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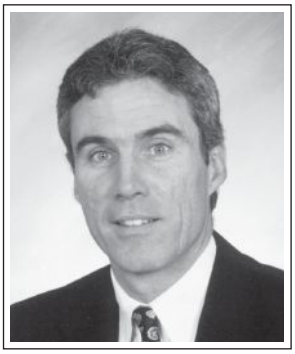
FROM THE EDITOR

RUSS EBBETS

THE GRIP



Success is often about attention to the little things, seemingly insignificant, uncontroversial. They generally provoke agreement when brought up in casual conversation. Grip strength is one of those topics. You shake hands, carry a bag of groceries or open a jar and think nothing of these activities of daily living. They are things that everyone does. They are just taken for granted.

But grip strength is something scientific researchers have studied worldwide for decades. Different ages, races, colors, creeds have been asked to push this and pull that in an effort to document grip strength. Grip strength has become an important safe, simple and quick test to document one's vitality, infirmity or to chart the progress of one's rehab efforts.

Some researchers have even dedicated their lives to studying grip strength and its implications. On one hand that may seem like an odd way to make a living until you consider there are actually people who get paid to teach other humans how to run around a circle faster. What is that glass house quote? Running events are not much of a "hands on" process. Granted one can use the hands in a sprint start or to carry a baton but most would agree the contribution of the hands to running is minimal.

Except for the vault the jumps are pretty much the same. But when the throws enter the conversation, well, things get thrown with the hands.

I remember reading somewhere that the center-fleeing (centrifugal) force of the hammer on the hammer thrower's hands is equal to the grip needed to dead lift 400 pounds. And remember one must maintain balance and grip while spinning at 3-4 meters/second.

While the hammer is "held" with a handle the shot, discus and javelin are let loose directly from the hand. It does not matter if you are a big fan of the closed kinetic chain, the stretch reflex or the summation of forces if the last part of the human body to impart force to the implement is the fingers, the fingers warrant some flex (and extend) time in the weight room.

The Russians used to test for their hammer throwers by seeing how quickly prospects could tap the index finger. I'll give you a moment to stop laughing and then consider this. Prospects had to have a certain body type (anthropomorphic measurement). They used the index finger because it was the only finger in the hand innervated by the three major nerves to the hand (median, radial and ulnar). The index finger also has its own muscle for extension. Did it work? Remember before the Wall fell the

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ATHLETE-CENTERED COACHING: WHAT, WHY, AND HOW

Marshall Milbrath is a PhD student in Sport Pedagogy at the University of Northern Colorado and serves as a USATF Level I Coaching Education Instructor. Milbrath has seven years of coaching experience at both high school and college levels.

BY MARSHALL J. MILBRATH, M.ED.

INTRODUCTION

Over the past two decades, athlete-centered coaching philosophies have emerged in promoted coaching practices (Cassidy, 2010). While athlete-centered coaching has been advocated across a wide spectrum of sport, athlete-centered coaching practices have been promoted in track & field in both non-formal clinics (Freeman, 2009) and in the USATF Coaching Education Program (McGuire, 2015). Taking root in humanistic psychology, athlete-centered coaching emphasizes coaching that addresses not only the physical requirements of sport, but also addresses the needs of the mind and spirit.

The humanistic view accepts that every individual has a deep desire to fulfill his or her own potential, and that when appropriate conditions (e.g., consistency in personal treatment, unconditional positive regard, and accurate empathic understanding) are present within positive interpersonal relationships, individuals grow, as cited in Jenny & Hushman, 2014; also see Rogers, 1957.

Despite the growing interest in athlete-center coaching, a clear definition of it has yet to be established. Humanism itself has been described as an adapted attitude rather than a prescriptive orientation. This may help explain why such a range of ideas about athlete-centered coaching exist including the challenging of dominant practices (Gould, Guinan, Greenleaf, Medbery, & Peterson, 1999; Vealy, 2007); descriptions of coaching processes (Greenleaf, Gould, & Dieffenbach, 2001); descriptions of coach education strategies (Lombardo, 1999 as cited in Jenny & Hushman, 2014 and Orlick & Partington, 1988); and the coaching process itself (Ewing & Seefeldt, 1989).

While it has been suggested that research must continue to develop a working definition of athlete-centered coaching, common methods recognized as athlete-centered practices have been identified. This

review describes some of these approaches taking into account scientific findings from a multitude of sports contexts, rationales for why these should be considered by the track coach in her or his practice, and recommendations for its implementation.

WHAT ATHLETE-CENTERED COACHING IS

Humanistic fulfillment in sport has gained increasing focus in the past two decades in psychological and pedagogical research. This has resulted in an emphasis on humanistic coaching practices by promoting positivity and development of the whole person (Smoll & Smith, 1987; Thompson, 1995, 2003; Weiss & Gould, 1984). This practice is rooted in a focus on humankind's striving for unmet potential in an effort to seek self-actualization, or self-fulfillment (Lombardo, 1987). This notion of self-actualization was first coined by Abraham Maslow who described a hierarchy of needs (e.g., physiological, safety, love and belongingness, esteem, etc.) all which build upon each other as one becomes everything she or he is capable of becoming (Maslow, 1943, 1954). Jenny (2013) describes five underpinning themes in humanism:

1. Because people possess a variety of feelings and views, personal interpretations of experiences should be personalized to the individual.
2. The notion of a separate relationship between mind and body is rejected in favor of an interconnected view of the body.
3. Freedom and autonomy of the individual is promoted through freedom of choice and decision making.
4. Experiences are not analyzed in component parts, but as a whole.
5. A constant pursuit of knowing one's self should be promoted as no two people experience human nature in the same way.

These five themes guide coaching that focuses on collaborative and non-manipulative methods, qualifying athlete-centered coaching as democratic, interactive, collaborative, and empathetic. This kind of coaching may include posing challenges and questions to athletes in order to deepen their understanding of sport. Additionally, coaches may share the decision-making process with athletes while delivering feedback in a way that allows athletes to retain understanding and gain independence and confidence in their abilities as athletes (Arena, 2003; Jenny & Hushman, 2014; Lombardo, 1987, 1999). These approaches emphasize the empowerment of athletes through personal achievements and positive relationships.

The athlete-centered approach breaks away from negative articulations in coaching, while reducing the prevalence of autocratic, "win-at-all cost" mentalities common in many sporting contexts. Athlete-centered coaching adopts an attitude of facilitation and teaching. By focusing on teaching the mind, body, and spirit of the athlete, humanistic needs are fulfilled and athletes are empowered.

WHY ATHLETE-CENTERED COACHING IS BENEFICIAL

Athlete-centered coaching has several positive implications in sport. Athlete-centered coaching empowers athletes and coaches, focuses on athletes' personal achievements, is preferred by athletes, and is in agreement with the mission of the Olympic Games, the pinnacle of sport competition. This section outlines the importance of these four implications in sport.

Empowering Athletes and Coaches

Several sources of empowerment through humanistic coaching for both the coach and the athlete have been identified (Cross, 2002 as referenced by Jenny, 2013; De Souza & Oslin, 2008). For the coach these include: 1) transferring responsibility to the athlete for their own success, 2) pressure on the coach is reduced as he is no longer the sole source of direction, knowledge, and wisdom, 3) decreased likelihood to play the "blame game" as all share responsibility, and 4) the importance on winning is no longer the primary motivator.

BY FOCUSING ON TEACHING THE MIND, BODY, AND SPIRIT OF THE ATHLETE, HUMANISTIC NEEDS ARE FULFILLED AND ATHLETES ARE EMPOWERED

Athletes are empowered through: 1) encouragement to discover their full potential, 2) increased independence, self-reliance, and control, 3) prioritization of personal goals over winning, 4) ownership of responsibility for success and failure, 5) valuing of creativity and imagination, 6) increased feelings of competence and motivation, and 7) support through the highs and lows of sport involvement. Additionally, communication is boosted between coaches and athletes. DeSouza

and Oslin further comment that these benefits increase athlete engagement in the athletic process. Altogether, these sources all lead toward a more positive experience for both coaches and athletes.

Focusing on Personal Achievement

Athletes participate in sport for various reasons, among which, is the desire to meet full athletic potential (Caron, Bloom, & Bennie, 2015; Jenny, 2013; Stec, 2011). Studies that examined why athletes chose the schools they did found that coaching staff, scholarship awards, academic reputation, athletics facilities, location, and coaching philosophy/style emerged most often as top influencers of college choice (Baumgartner, 1999; Bukowski, 1995; Croft, 2008; Crowley, 2004; Fielitz, 2001; Glasby, 2014; Howat, 1999; Pauline, 2010; Pauline, Pauline, & Allen, 2008; Reynaud, 1998; Walker, 2002).

Among these, two of these studies also indicated the desire to achieve unmet athletic potential contributed to the selection decision as well. While factors relating to the need to meet unmet potential are only observed twice in these studies, they emerged as influential in both studies that allowed for their consideration. Thus, while motivating factors for college selection include an array of factors, evidence exists that the need to achieve unmet potential is of personal importance to prospective college student-athletes.

Research on sources of athlete motivation additionally demonstrate this importance. Frey and Ruble (1990) investigated the focuses of goal setting and competition satisfaction in competive runners. This study found race time improvement to be a powerful predictor of satisfaction shared by adults of all ages, including college-aged (20-22 years) participants. Additionally, 84% of runners experiencing continual improvement and 76% of runners who maintained stable performance times indicated that achieving specific finishing times were of primary concern. Lombardo, (1999) has demonstrated the connection between achievement of personal goals and self-actualization. Therefore, it may be reasonable to suggest that personal improvement in performance is a source of humanistic fulfillment in endurance runners. Athlete-centered coaching focuses primarily on providing for this demonstrated need to reach unmet potential, implicating it as a means by which the coach can facilitate this kind of success.

Athlete Preference for Athlete-Centered Coaching

While there is currently no evidence to directly suggest that athlete-centered coaching is effective at improving performance, there is evidence to suggest that athletes prefer humanistic coaching styles in comparison with more autocratic coaching styles. Parker and colleagues (2012) found that coaches who 1) remain calm and do not yell, 2) are caring and encouraging, 3) have knowledge of the sport, and 4) involve the team in decision-making were most preferred with youth soccer players. In two separate studies, Hastie (1993, 1995) found that volleyball players preferred coaches who provided positive feedback and were democratic (i.e. humanistic). Cuka & Zhurda (2006) found concurrent results with 80.9% of Albanian athletes preferring democratic coaching philosophies across multiple sports and among both males and females. Taken together, these studies provide evidence that athletes may prefer humanistic coaching practices over more “old school” approaches.

Humanism and Olympism

Societal support exists for the emphasis of humanistic fulfillment in sport. As an Olympic sport, the importance of individual achievement is emphasized in the Olympic Creed which states, “The most important thing in the Olympic Games is not to win but to take part...The essential thing is not to have conquered but to have fought well,” (“The Olympic symbols,” 2007, p.5). This emphasis on fulfillment of personal potential rather than competitive victory, even at the pinnacle of sport competition, indicates an implicit value of humanistic fulfillment which can be demonstrated by the adoption of athlete-centered coaching as discussed above.

HOW TO IMPLEMENT ATHLETE-CENTERED COACHING

Before addressing how a coach may go about adopting an athlete-centered coaching approach, it should be noted that there is no single correct way that a coach should operate. Indeed, Ron Warhurst (1985) of the University of Michigan stated that a training program may work one year for a college cross-country team only for it to fail the next indicating that not every program is suited for every individual. Côté and colleagues (2007) identify that success in coaching is rooted in the coach’s ability to align competencies in coaching with the needs of the athletes. This involves the effective implication of professional,

interpersonal, and intrapersonal knowledge of their current team (Côté & Gilbert, 2009).

However, two things a coach can do to purposefully implement athlete-centered coaching without disregarding the constantly fluctuating contextual dynamic is to 1) construct an athlete-centered coaching philosophy statement and to 2) regularly set personal goals for her or himself just as goals are set for the athletes. By purposefully implementing these actions, the coach creates an environment for him or herself that can help take idealistic intention of athlete-centered coaching and materialize it into deliberate action.

Adopting a Coaching Philosophy

Coaching philosophies are generally promoted as able to improve effectiveness within an athletic program (Martens, 2012). This is accomplished by clarifying the coach's mind on many aspects of the coaching process, which in turn helps him or her make decisions with certainty (Hogg, 1995; Parsh, 2007). Evidence in social psychology strongly suggests that attitudes follow exhibited behaviors, or in other words, attitudes change to meet or align with actions (Festinger, 1962). By writing down a philosophy statement and revisiting it regularly, a coach creates an environment for his or her coaching to fall in line with what he or she believes. Answering the following questions when constructing an athlete-centered coaching philosophy, may help guide you in articulating to yourself what you believe the best coaching practice looks like for your team:

- How will you define success on your team?
- How will you use collaborative processes on your team?
- How will decisions on your team be made?
- How will you address body, mind, and spirit on your team?
- How will relationships be developed on your team?

BY WRITING DOWN A PHILOSOPHY STATEMENT AND REVISITING IT REGULARLY, A COACH CREATES AN ENVIRONMENT FOR HIS OR HER COACHING TO FALL IN LINE WITH WHAT HE OR SHE BELIEVES

No two coaching contexts are identical, and the way coaches approach these and other questions may be different. As a coach answers these questions, it is prudent to avoid the temptation to seek the *right* answer; rather the coach should seek the answer that is right *for his or her team.*

While the development of a coaching philosophy statement can help a coach develop athlete-centered attitudes, it is important to acknowledge that a coaching philosophy is even more truly expressed through coaching behavior rather than through philosophy statements. This is mentioned because attitudes and actions often fail to align as coaches sometimes preach one thing while practicing another (Garringer, 1989; Lyle, 2002; Martens, 2012).

Jenny & Hushman (2014) examined the philosophy of endurance running coaches against humanistic philosophy and the extent to which coaches facilitated humanistic environments. Findings suggested that humanistic approaches that were collaborative and involved joint decisions between coach and athlete provided athletes with opportunities to self-regulate, individualize, and make decisions they felt were in their best interests. However, many coaches chose not to employ coach/athlete decision-making for training sessions that target specific physiological adaptations (e.g., improvement in anaerobic threshold through interval training) indicating a deviance away from a professed athlete-centered coaching approach. Therefore, it is important to stress that coaches should constantly compare their methods with their accepted philosophies to ensure congruence between them.

Setting Coaching Goals

One way to create a regular means of comparison of coaching practice with coaching philosophy is by creating coaching goals for components of the training season. When coaching athletes, coaches design training around an all-encompassing goal. However, to effectively pursue this overall goal. A series of objectives and smaller goals are created to develop the abilities and skills for the overarching end-goal. For the coach, developing a coaching philosophy could be thought of as setting that overarching goal. In order to develop one's self into the coach that he or she wants to be, setting smaller, demonstrable goals can help the coach adhere to his or her coaching philosophy. These goals could be constructed on a daily, weekly, monthly, or seasonal basis.

Goals might relate to the following themes:

- Emphasizing your team's defined measure of success
- Providing way for athletes and coaches to collaborative
- Providing ways for athletes to make directive decisions
- Paying attention to more than just the physical work of training
- Providing opportunities to build relationships

Studies in psychology have indicated that setting explicit goals is likely to increase the likelihood that the behavior will be followed (Fiske & Taylor, 2008). Implementation intentions such as these have been found to be profoundly effective with over 90 studies showing them to foster goal attainment (Gollwitzer & Sheeran, 2006). Taking roots in theories of self-regulation (e.g., Zimmerman & Kitsantas, 2005), it is theoretically sound to suggest that the more often a coach engages in the cycle of setting goals, creating strategies to meet those goals, and evaluating his or her success or failure in meeting those goals, the more rapidly the coach will be able to meet the overarching goal of being an athlete-centered coach.

However, self-imposing, or as a head coach, imposing on staff the requirement to create new goals too often could result in frustration and demotivation towards the pursuit of those goals due to feelings of inadequacy stemming from a lack of success in the goal setting itself (Bandura, 1997). Therefore, by setting achievable coaching goals for non-imposing time periods, a coach creates for her or himself an environment in which she or he can integrate athlete-centered coaching practices into her or his coaching practice.

Reservations of Athlete-Centered Coaching

Athlete-centered coaching has many beneficial implications. However, it is not without some reservation. Some authors believe that existing perspectives around athlete-centered coaching make over-generalized assumptions which could be problematic and produce dangerous effects for coaches, and the valuation of the coaching profession at large (Denison & Avner, 2011). Some of the approaches to positive coaching in the literature reduce the positive coaching process to a mechanistic "checklist approach" to becoming an athlete-centered coach (Martens, 2012; Sabock & Sabock, 2008). As stated earlier, no two coaching contexts are identical and therefore the requirements for any two coaching contexts will likely vary. This has concerned some authors as challenges in coaching rarely come in a standard form and cannot always be approached with a fixed set of problem-solving strategies (Markula & Martin, 2007; McNamee, 1998; Shogan, 2007). Because of this, while athlete-centered principles can be developed, it is important to recognize that these principles may be implemented in different ways between teams, or even between different seasons on the same team.

CONCLUSION

This brief review has provided an overview of what athlete-centered coaching is, why it may be considered as a coaching philosophy along with some potential limitations, and how a coach may go about adopting this kind of a coaching approach. It is my view that a humanistic coaching focus should pervade all aspects of any coaching process. The nature of track & field requires that training is provided that will be effective for each individual to best meet the demands of the environment in which she or he competes, that is to prioritize the meeting of unmet potential. Implementing an athlete-centered approach purposefully pursues these individual needs on the path to mastery and self-fulfillment as a track & field athlete.

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From the Editor

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Soviets had a Kenyanesque dominance in the hammer frequently producing 40 of the top 50 male hammer throwers in any given year. Are you laughing now? While sources disagree, many researchers have found the index finger to be the strongest of all the fingers. I recently did a pilot study on which finger was stronger and the index finger won—hands down. The index finger accounted for approximately 34% of total grip strength and beat the strength of the middle finger by 4%.

There are many ways to strengthen the grip but the general caveat here may be to consider grip strength as one of those qualities that should be "optimized, not maximized." Diminishing returns in the form of forearm compartment syndromes may be the result of using Popeye as a role model.

Al Oerter used to dribble a medicine ball against a wall with his arms extended above his head. Lifting with a thicker straight bar activates the forearm muscles that control fingertip strength. Fat bars or fat bar attachments are available on the Internet.

The hands are the first and last parts of the body to touch the weapons of war. Total body conditioning should be just that—total body because the first are the last. Little things can make a big difference. You only need to win by a centimeter in the throws, coincidentally about the width of a finger.

A FEW NOTES ABOUT A COACH NAMED PETROV

Vault coach Vitaly Petrov's theories sometimes are questioned in these pages. Here is a spirited defense of the "Master's" methods by Rice coach David Butler.

BY DAVID BUTLER, RICE UNIVERSITY ATHLETICS, USA NATIONAL POLE VAULT EXECUTIVE STAFF

There seems to be a lot of misunderstanding, controversy, and confusion about the teachings of a man named Vitaly Petrov. Vitaly Petrov was Sergey Bubka's mentor and teacher back in the day. Coach Petrov created and developed some "pole vault concepts" that are debated, ignored, criticized, and utilized by nearly all who either coach the event or have held fiberglass in their hands. I thought that I'd attempt to clarify or bring to focus some of these "concepts" of Petrov.

Why me? How do I know?

I had the great privilege of traveling to Formia, Italy the summers of 2000-2006 to meet with the Master. We first met at the USA National Pole Vault Summit in the early 1990's. He watched my high school vaulter warm up and liked the way he dropped his pole tip during the approach. I was a high school coach coaching "from study & observation." I noticed and figured that Bubka was doing some things differently. And they worked. So, I taught what I saw, even though I may not have understood the reasons why.

Those incredible six summer pilgrimages to Formia were like an apprentice climbing the mountain again and again to learn from the Guru, the "pole vault monk" who had the answers to my questions. Petrov invited me with open arms and an open heart, taking time to help me understand and pay attention to the little details I never even noticed before. When I returned to

Petrov at work

the USA, I began to teach what I was taught to my college athletes. It was amazing! They responded to the addtional pole vault knowledge with huge PRs!

Vitaly Petrov revitalized my coaching career! He became like my "big vault older brother" or my "Uncle Petrov" who gave me a wealth of knowledge that I didn't know or see before!! Let me share with you all, some interesting things I learned from "the horses mouth." Please understand, Vitaly Petrov is one of the greatest teachers I've ever met. That's why the world is invited to train in Formia, an "International Pole Vault Center".

There are three major things I learned from Vitaly that seem to be ignored or missing in vaulters' technique and coaching instruction today. These "big three" can revolutionize an athlete on a pole or the coach's ability to help many athletes realize their dreams.

1. **The Active Pole Drop** (a difficult technique that few coaches pay attention to). Petrov first noticed the benefits of sprinting with a pole that is moving with the vaulter's body rather than being carried as a dead weight down the runway. He got this from his coach in the Ukraine, who returned from serving in WWII with his left arm sacrificed in battle. Petrov watched his coach pole vault on bamboo by carrying it with one arm down the runway and clearing the bar, landing in sawdust and sand. His coach would start with the tip nearly straight up in the air, resting against his right shoulder. As he ran faster, the pole left his shoulder and fell with the rhythm of his run! Active pole drop!! Fast forward to the early 1980's and we see a young Bubka with the pole's fall helping him run faster, hold higher and get on stiffer poles!! Today, many and most IGNORE the pole drop and just carry that static, dead weight down the runway. It is not an easy technique to learn, but once it is learned, the vaulter will be taller, more postural, faster and be vaulting higher.

2. **Free Takeoff.** Just picture a free takeoff being a weightlifter pushing a weight up using his whole body (like weightlifters do). A free takeoff is, in Petrov's words, "SAME TIME". Same time the vaulter takes off from his toes and the pole strikes the back of the box, same time!! This free takeoff is simply pushing the pole to its highest possible angle for any given vaulter.

   This higher angle bends the pole higher and rolls it over like a whiplash!

   The first thing I did when I returned from Italy, was to go out and pole vault myself, trying this free takeoff. I first measured my takeoff step, placing my foot what would be considered a few inches out (in a vertical line from the top of my tophand, through the hips and down to my toes.

   I placed a foam rubber pad down a few inches in front of my "free takeoff step", backed up to around 8-10 steps, and vaulted! When I hit that Free area, the pole "disappeared"!!! It was amazing! I had never hit that position when I was an athlete, but I remember watching Buciarski and Slusarski from Poland warm up at an indoor meet in 1979 or 1980. I remember how they just "flew" off the takeoff. I am sure now that they were jumping close to free.

   If you study the takeoffs of the greats, you will see "free takeoffs" before they were called free. Bob Richards took off free in the 1952 Olympics. So did Ron Morris in 1960. Warmerdam was very close to free and Dr. Fred Hansen (1964 Olympic Champion and my dentist for 25 years) told me that "he liked to take off just a few inches out because he felt he could really get the pole moving!. [Kjell] Isaksson was nearly free when he was setting world records in 1972. The vaulters from the early 1980's all were close to being totally free! How do I know? I simply watch the hips! If the hips are accelerating up and forward when the pole is straight, that's a free takeoff!! Same Time!!! Free takeoff is not jumping and being airborne when the tip hit!! This freezes the rotation of the pole! It's same time!!

   A free takeoff is a great advantage because it gets the vaulter on stiffer poles and higher grips!! It also forces the vaulter to reach at their highest extension, creating a great connection from ground to hands! I believe the hips can be engaged if the vaulter takes off anywhere between the ball of the foot to the toes, which is within a vertical line from the top hand. A vaulter does not have to be OUT in order to get the pole pushed off the ground, though I prefer a little bit OUT. In Petrov's words, "not knee drive, my boy, hips!" A free takeoff accelerates the

pole towards vertical before it bends and as it bends!!! It's that "straight pole" rotation that is a hidden power of a free takeoff! It is not a myth, not fantasy, it is a fine, wonderful detail that helps vaulters vault higher!!!!

3. **Elastic…** Elastic is the body jumping through the left arm, the arms expanding above the vaulter at takeoff! Elastic movement allows the vaulter to enter the pole and become part of the pole, rotating the pole higher and faster! When the shoulders/arms/hands move up, they allow the hips to cast forward, setting up a long and powerful swing towards vertical.

   Elastic is how the vaulters of history moved the poles! The vaulters on bamboo and steel would shift their bottom hand up to their top hand and elastically stretch/cast/extend their body through the pole! If they had not used this "elastic attack" into the pole, they would not land in sawdust or sand. They discovered this elastic technique through trial and error, for the purpose of survival and vaulting higher!

Petrov told me years ago that his idols in vaulting were Warmerdam and Sternberg, both great elastic, giant swingers who were "gymnasts" on a stick! Elastic is the way everyone jumped up to the mid-1980's. Since then, many vaulters "block" their shoulders/arms at takeoff, force bending the pole! Yes, this is a way to pole vault, but not as powerful and dynamic as being elastic. Elastic vaulters can "swing to and on top of a bigger bend" or "catch the bend before it unbends." It is a natural way to pole vault.

Petrov, for over 50 years now, has formulated his pole vault philosophy from the history of the event. He has studied the little details of the athletes who used bamboo, steel and fiberglass. In fact, the basis, the structure of his model, is "the straight pole." Petrov teaches vaulters to move straight poles even before they learn to bend the pole. It is difficult to move a straight, non-bending pole without jumping free and being elastic!

In my opinion, these three core techniques are the essence of the practices of Vitaly Petrov. Those who refuse to understand are missing these crucial details that help vaulters make huge improvements. Ignoring Petrov means you are ignoring pole vault history. He is not called the "Father of Modern Pole Vaulting" for nothing. Open you eyes and your mind. See if an active pole drop or a free takeoff or being elastic makes the pole rotate faster! Your vaulter will feel the difference!

A toast to one of the greatest teachers of our beloved event. I am in a great debt to a man who has never asked for anything in return, a coach who never made me feel like he was elite or that I was stupid for not knowing. Petrov always treated me with respect and shared willingly, the joy of pole vaulting! Thank you Vitaly, my mentor, my brother, OUR uncle of the pole vault.

PETROV—A SUCCESSFUL COACH

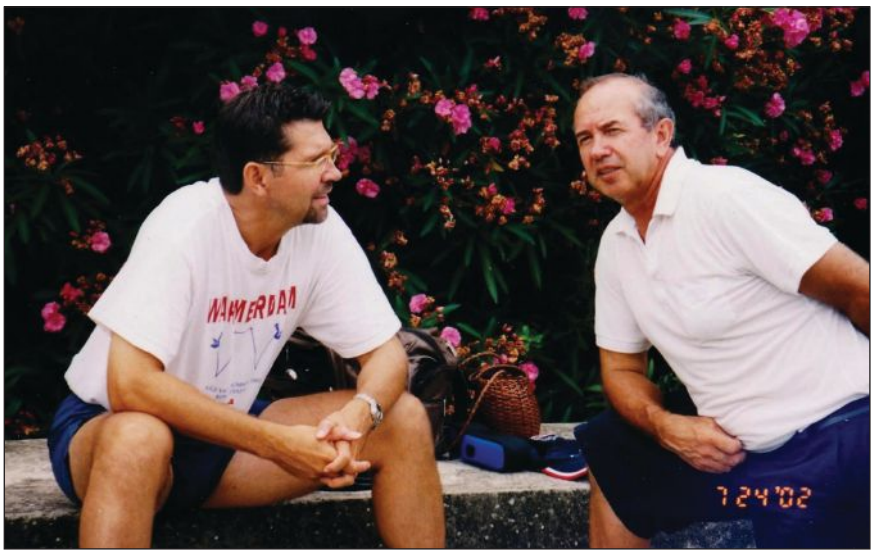
Sergey Bubka
1983, 1987 World Champion
1988 Olympic Champion
Multiple world records

Giuseppe Gibilisco
2003 World Champion
2004 Olympic Bronze

Yelena Isinbayeva
2005, 2007 World Champion
2008 Olympic Champion
Multiple world records

Fabiana Murer
2011 World Champion

Thiago Braz
2016 Olympic Champion



The author with Coach Petrov, 2002.

HAS THE ROTATIONAL SHOT PUT STYLE TAKEN OVER THE EVENT?

Is the glide going the way of the horse-and-buggy and the straddle high jump?

BY JOHN N. KERNAN, EdD
USATAF LEVEL III THROWS COACH—PUYALLUP, WA,
WITH KEVIN MCGILL

INTRODUCTION

Or maybe a better question is: "Has the rotational shot put style become the new "Flop" of the track & field world"?

RECENT SWEEP

The recent Rio '16 Olympic shot put sweep must give pause for thought by throws coaches; especially those working with youth and beginning throwers. *Should they teach the rotational style? Should they start with glide? Should one precede the other?*

Track & field historians will note that while in the 1968 Olympic Games high jump competition Dick Fosbury used his revolutionary "flop" style to win the gold medal, straddle jumpers still won international and national medals and championships up through and including the 1980's. So, it was not an immediate change or rush to dominance (especially in Eastern Europe), but rather a gradual process to what we find now. It seems the only time a straddle jumper can be found is in a local seniors or masters meet!

The question really needs to be asked if the shot put event is moving strongly from gliders to those who rotate? Although recent World and Olympic Games results still find gliders winning medals and championships (especially on the women's side), will the next generation evolve to the rotational style of shot put throwing? Will we see all the girls and women follow suit?

LITERATURE REVIEW

I went to a couple of reliable resources for the research basics of the rotational versus glide techniques. Technical food for thought!

1. *Track and Field Omnibook* (Ken Doherty, 5th Edition, 2007)

   "The greatest advantage of the spin technique is the superior development of momentum and the application of force over the greatest distance."

2. *Basic Track & Field Biomechan-*

Ryan Crouser, 2016 Olympic shot put champion

ics (Tom Ecker, 4th Edition, 2015)

"The great successes of some rotational shot putters in recent years cannot be attributed to an increase in release speed due to the turning action of the rotational technique. The reason for the successes of the rotational shot putters is an increased release speed made possible by an improved delivery position that is produced at the conclusion of the turning action."

PRACTICAL APPLICATION AND OBSERVATION

While it is good to have the solid sport research at your back for a decision on how you are going to present a technique and style to a young athlete, my focus was to take this question to several of my colleagues and mentors to give both an expert and practical answer to the above question. I have contacted and posed questions about teaching and training for the rotational technique versus the glide technique to shot put athletes and beginners. I reached out to former *Track Coach* editor and throws coach Kevin McGill, throws coach John Smith of Ole' Miss, and Dr. Larry Judge of the Ball State University coaching education department, as well as other USATF Coaching Education colleagues and mentors.

For over two decades, through the seventies and into the nineties, I personally trained my athletes to learn both techniques. Recently, however, I have had more success with my middle and high school athletes as well as elite disabled throwers and collegians teaching the rotational style first, or converting them from the glide. Since doing this, almost all of the athletes not only improved their overall marks, but have experienced an improvement in marks from those who throw not only the discus but the hammer as well.

My explanation for this is that the multitude of rotational drills and throws ingrain better hip and foot movements for the other events despite the ring dimensions or event technique differences. Personally, I have found that those who are not as strong and powerful initially, do better in the rotational style. This has been especially true with combined event athletes, specifically the men. Obviously, when strength and power levels come up, so does the length of their throws.

Some recent experimentation from Dieter Poppe from New Zealand has shown some of his youth and younger throwers training with two turns for rotational shot as well as

discus. When I posed a question about this method to Olympian and discus great Jay Silvester last year, he stated that he had experimented back in the sixties with double rotation for his discus technique. While he never felt comfortable with two turns, he did adjust his starting point at the back of the ring to initiate more torque for him, something that set him apart from other discus throwers of his era.

NOT SO FAST!

Kevin McGill, co-author of *The Throws Manual*, has been one of my mentors for the throwing events. He was one of my USATF Level II and III instructors during my developmental years. Though I am convinced that the rotation is the way to present, teach, and coach shot put technique, Kevin has several good ideas to consider.

To answer your question about the rotational shot, I looked back at the last ten Olympics, just the men. There were 30 medals awarded from 1980-2016, and 17 were rotational; 13 were glide. However, in gold medals, there were six glide winners, and four rotational winners.

Looking at 2016, we can remember that two-time Olympic Gold Medalist, Majewski, did not have a great day with 20.72, but he does have a PR of 21.95. David Storl was also out of the medals, and was a silver medalist in 2012. He threw 20.44, but has a PR of 22.20.

Ryan Crouser was dominant in this Olympics, no question. Joe Kovacs, also a rotational thrower, did not have his best day, but has a PR of 22.56. Kovacs would have had to nearly match his PR to win over Crouser. It can be said that IF Majewski and Storl had matched their PR's, then it would have been a different story!

While Europe has produced several great rotational throwers, in recent years Majewski and Storl have usually managed to handle them with their glide technique. In the U.S., the glide seems to be vanishing with the men, but Michelle Carter is keeping the flame alive on the women's side. In recent years, Valerie Adams has been dominant, winning the Olympics twice, and the World's Outdoor Championships four times as a glider.

Back in 2000, pundits may have said: "See the glide is dead, all three Olympic medals went to rotational throwers". So, we have the situation in 2016, where it will also be said: ***The glide is dead****.*

Many coaches have wondered if there is value in learning the glide first, even if the goal of the coach is to have the athletes do the rotation. In my opinion, the value of the glide is in learning the power position, and how to deliver a shot using both legs, hips, upper body in the correct order. The glide is easier to teach than the rotational, because the timing is simpler. In the past 40 years or so, dozens of articles have been written on the rotational shot, and the science concludes that the rotation, if done properly, can provide an increase in distance, for most athletes.

For the women athletes, the glide is the better bet for most. When you discuss the men, and look at the Olympics since 1980, you could say that despite the science supporting the rotation, the reality is: it is a toss-up.

The U.S. had fantastic rotational throwers in 2008 and 2012 lose to a glider, and that is recent history. While coaches here in the U.S. appear to have abandoned the glide, we have to keep in mind that some athletes may be more suited to a glide. It is up to the coach, to read the literature, and make decisions based on experimenting with both techniques, before going into the rotation. David Storl is still a young thrower, and as he improves, and gets closer to 23 meters, our U.S. coaches need to be prepared!!

So, in conclusion, don't count out the glide when the women are doing fine with it; and two of the last three men's gold medals were won by a glider!!

While I concur that the rotational style shot put may not be for everyone, I do favor the mass movement to the rotational for most of the younger throwers. And while I can agree that the glide for some may be a "if it works don't fix it" proposition, I don't feel that the glide power position is a prerequisite for learning the rotational. As a matter of fact, I don't feel the rotational shot put power position is the same as the glide! Mac Wilkins inferred that when Crouser won the Olympic title one of the most extraordinary things was that he didn't foul. It has been a common theme that those who rotate foul more than the glide style. My take on this that more fouls mean the thrower is trying to hit a glide power position rather than a rotational style power position. After over 40 years of watching film and video of both styles my conclusion is there a distinct difference in the setup of the power positions.

THE FUNCTIONS OF EXTREMITIES IN DISCUS THROWING

Biomechanical considerations in the discus. This piece is adapted from an article which first appeared in *Long & Strong*, April 2009.

BY ANDREAS V. MAHERAS PH.D., FORT HAYES STATE UNIVERSITY

Angular momentum, which is also called rotary momentum is a mechanical factor in discus throwing that basically describes how fast the thrower+discus system is rotating (speed of rotation). In this respect, angular momentum is also related to how "spread out" the system may be with respect to the axis of rotation. The faster the system is rotating and the more spread out the system is with respect to the axis of rotation, the greater the angular momentum of the system.

Changes in the angular momentum of the system can occur only when forces are exerted at a point off center to its center of mass (c.m.). In turn, this is only possible when the system is directly affected by another system as, for example, the ground.

In cases where the system is not in direct, physical contact with other systems, its angular momentum will remain constant. In discus throwing when the thrower is airborne, as happens in the phase between left foot takeoff and right foot touchdown in the middle of the circle, the angular momentum of the thrower+discus system will remain constant. Generally, engaging the "free" extremities quite aggressively towards the direction of the angular momentum that the thrower desires to achieve enhances the generation of angular momentum in discus throwing.

It is also possible to transfer angular momentum from one part of the system to another, while for any given amount of angular momentum that a part of the system has, the closer this part is kept to the axis of rotation, the faster it will tend to rotate around that axis.

In discus throwing, the thrower will acquire angular momentum, the discus will acquire angular momentum, and the combined thrower+discus system will acquire angular momentum. The force interaction between the thrower and the ground will determine the generation (or the loss) of angular momentum for the thrower+discus system, while the force interaction between the thrower and the discus

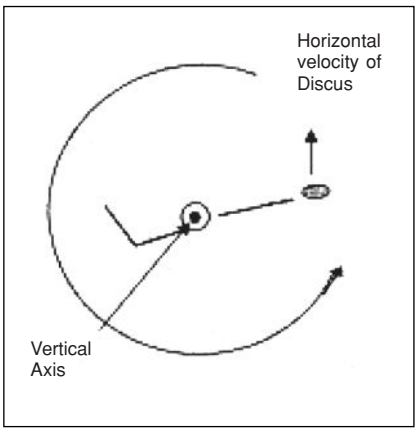


Figure 1: Angular momentum about the vertical axis (view from top. Curved arrow indicates direction of rotation).

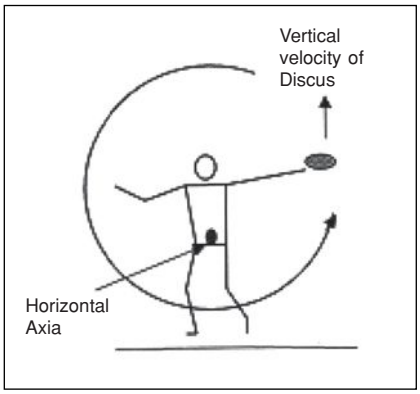


Figure 2: Angular momentum about the horizontal axis (view from the 0° azimuthal angle. Curved arrow indicates direction of rotation).

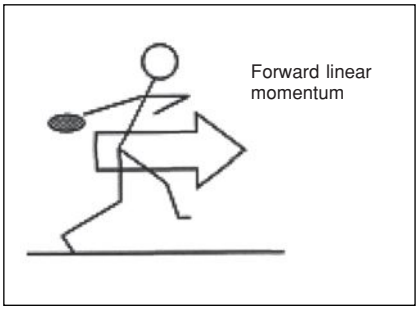


Figure 3: Forward linear momentum (transition to the middle of the circle).

will determine the transfer of angular momentum from the thrower to the discus or vice versa. In these terms, the angular momentum of the thrower+discus system is equal to the angular momentum of the thrower plus the angular momentum of the discus.

In studying the angular momentum of the discus, one can gain an insight as to the actual speed of it because those two values are directly proportional. In other words, by examining the angular momentum of the discus we can also tell whether the discus is moving fast or not.

The ground reaction forces will produce angular momentum in two directions. There is angular momentum about the vertical axis (Figure 1) and there is also angular momentum about the horizontal axis (Figure 2). A transfer of angular momentum about the vertical axis from the thrower to the discus imparts horizontal speed to the discus. A transfer of angular momentum about the horizontal axis from the thrower to the discus imparts vertical speed to the discus (Dapena, 1993; Maheras, 2007).

In discus throwing there is also linear momentum generation involved. Forward linear momentum (Figure 3) will contribute approximately 6% to the horizontal speed of the discus at release with the angular momentum about the vertical axis contributing the remaining 94% of the horizontal speed. Upward linear momentum (Figure 4) will contribute approximately 10% of the vertical speed of the discus at release with the angular momentum about the horizontal axis contributing the remaining 90% of the vertical speed (Dapena, 1993; 1994). Therefore, as a whole, the contribution of the rotary momentum in discus throwing (its contribution to the speed of the discus at release) is significantly greater than the contribution of the linear momentum in both the vertical and the horizontal directions. Given this fact, the action of the extremities as sources of rotary momentum generation is examined below.

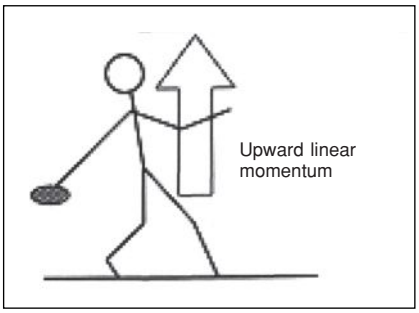


Figure 4: Upward linear momentum (final delivery).

PROPULSIVE ACTIONS OF THE RIGHT LEG AND THE LEFT ARM IN THE BACK OF THE CIRCLE

As soon as the right foot is lifted off the ground in the back of the circle, the right leg should make a rather wide counterclockwise rotation around the body as viewed from overhead. Following, it should be "thrust" very aggressively towards the front/middle of the circle. This thrusting action of the right leg enables the generation of angular momentum around the vertical axis due to the fact that it makes it easier for the left foot to exert on the ground the forces that are necessary for generating angular momentum. The right leg should be thrown around the body in a controlled but very fast way and over the longest range of motion possible. This dynamic action of the right leg can be experimentally evaluated with the larger values considered to be optimum in discus throwing (Dapena & Anderst, 1997).

In case the right leg action seems to be less than optimum, two main factors can be the cause. First, the angular momentum of the right leg

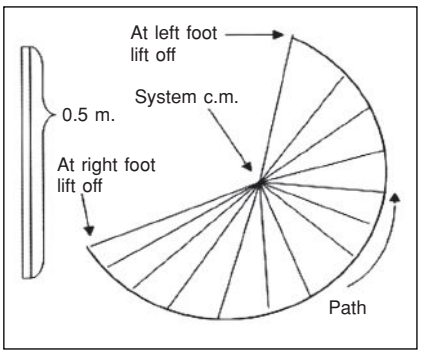


Figure 5: Approximate path of the c.m. of the right leg during its drive. The larger the shaded area the better (adaptedfrom Dapena & Anderst, 1997).

may be small or second, the duration of the sweeping of the right leg may be too brief. In the case where the angular momentum of the right leg is small, this could be due to a slow speed of rotation of the leg or due to a short distance between the c.m. of the leg and the c.m. of the system (Figure 5).

The activity of the left arm in the back of the circle is similar to that of the right leg. As soon as the discus reaches its furthermost position to the right during the winds, and until the lift off of the left foot, the left arm should execute a wide rotation around the body and towards the left. This sweeping action of the left arm enables the generation of angular momentum around the vertical axis following the same mechanism as during the action of the right leg.

The left arm should be thrust in a controlled manner but at high speed, far from the middle of the body and over the longest possible range of motion. During the dynamic action of the left arm, larger values of angular momentum are considered to be optimum in discus throwing. If the left arm action seems to be less than optimum, either the angular momentum of the arm may be small, or the combined duration of the double support and single support over the left foot in the back of the circle may be too brief. In the case where the angular momentum of the left arm is small, this could be due to a slow speed of rotation of the arm or due to a short distance between the c.m. of the arm and the c.m. of the system (Figure 6).

An important observation in comparing the momentum of the right leg and the left arm in the back of the circle is that the average angular momentum of the left arm is only about half of that of the right leg (Dapena & Anderst, 1997). However, the sweeping of the left arm lasts two and a half times longer than the sweeping of the right leg. Therefore, the longer duration of the sweep of the left arm allows the left arm to make a larger contribution to the rotation of the system. On average, the action of the left arm contributes about a third more than the action of the right leg to the rotation of the system.

RECOVERIES OF THE RIGHT AND LEFT LEGS

During the airborne phase immediately following the left foot push-off in the back of the circle, when ground contact is lost, no more angular momentum can be produced and the legs cannot be used for the generation of such momentum. The new role of the legs during this phase is to increase their own speeds of rotation in relation to the upper body. This will allow for an early and quick planting of the left foot in the front of the circle—a beneficial action in discus throwing—(also see Maheras, 2008) and will also enable the thrower to assume a "wound-up" position in the middle of the circle, one where the lower body and hip axis are rotated significantly ahead of the upper body and the shoulder axis. To achieve a faster rotation of the legs, the thrower, during the non-support phase and the single support over the right foot, should decrease as much as possible the distance between the c.m. of the right and left leg and the axis of the system.

That axis passes through the system's c.m., is in line with the lower and upper part of the system and if the system tilts, it tilts also. During this airborne phase, the smaller the radius of the legs the better (Figures 7, 8).

RECOVERY OF THE LEFT ARM

As is the case with the right and left legs, the left arm is also unable to produce any additional angular

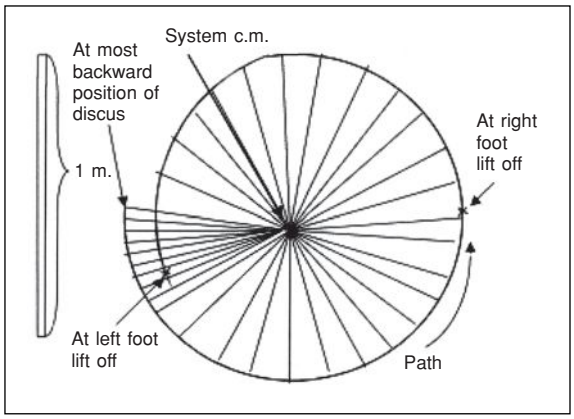


Figure 6: Approximate path of the c.m. of the left arm during its initial drive. The larger the shaded area the better (adapted from Dapena & Anderst, 1997).

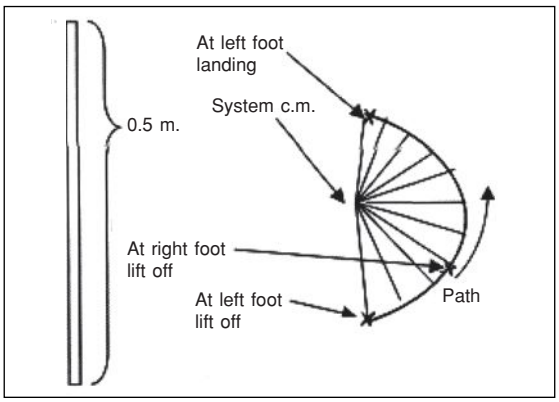


Figure 7: Approximate path of the c.m of the left leg during its recovery. The smaller the shaded area the better (adapted from Dapena & Anderst, 1997).

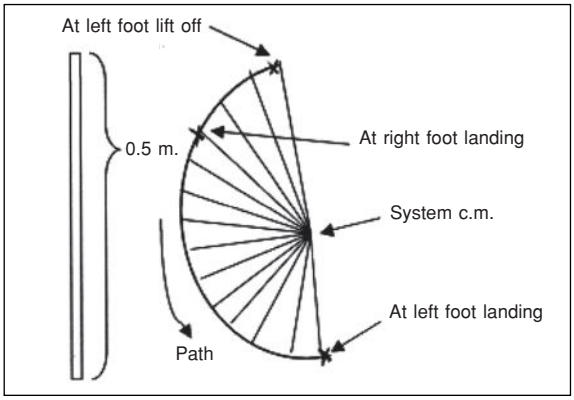


Figure 8: Approximate path of the c.m. of the right leg during its recovery. The smaller the shaded area the better (adapted from Dapena & Anderst, 1997).

momentum during the airborne phase after the left foot lifts off in the back of the circle. This is again due to the loss of ground contact. The function of the left arm during this airborne phase is to slow down its rotation and/or decrease its radius of rotation. This will cause the arm to use a smaller amount of the total angular momentum of the system and thus there will be more angular momentum available for the other parts of the system. Essentially, there is a transfer of angular momentum from the left arm to the rest of the system. There are two advantages of the mentioned slowing down of the left arm. First, the thrower can indeed transfer angular momentum to the legs where it is needed the most.

That is, the slowing down of the left arm, in cooperation with the mid-section muscles, contributes in speeding up the rotation of the legs which in turn results in an earlier planting of the left foot in the front of the circle. Second, the slowing down of the left arm causes it to fall behind in its rotation with respect to the rest of the system. In turn, this makes it possible for the left arm to later execute another counterclockwise (towards the left) sweeping action as soon as ground support has been reestablished. This second sweeping action aids in generating additional angular momentum for the system during the single support over the right foot and the double support delivery phases.

If the angular momentum of the left arm is large during the period of the left foot takeoff in the back of the circle and the subsequent right foot landing, either the arm is rotating too fast or the radius of the arm is kept too long. It is not clear what would be the preferred method as the thrower attempts to keep the angular momentum of the left arm low. Does a thrower need to slow the arm down or does he/she need to shorten its radius of rotation? Both methods will be equally effective in helping the legs accelerate.

However, the slowing down of the arm action offers the advantage of allowing the left arm to keep moving over a long range of motion in the ensuing single support and double support phases (Dapena & Anderst, 1997). If the left arm's radius is shortened, that short radius will cause the arm to keep moving to the left quite fast which will allow for a smaller range of motion available for the arm in the subsequent single and double support phase (Figure 9).

SECOND PROPULSIVE DRIVE OF THE LEFT ARM

Following the right foot landing in

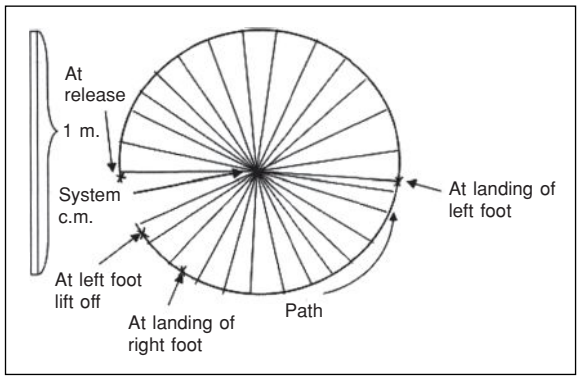


Figure 9: Approximate path of the c.m. of the left arm during its initial recovery, during its second drive and, during its second recovery (adapted from Dapena & Anderst, 1997).

the middle of the circle, the thrower should throw the left arm very dynamically to the left, far from the middle of the body and through the longest range of motion possible (Figure 9). As a result, the c.m. of the left arm obtains a significant amount of speed. This action aids in the generation of angular momentum for the thrower+discus system because it enables the right foot and, during the double support, both feet to exert on the ground the forces necessary for generating angular momentum. A characteristic of this part of the throw is that the thrower has an inclined position towards the back of the circle, which causes the axis to also have a backward incline. Due to that incline, the angular momentum generated by the second propulsive action of the left arm is a combination of angular momentum around a vertical axis and angular momentum around a horizontal axis which is exactly what the discus thrower is after, since during that phase the thrower desires to develop both horizontal and vertical speed which will contribute to the final speed of the discus at release. If the thrower's second left arm drive is less than optimum, that occurs because either the angular momentum of it is small or the combined duration of the single support on the right foot and the delivery phase is too short.

SECOND RECOVERY OF THE LEFT ARM

The second propulsive action of the left arm described above will help the thrower+discus system to acquire more angular momentum from the ground, which is very beneficial for the throw. Most of this angular momentum will be stored in the left arm itself. However, if the thrower keeps the momentum stored in the left arm throughout the delivery phase, then it will not do the thrower any good. That is why, before the release of the discus, it is necessary for the discus thrower to transfer as much of this angular momentum as possible to the discus he/she is holding. To do this, the thrower needs to reduce the angular momentum of the left arm during the final release phase by either slowing down the left arm or by reducing its radius of motion (Figure 9). For a satisfactory transfer of angular momentum from the left arm to the rest of the system and the discus, the smaller the angular momentum of the left arm at the instant of release the better. It seems that most throwers slow down the left arm to reduce its angular momentum while a few others in addition to slowing the arm down will also progressively shorten its radius of rotation by bending the arm at the elbow.

SOME CONSIDERATIONS

Andreas Maheras

It was mentioned earlier that rotary momentum contributes the great majority of the total momentum observed in discus throwing. Based on that, we can generalize and conclude that the discus thrower should make rotary momentum development the focus of his/her throwing and he should be devoting most of his efforts to maximizing the rotational part of his technique and the development of rotary momentum following the guidelines mentioned above. Many coaches and athletes may tend to overemphasize the linear momentum and the linear drive (sprint) from the back of the circle towards the center, at the expense of rotary momentum. However, there is a caveat here. Paying attention to the linear drive from the back of the circle is not entirely a bad thing, because the ground reaction force that drives the thrower off from the back of the circle also contributes to the generation of a fair amount of the angular momentum about the vertical axis. This is due to the fact that (in the view from overhead) the force points off-center to the center of mass of the thrower+discus system as it passes slightly to the right of the c.m. (Dapena. 2009). If a thrower seems to be entirely ignoring the linear aspect of throwing, then there is a need for the coach to address the issue and place the needed emphasis there. However, in the final analysis there is no question that the rotational effect is by far the more important of the two (rotational vs. translational). This should be clear in the coach's mind.

We also saw earlier that on average, the left arm contributes about a third more than the action of the right leg to the rotation of the system. For that reason, the role of the left arm needs to be better appreciated. We saw that the thrower needs to move the left arm aggressively and at high speed to the left and then stop it and "re-wrap" it clockwise prior to the start of the double support. Finally, he should again move it aggressively and at high speed to the left during the final double support, and stop it (or bring it toward the body) just before release. So what the athlete needs to do is, two

(Continued on page 6961)

THE AMERICAN ENDURANCE RUNNING SCENE

Coach Jim Hunt has long been a proponent of speed development in distance runners from the get-go—if American endurance athletes are to be competitive on the world scene.

BY JIM HUNT

American elite endurance runners emerge from our youth and high school programs, where thousands of young athletes begin their running careers. Further, high school and collegiate programs provide the United States with a farm system second to none. So why is it that we produce so few medal winners at the World and Olympic Games?

The problem lies in our roots. To begin with, we are a riding nation, whereas the countries that produce most of the medals emerge from walking and running societies. By walking or running to school, church, work, to visit relatives, and play, young people in these countries develop a base for strong leg muscles. By the time they are of high school age, their working muscles are as strong as American collegiate runners.

Adding to the problem is the fact that when our young males decide to compete in athletic events, those with the best basic speed and athletic ability have been siphoned off into football and soccer. The same is true with young females with soccer and volleyball. What the cross country coach gets is mostly the bottom of the athletic chain.

When track season rolls around, the head coach wants to determine where the talent lies in the new team. The coach then has a time trial at 100 meters. The top four or five become sprinters, the next in line become hurdlers and jumpers, then of course the heavyset members become throwers. The coach in charge of developing 800, 1600 and 3200 runners gets whoever is left. There are few in this group who possess good basic speed. The coach then further impedes their basic speed by sending them out to build up minutes of running with little or no instructions on proper running mechanics or any functional muscle strengthening to prepare their muscles for running.

Excerpt from Ken Doherty's *Track & Field Omnibook:*

I'd start jogging twice a week for five minutes, then ten—twenty—thirty, then three times a week, then daily. I'd do it on a time and fun basis. Distance runners develop primarily by simple progressive increments of enjoyable running.

This is the basic theory of training followed by entry level coaches throughout the U.S. The theory is to start easy and slow, then build toward faster running.

Given their own means of interpreting running form, entry level athletes will, with few exceptions, develop a running rhythm that features overstriding with a slow turnover and foot strike. As the number of minutes of slow running is increased, the athlete becomes neuromuscularly adept at running slow. The slow-to-fast theory of developing entry level athletes defies the fact that speed is the most important physiological factor in determining a person's ability to race at any distance.

Somewhere during the latter part of the training season, the coach decides that in order to race, it might be necessary to develop some speed. Since it takes several weeks of specific training to improve basic speed, it is too late to be truly effective for that season. In many cases, the coach has not spent enough training time conditioning the muscles that do the work of running to withstand this new stress and injury rates rise dramatically during the last few weeks of the season.

The solution to producing better elite runners in this country is for the USATF Coaches Education Committee to come up with a training scheme where entry level athletes are taught to run with power and efficiency and to develop strong, fatigue-resistant working muscles. If our young hopefuls could be exposed to heavy doses of these types of activities for the first 10 years of their running development, they would be more complete runners by the time they become emerging elite athletes. The complete runner is one with speed and strong, fatigue-resistant working muscles that can sustain speed endurance paces for long periods of time and still be able to sprint at the end of a race.

*Track & Field Omnibook: "*Basic speed is the most important single factor in 400-meter performance. There is a close relationship between 100-meter time and 400-meter time and 400 meters time with the 800, 1500, 3k, 5k and 10K."

From the *Omnibook*—Lee Evans: "Run as fast as possible while staying completely relaxed. The ultimate competitor is one who learns how to sustain an all-out fast, relaxed effort for the entire distance" (faster—looser). OK.

From the *Omnibook*—"Coach Timmons: Jim Ryun worked for six weeks to do one thing—learn how to sprint when tired."

Haile Gebrselassie was able to use his speed to surge to a 10-meter lead, then drop back to his race pace and hold that lead. Medals in the World Championships and Olympic Games endurance races go to the athletes who can run the fastest when fatigued. They are the best in the world because they have learned to run fast-relaxed during their development from entry level.

Learning to run fast relaxed is a neuromuscular training procedure. Until our leaders in the profession of coaching endurance runners change their concept of the physiological aspects of developing the complete endurance athlete, the United States will never gain prominence in this area.

Until American coaches and athletes shun the myth that you must establish an aerobic base with submaximal paced running before adding other physiological aspects of training, we are doomed to lag behind in the world of endurance running. In order to change, we must build our training scheme around teaching our entry level athletes how to run with power and efficiency and build strong, fatigue-resistant leg muscles. As we accomplish this, we can jump start all of the other physiological systems and develop both the cardiovascular and neuromuscular aspects.

The faster an athlete's 400-meter time, the greater the potential to race in endurance events of 800 meters to 10K. Improving 400-meter time should be at the top of the list when planning workouts. In order to continually improve basic speed, we must teach the athlete to run with power and efficiency. This learning process must be combined with developing strong, fatigue-resistant working muscles, mainly the core, buttocks, quads and hamstrings.

The basic element of improving real speed is learning to run fast relaxed.

Clyde Hart former Baylor coach: "In order to improve speed, you must eliminate as much back side mechanics as possible and increase front side mechanics as much as possible."

Running skills must be the first thing taught to endurance runners and must be continued throughout their entire running career. Even though Mo Farah did the traditional 120 miles per week, he had to spend four years working on improving his speed before he became the best 5k-10K runner in the world.

Galen Rupp finally won Worlds and Olympic medals after he spent considerable training time improving his speed.

If we accept the fact that basic speed determines an athlete's potential to race any distance, why do coaches in the USA wait until later in the season to develop this aspect? Why not make the very first step of the training period a fast one.

Young, unconditioned, entry level athletes are capable of running short, fast distances from the very beginning. Short, fast intervals accompanied by functional muscle strengthening will form a base for all of the other physiological aspects of training. The greater the stress on the muscles, the greater the stress on the heart.

Coaches are aware of the neuromuscular aspects of training, but either do not understand this aspect or choose to ignore it. The neurological aspects of training are learning to run with power and efficiency and running specific strengthening of the muscles that do the work of running. Running skills must be the first thing a coach teaches an endurance running hopeful and must be continued on a daily basis throughout the entire season and the athlete's entire running career.

TEACHING FUNDAMENTAL RUNNING SKILLS

1. *Posture:* A tall, relaxed torso with the head and shoulders directly over the hips.

2. *Arms:* The arms are the key to relaxation while running. The basic element of improving speed is learning to run fast relaxed. The arms are held at approximately a 90° angle and hang loosely from the shoulder joints. As the elbows move back and forth during the arm swing, the forearm closes the angle slightly at the top of the swing and opens slightly at the bottom of the swing. The hands are closed loosely, with the thumbnails pointing upward. There is no contraction of the muscles in the lower arms.

COACHES ARE AWARE OF THE NEUROMUSCULAR ASPECTS OF TRAINING, BUT EITHER DO NOT UNDERSTAND THIS ASPECT OR CHOOSE TO IGNORE IT.

3. *Foot Strike:* The foot is the lever that provides force for forward movement. The foot is composed of a heel bone, tendons, ligaments and soft tissue which provides stretch power energy that is stored during each foot strike. The foot strikes the surface slightly in front of the heel bone and slightly on the outside. As the weight of the runner's body is being supported, the foot slightly pronates then supinates slightly as the body moves forward. The compression of the tendons and ligaments, along with the pronation and supination action of the foot provides the force for forward motion. The further back under the center of mass the foot strike occurs, the quicker the foot strikes. The quicker the foot strike, the greater the force created.

4. *Front Side Mechanics:* When the toes push off, the thigh and knee are lifted forward and upward. As the thigh reaches its most forward and upward position, the lower leg is extended forward then quickly brought downward to cause a foot strike to occur just in front of the heel bone and as far backwards as possible. When the foot makes contact with the surface, the knee is slightly flexed during the support phase.

5. B*ackside Mechanics:* As the foot pushes backward and the toes leave the surface, it must be driven upward toward the knee as soon as possible. This will cause a high heel follow through, shorter angle between the upper and lower leg. The shorter this angle, the quicker the foot gets back onto the surface. The less time the foot spends on the surface and in the air, the faster one can run.

6. *Turnover and Stride Length:* A turnover is every time the same foot touches down. There are two steps per turnover which is called a stride. The optimal turnover for efficient endurance running is 96-98 per minute. Michael Johnson, when racing the 400 meters, used a turnover of two per second.

   Stride length and turnover must be compatible. Stride length is determined by how far back under the center of mass the foot strike occurs. A quick turnover with a medium length stride is most efficient. In order to accelerate running velocity, a runner should increase the turnover rate without sacrificing the stride length. Trying to run

faster by lengthening the stride length only is inefficient and will result in greater fatigue.

Running speed can only be increased when the foot strike is moving backward at a greater speed than the center of mass is moving forward.

All gold medal winners of endurance running events in the Worlds and Olympic Games reveal similar running characteristics. They exhibit a tall, relaxed torso with head and shoulders directly over the hips. The arms move with a short, quick, forward and backward motion. The foot strike is quick as the foot is driven back under the center of mass. The side view of the foot cycle resembles that of a wheel. The running action exhibits a full range of motion with an ankle-over-knee recovery. Entry level endurance runners can be taught to emulate gold Medal running form.

Have the athlete begin by quickstep walking with an ankle-over-ankle movement while maintaining good posture and arm action. Perform this action for 10 seconds x 6. Walk 10 seconds then quickstep run with ankle over ankle foot action for 10 seconds x 6. Now progress to 10 seconds of ankle-over-mid-shin quickstep running, and finally to 10 seconds of ankle-over-knee running action. This progression of learning can be incorporated into the warm-up.

TEACHING GOLD MEDAL RUNNING FORM

The Foot

The foot is the lever that provides the force for running. The contours of the foot, along with its tendons, ligaments and toes provide stretch power energy for running. The foot is the end of a kinetic chain of muscles, tendons and ligaments that begin at the core and glutes then continue by links down through the quads, hamstrings, gastric and Achilles tendon. All of these appendages go on stretching as the weight of the runner's body is absorbed with each footfall. As the runner's center of mass moves in front of the foot, all of the stretch power of the kinetic chain releases energy that propels the runner's body forward.

Haile Gebrselassie shown here with T&FN's Jon Hendershott: Gebrselassie used his speed to surge to a 10m lead, then drop back to race pace and hold that lead.

Foot Placement

The foot should strike the running surface just in front of the heel bone and slightly on the outer side. The farther back under the center of mass the foot lands, the quicker the foot strike. The quicker the foot strike, the greater the force created.

TEACHING FOOT PLACEMENT

Running is controlled by the central nervous system and is a neuromuscular activity. The neuromuscular system is a human computer and can be programmed to produce specific actions. The manner in which the foot strikes the surface and its position with relation to the runner's center of mass as it strikes is important for balance and power. A balanced body, with the head and shoulders directly over the hips and a foot strike that occurs as far back under the center of mass as possible, provides the greatest power and best economical use of energy. The neuromuscular system not only controls all muscular contractions and relaxations but also the intensity and duration of all muscular action.

PROGRAMMING THE FOOT STRIKE SPEED-AGILITY LADDER

A sure way to teach a runner proper foot placement is using a speed-agility ladder. The SA ladder is approximately 20 feet long with rungs placed every 14 inches.

Step one; imagine that you have a rod sticking through each ankle then

walk through the ladder by lifting the heel and stepping one ankle over the other, then flexing the toes downward. This walking action will teach the muscles to place the foot strike under the center of mass. Complete the walking action six times while increasing the walking tempo each time through the ladder. Repeat this action while running and increase the tempo each time.

An athlete should work toward running as fast as possible while keeping the foot strike within the confines of the ladder rungs. To further program the feet to move faster, have the athlete progress through the ladder by stepping in and out of the ladder as fast as possible (two feet in—two feet out) while advancing through it. Now face north and do the same quick foot action while advancing through the ladder laterally, returning facing south.

The quick step run can also be done on the hash marks of a football field or by placing flat stick a yard apart. When working in the S.A. ladder, practice good posture and quick, relaxed arm movements.

ACCELERATION LADDER

The next step in learning the progression of running is to work in an acceleration ladder. This ladder systematically increases the stride length while keeping the foot strike under the center of mass. For the first eight steps, use flat sticks set at 1.5', 2', 2.5', 3', 3.5', 4', 4.5' and 5'. For beginners, work up to 4' and then keep a 4-foot spacing until becoming adept at that stride length. For those who can advance beyond a 4-foot stride, the settings would increase to 5 feet and eventually 6 feet (5'-3", 5'-6", 5'-9" and 6'). When a young female can run smoothly using a 5-foot stride, she will become an accomplished runner, as will a young male at 6 feet. The most effective acceleration ladder is laid out with flat sticks the first 8 strides and then 3" risers to 30 meters then followed 5" risers to 45m. The ultimate ladder advances to 60 meters with 7" risers from 45 meters to 60 meters.

The running action is a sprint start through the flat sticks, ankle-over-mid-shin to 30 meters and ankle-over-knee for the rest of the ladder. A 45m ladder is very practical as the runner can continue beyond that distance using muscle memory to complete any distance desired. Remember to maintain a tall, relaxed posture with arms moving fast relaxed throughout each effort.

WARM-UP

Begin by walking for 10 seconds, then ankle-over-ankle quickstep running for 10 seconds, then 10 seconds of ankle-over-mid-shin running, then transition into an ankle-over-knee running action for 30 seconds. Continue this for 10 minutes, then continue dynamic warm-up.

In order to accelerate running velocity, a runner should increase the turnover rate without shortening the stride. Trying to run faster by lengthening the stride length only is inefficient and will result in greater fatigue. Running speed can only be increased when the foot strike is moving backward faster than the center of mass is moving forward. Note: Too much backside mechanics is when the toes finish pushing off the surface and the foot and lower leg follow through too far behind the center of mass causing a long leg lever for the recovery leg. This slows the forward leg movement and causes a pronounced heel strike and braking action.

SCIENTIFIC EVIDENCE POINTS TO THE FACT THAT A PERSON'S BASIC SPEED IS THE SINGLE MOST IMPORTANT PHYSIOLOGICAL VARIABLE DETERMINING A HUMAN BEING'S ABILITY TO RACE AT ANY DISTANCE

Scientific evidence points to the fact that a person's basic speed is the single most important physiological variable determining a human being's ability to race at any distance. 400-meter time is basic to determining performance in the 800 meters, 1500 meters, 3k, 5k and 10K. Science has given us the formula for determining potential to race in those events, computing training

TABLE 1

Event	Percentage	Potential Time	400 Meters Goal Pace
800	.91-.92	2:13	65
1500	.84-.85	4:28	69
3k	.77-.78	9:50	74
5k	.75-.76	16:50	79
10k	.74-.75	34:00	83
Steeple	.74-.75	10:12	69-83
Mile	.84-.85	4:47	69

paces based on a percentage of 400 meters speed. See Table 1.

Ken Doherty tells us: "An athlete with greater speed can carry a given pace for a short distance with a relatively lower level of stress." This factor sets the parameter for goal pace training. Assuming equal pace, the greater the distance of each run the greater the stress produced, even though the rest intervals are increased correspondingly. 3 x 400 at 60s with 60s rest produces greater stress than 30s with 300s rest. The recovery period or the time between runs, from a heart strengthening standpoint, the work period and the rest period are both developmental. During the first 10s of the rest period, the stress is the greatest and therefore, the greatest stimulus for expansion and development. The development period can last up to 30s.

A pace that is considerably faster than race goal pace not only achieves a developmental heart stress, it also develops a fast-twitch function in the leg muscles which is necessary for a sustained sprint at the end. The greater the number of muscle units and fast-twitch fibers recruited, the stronger the working muscles. The stronger the working muscles, the harder they can make the heart work. The stronger the heart muscle, the more oxygen rich blood being sent to the muscles that do the work of running.

When an athlete's best potential race distance has been determined, the best way to develop race potential is by training at variable paces. Variable pace training was conceived by British club coaches during the early 50s and 60s. During this time period, numerous world records were set using variable pace training. The essence of the variable pace system is to train at race pace plus two paces that are faster than goal pace and two paces that are slower than race goal pace. Example: An 800 meters runner would train with sprint work and 400 meters pace, as well as paces at 1500 and 3k. These paces provide both speed effort and endurance. A greater percentage of work is done at race goal pace because the more work done at a specific pace, the more the athlete becomes efficient at running that pace.

Jim Hunt coached track and cross country for many years at Humboldt State and UC Davis. He was inaugurated into the USTFCCCA Hall of Fame in 2013.

The Functions Of Extremities In Discus Throwing

Continued from page 6955

high-speed drives of the left arm and two "re-wrappings." However, contrary to those guidelines, many coaches have been encouraging the thrower to keep the left arm relatively inactive, particularly during the entry in the back of the circle.

This encouragement may not be entirely incorrect. If the thrower allows the aggressively moving left arm to overly engage the upper body in leading the throw in the back of the circle, then there should be a compromise and this arm needs to be restrained and be kept in check. The criterion for the dynamic or non-involvement of the left arm, particularly in the back of the circle, is whether the athlete, following the drive from the back, is able to rotate the hips counterclockwise relative to the shoulders so that the hips are again rotated markedly ahead of the shoulders before the start of the final delivery action.

Even if the athlete were to allow the upper body (shoulders) to catch up with the lower body (pelvis) just before the takeoff from the back of the circle, this would not be a problem, again provided that the thrower is able to get "wound up" in the middle of the circle. Then the thrower would be OK. If the thrower could bring the shoulders back again after they have caught up with the pelvis, then it would actually be a good thing to allow the shoulders to "catch up" with the pelvis momentarily around the end of the takeoff from the back of the circle. Technical finesse comes into play here with the goal being for the thrower to take advantage of as much rotary momentum as possible from the left arm in the back of the circle without compromising the integrity of the ensuing throw ing movement.

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USATF COACHING EDUCATION

2017 LEVEL 1 SCHOOLS

http://www.usatf.org/Resources-for---/Coaches/Coaching-Education/Calendar-of-Schools.aspx

Jan. 6-8	Christian Brothers College HS St. Louis, MO
Jan. 6-8	University of South Carolina Columbia, SC
Jan. 7-8	Florida Atlantic University Boca Raton, FL
Jan. 14-15	Chabot College Hayward, CA
Feb. 11-12	Red Mountain High School Mesa, AZ
Feb. 11-12	San Diego State University San Diego, CA
Feb. 17-19	Benedictine University Lisle, IL
Feb. 17-19	Pacific University-Hillsboro Campus Hillsboro, OR
Feb. 18-19	University of New Mexico Albuquerque, NM
Mar. 10-12	Public School 9 New York, NY
Mar. 11-12	Episcopal High School Alexandria, VA
Mar. 17-19	Villanova University Villanova, PA
May 21-22	Allen High School Dallas, TX
May 27-28	Cerritos College Norwalk, CA
June 2-4	Atlantic Sports Health Morristown, NJ
June 3-4	Jacksonville University Jacksonville, FL
June 9-11	Benedictine University Lisle, IL
June 10-11	Houston Baptist University Houston, TX
June 16-18	Wellesley College Wellesley, MA
June 18-20	UNC Greensboro Greensboro, NC

June 23-24	Oral Roberts University Tulsa, OK
June 26-27	Stillwater High School Stillwater, MN
July 7-9	University of Albany Albany, NY
July 14-16	Nassau Community College Garden City, NY
July 21-23	Johns Hopkins University Baltimore, MD
July 21-23	Savannah State University Savannah, GA
Aug. 4-6	Yale University New Haven, CT
Aug. 5-6	Central College Pella, IA
Aug. 12-13	Highline College Des Moines, WA
Sept. 29-Oct. 1	Community College of Philadelphia Philadelphia, PA
Oct. 13-15	Marian University Indianapolis, IN
Nov. 11-12	Cardinal Stritch University Milwaukee, WI
Nov. 17-19	Eastern Michigan University Ypsilanti, MI
Nov. 18-19	Tennessee State University Nashville, TN
Nov. 25-26	UNLV Las Vegas, NV
Dec. 1-3	IMG Academy Bradenton, FL
Dec. 8-10	Westerville South High School Westerville, OH
Dec. 9-10	Houston Baptist University Houston, TX
Dec. 15-17	Public School 9 New York, NY
Dec. 16-17	Allen High School Dallas, TX

Save the Date for the 2017 Level 2 School

USATF will head to the campus of California State University – Fullerton for the 2017 Level 2 Program. The dates of the week-long school are scheduled for July 17-22, 2017. Applications will be available by March 1, 2017. Please visit the Calendar of Schools for more event information to be posted soon.

http://www.usatf.org/Resources-for---/Coaches/Coaching-Education/Calendar-of-Schools.aspx

USATF COACHING EDUCATION AWARD WINNERS

Dr. Joe Vigil Sports Science Award: Dr. Larry Judge

This award recognizes a coach who is very active in the area of scholarship, and contributes to the coaching literature through presentations and publications. This award identifies a coach who utilizes scientific techniques as an integral part of his/her coaching methods, or has created innovative ways to use sport science.

Ron Buss Service Award: Dave Pavlansky

This award recognizes a coach that has a distinguished record of service to the profession in leadership roles, teaching, strengthening curricula and advising and mentoring coaches. This person is a leader, whose counsel others seek, and who selflessly gives his/her time and talent.

Fred Wilt Coach/Educator of the Year Award: Ian Dube

This award recognizes a coach that has a distinguished record, which includes sustained, exceptional performance. This award will be presented annually to recognize one individual who has exemplified passion and leadership nationally for the promotion of USATF Coaching Education.

Vern Gambetta/Young Professional Award: Ronda Broome

This award recognizes a young coach in the first 10 years of his/her career that has shown an exceptional level of passion an initiative in Coaching Education. This award will be presented annually to recognize one individual who has exemplified passion and leadership nationally for the promotion of USATF Coaching Education.

Terry Crawford/Distinguished Female in Coaching Award: Tamara Ards

This award recognizes a female coach that has shown an exceptional level of accomplishment, passion and initiative in Coaching Education. This award will be presented annually to recognize one female coach who has exemplified passion and leadership nationally for the promotion of USATF Coaching Education.

Kevin McGill/Legacy Award: Dr. Dave Shrock

This award recognizes a veteran coach with 25+ years of involvement that has shown an exceptional level of passion an initiative in Coaching Education. This award will be presented annually to recognize one individual who has exemplified passion and leadership nationally for the promotion of USATF Coaching Education.

Level 2 Coaches/Rising Star Award: Glenn McAtee

This award recognizes a coach that has utilized the USATF level 2 CE program to make an impact on their coaching that includes sustained, exceptional performance. This award will be presented annually to recognize one individual who has recently completed the level 2 school and it has helped to make an impact on their coaching. This award winner exemplifies the impact of the USATF Coaching Education program.

USATF COACHING PROGRAMS BY THE NUMBERS — 2016 YEAR IN REVIEW

Level 1

- 46 Level 1 Schools across 27 states
- 2000+ coaches earned Level 1 certification

Level 2

- Marian University, Indianapolis, Indiana, July 18-23, 2016
- 228 coaches earned Level 2 certification

Level 3

- IMG Academy, Bradenton, Florida, December 4-10, 2016
- 41 coaches – 12 for Jumps and 29 Youth Specialization

USATF Campus

- 3 new sports science courses added in 2016
- 100+ courses delivered

Cross Country Specialist Course

- Initial course at Olympic Training Center, Chula Vista, California, August 19-20, 2016
- 38 coaches earned Skill Specialist certificate

Learn By Doing Clinic

- Initial clinic held at Olympic Training Center, Chula Vista, California, August 27, 2016
- 54 coaches earned Skill Specialist certificate
- 41 student-athletes attended

http://courses.usatf.org/

TRACK TECHNIQUE/ TRACK COACH CONTENTS

TRACK TECHNIQUE/TRACK COACH BACK ISSUES. The issues listed below are the only remaining issues of the printed issues. If an issue is not listed, it is out of print and unavailable. These issues are available singly for $5.50 apiece postage-paid for U.S. delivery; $8.00 apiece postage-paid for foreign delivery. Order 5-9 issues, pay $4.00 apiece; more than 10 issues, $3.00 each, postage-paid. Non-U.S. orders—add $2.00 shipping per copy. Some issues are in short supply, so order early. Visa/MC/Amex orders accepted by phone: 650/948-8188 9 am-5 pm PT, M-F. Note: The periodical's name was changed from *Track Technique* to *Track Coach* with issue #131 (Spring 1995). Listed below are a few of the more prominent articles in each issue. There are many more useful contributions in each number.

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