the volume and intensity through different training periods of the year.

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2028 OLYMPIC TRIALS

Dates and site to be determined. We are expecting the site to be either Los Angeles or Eugene. Since the first day of track competition at the Olympics is July 15 and the 2028 NCAA Outdoor Championships are scheduled for June 7-10, it has been proposed that the Trials will be held beginning on June 17, however, exact dates have yet to be confirmed. Also under consideration is shortening the length of the Trials from 8 days of competition (4 days on, 2 days off, 4 days on) to 6 consecutive days of competition. This format change would allow athletes approximately 22 days of recovery between the end of the Olympic Trials and the start of the Olympic Games, which would be the shortest turnaround from an Olympic Trials to an Olympic Games in US history. \$100 per person deposit now accepted.



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<i>June 19-20</i>	<i>USATF Level 1 Event Specific Training – Zoom (Pacific Time)</i>
<i>July 7-10</i>	<i>USATF Level 2 School – Hybrid – TBA</i>
<i>July 10-12</i>	<i>USATF Level 1 Event Specific Training – Zoom (Eastern Time)</i>
<i>July 22-24</i>	<i>USATF Level 1 Event Specific Training – Zoom (Central Time)</i>
<i>August 15-16</i>	<i>USATF Level 1 Event Specific Training – Zoom (Pacific Time)</i>



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<https://www.usatf.org/programs/coaches/grants/national-championship-mentorship-grant>



MODERNIZING SPORT SCIENCE: NEW AND RECENTLY UPDATED CEU COURSES

USATF’s online catalog continues to evolve with the launch of the updated Level 2 Sport Science course. This essential prerequisite for the Level 2 Program has been remastered into a streamlined, single-platform experience. The new format features eight units—each containing approximately two hours of content—and replaces individual discussion posts with a single, comprehensive final exam. Enroll now to get a jump start on attending the July or December Level 2 Event Specific Schools.

Coaches can also enroll in the new asynchronous course, *A Multi-Dimensional Approach to Skill Development in Youth Athletes*. For a \$89.00 registration fee, this six-hour program uses brain-based coaching and biomechanics to help coaches move beyond rote drills. The goal is to create high-performance environments where athletes “own” their movements and develop the resilience needed to thrive under pressure.

A current USATF membership is required to enroll in all free and paid CEU courses.

Full Catalog and CEU Hour Rating (* indicates new or recently updated)

- Coaching Race Walking* (6) - \$89
- A Multi-Dimensional Approach to Skill Development* (6) - \$89
- Energy Systems and Biomotor Abilities for Optimal Performance (4)

-
- The Athlete’s Strength and Power* (4) - \$69
 - Reactive Strength: The Fundamentals* (4) - \$69
 - Reactive Strength: Advanced Concepts* (4) - \$69
 - Physiology for Long Term Athlete Development (4) - \$69
 - Understanding Acute Fatigue in Training and Competition (4) - \$69
 - Basic Principles of Training Design* (4) - \$69
 - Advanced Principles of Training Design* (4) - \$69
 - Basic Principles of Sprinting* (4) - \$69
 - Basic Principles of Long Jump (4) - \$69
 - Basic Principles of Endurance Training (2) - \$49
 - Motor Learning and Effective Coach Communication* (2) - \$49
 - USADA Coach’s Advantage (1) - FREE
 - KT Tape for Coaches (N/A) – FREE

IMPORTANT: The new CEU rating is an important detail to note for USATF Level 1 coaches as a minimum of eight CEU hours is now required to maintain their certificate. In the expiring year, Level 1 certificate holders will provide a transcript (Skills Passport) of the number of CEU hours obtained.

<https://www.usatf.org/programs/coaches/continuing-education-unit-ceu-courses>



STAY CHAMPIONSHIP READY: 2026 USATF COACH CREDENTIALING REMINDERS

As the outdoor season kicks off, coaches are encouraged to verify their status in the USATF Coaches Registry to ensure credentialing eligibility. Key dates on the horizon include the **USATF U20 Outdoor Championships in Eugene, OR (June 18–19)**, **USATF National Youth Outdoor Championships in Huntsville, AL (June 24–27)**, and the **USATF Outdoor Championships in New York, NY (July 23–26)**.

Maintaining eligibility requires a current USATF membership, current US Center for SafeSport training (required every 365 days) and NCSI Background Screening (valid for two years), along with a current Coach Certification (Education Standard). Because screenings can take up to 10 business days to process, coaches should check their USATF Connect profile well in advance of competition dates. If you use a non-USATF certification to meet the education standard, you

must upload proper documentation (e.g. certificate of completion, results link, verification letter from human resources) to your USATF Connect profile before approval. USATF members can review all accepted courses and frequently asked questions at the link below.

<https://www.usatf.org/programs/coaches/coaches-registry>



THE DIGITAL HUB: MAKING USATF CAMPUS YOUR NEW TECHNICAL HOME

USATF Campus has become a definitive resource for technical information, offering everything from archived *Track Coach* articles to original performance content from Orlando Health, TrueSport, and USATF instructors, along with special features such as USATF Fantasy Pick'em and World Rankings insights. The platform features sophisticated laboratory tools, such as the USATF Acceleration Calculator developed by Dr. Ken Clark, which models the critical first eight steps out of the starting blocks. The laboratory also boasts calculators for World Athletics Rankings, age-grading, combined events scoring, and field event mark conversion tables.

Beyond performance calculators and articles (library), the Campus offers exclusive webinars and podcasts. Coaches should mark their calendars for the upcoming session, *“From Question to Insight: A Practical Sports Science Approach for Coaches,”* on May 6, 2026, at 8 PM ET.

While currently in a free preview period for all users, coaches can also sign up for the biweekly newsletter to stay informed on the latest technical updates and the weekly “test your knowledge” games.

<https://www.usatf.org/campus/home>

The Ultimate Guide To Mile/1500 Racing Strategy and Tactics.

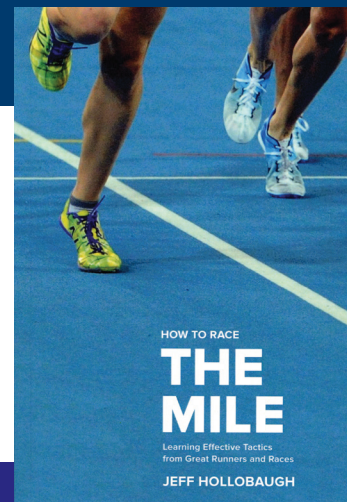
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