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USA Track & Field

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COACH
FORMERLY TRACK TECHNIQUE

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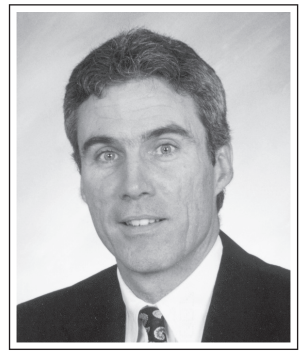
FROM THE EDITOR

RUSS EBBETS



THERE WILL BE HOMEWORK

The big problem with the 1968 Olympics was the altitude. Mexico City has an altitude of 7350 feet above sea level and no one was exactly sure how much the thin air would affect performances. It turned out that performances were affected significantly.

If you remember, Mexico City was the Olympics where Bob Beamon jumped and almost missed the earth. They had a new-fangled optical measuring device to quickly and accurately measure jump distances. Problem was the track the camera slid along wasn't long enough to measure Beamon's jump and it was back to the steel tape.

Tommie Smith and John Carlos had to share a pair of gloves because Carlos misplaced his. That lead to a right handed/left handed Black Power salute and an invitation for a quick exit from the games.

In the weeks prior to the Games there were student protests that turned violent. The protestors wanted to use the Games to showcase their grievances. The Mexican government decided it would not suffer the international embarrassment. The protestors were arrested and some joined the ranks of "the disappeared." Welcome to Central America.

When I was a high schooler Jim Ryun was my idol. He was to run the 1500. There was much speculation in the press as to how altitude was going to affect the endurance performances. This was an area of sport physiology that was in its infancy.

The distances began on the all-weather track with Ron Hill running the 10k in his bare feet and Naftali Temu leading an African sweep of the race. There was much speculation that the altitude trained Kenyans would have an advantage. Kip Keino was scheduled to race Ryun in the 1500. Keino's race strategy for the 1500 was simple. Teammate Ben Jipcho lead the pack through a very fast first 400 in 56 seconds. Keino caught Jipcho and together the two soon had a 30-yard lead on the field. Ryun lead the chase pack that only chased.

Although Jipcho faded to 8th and Ryun closed over the last 400m he couldn't catch Keino, who was running his fastest-ever 1500. Ryun got the silver. I was crushed. The US 1500 gold medal drought continued. The next day one of my junior high classmates had to rub it in. This was the same knucklehead who brought a live snake to "Show and Tell" in 5th grade and it got loose. It was not funny that day.

CONTINUED ON PAGE 7039

ALL IN? MANAGING CONFLICTING COMMITMENTS ON NO-CUT TRACK TEAMS

The coach has to deal with various levels of commitment among his team members. Here are some words of wisdom from a veteran high school coach.

BY JIM VERMEULEN

An athlete without commitment is like a kite without wind."

This is a pre-season athlete-coach exchange none of us has likely experienced:

Coach: *Ready for the season ahead, Jake?*
Athlete: *Looking forward to it Coach. Just to let you know, I have another important club activity that will mean missing most Thursday practices—and I'm going with my family to Florida for spring break in April. But I definitely plan to give it 70% this season.*

Were I on the receiving end of such a promise, my first response would be, "Well, thanks for being so honest." My second: "Maybe you should reconsider joining the team."

In reality, we live out these unspoken declarations every season. No-cut scholastic track teams are typically characterized by the presence of not only a wide range of talent levels but also an acute disparity in commitment to the sport by its participants. Total neophytes to a varsity-level activity rub elbows daily with veteran team members who have state or national championship experiences on their resumes. Students who line up for drills each afternoon because a friend convinced them to "try it" share gym or track space with fourth-year veterans already committed to college teams. The coach is given the challenging task of managing that diversity in talent and investment. It's no cakewalk. Programming for the talented and the motivated is the easy part. Most of the stress and conflict of coaching scholastic athletes stems from managing team members who are not "all in" for the season, athletes who believe 70% is perfectly acceptable.

At the beginning of each season, what we in effect say to our prospective athletes is this: *You've freely chosen to become a team member, to take on the* **role** *of track athlete and all that role entails*. With training and competing, those roles are defined by historical precedent and current best practices (e.g. performing properly the most scientific drills to improve muscle reactivity for running). Regarding an athlete's function on the team, those roles are defined by stated team and athletic department requirements for participation and behavior (e.g. showing up for all scheduled practices, giving full efforts). The degree to which the athlete embraces and fulfills the *role* of track athlete is how we typically judge commitment.

Of course, those roles are often open to interpretation. With any typical high school track team in any given season, the notion of a team role is elastic simply because it encompasses a wide variety of students. Athletic and non-athletic. Sports-experienced team members and total neophytes to scholastic team sports. Three-year goal-driven veterans and wary freshman.

Most teams are a mishmash of reality and dreams. Even though everyone may be "'all in" on Day 1, it's usually in the following days or weeks that the participants begin to challenge the chief organizational assumption of the sport as, ultimately, a like-minded pursuit with a common purpose.

JANSSEN'S COMMITMENT CONTINUUM

When discussing or evaluating the investment of athletes, it is tempting to lump them into stark, well delineated categories, to simply declare them, in our case, committed or not committed. Such labelling, however, masks more than it reveals. For most scholastic athletes, commitment occurs in shades of grey, in degrees, differing from season to season and also from sport to sport.

A more useful paradigm for considering athlete commitment levels is that provided by Jeff Janssen. His "Commitment Continuum," as described in *The Athlete's Commitment Manual,* recognizes seven levels of athlete involvement:

Resistant – **Reluctant** – **Existent** – **Compliant** – **Committed** – **Compelled** – **Obsessed**

A brief summary of his descriptions of each is this:

1. The **Resistant** team member rejects team goals, standards and training methods. He/she can be argumentative or openly oppositional to coaches and team expectations.

2. The **Reluctant** team member has not bought into team goals and standards. This member is skeptical and usually has a "wait and see" attitude, quietly questioning aspects of team membership.

3. **Existent** team members show up but accomplish little. They are 'just there,' contributing little to the team. Janssen notes that college coaches sometimes refer to such team members as "dead weight."

4. Team members who are **Compliant** do what they are told but do not exhibit the self-motivation to do much more. They meet team standards but seldom go beyond. They tend to be motivated by others rather than self and can frustrate others with their lack of initiative.

5. The **Committed** team member is self-motivated to go the extra mile to achieve. He/she accepts and completes the daily hard work necessary, understanding their efforts are an investment in self and team. This type of athlete takes the initiative to "get the job done."

6. A **Compelled** athlete always finds a way to succeed, despite obstacles. He/she holds high personal expectations and does not allow adversity or distractions to get in the way. This athlete is usually a positive leader and role model on the team, drawing others along to higher efforts and goals.

7. An **Obsessed** team member is consumed by achieving a goal, and drives him/herself relentlessly, often disregarding a proper balance in life. Focused primarily on self, this person typically ignores the aspirations or needs of teammates and thus makes a poor leader.

According to Janssen, compliant, committed and compelled team members comprise the "Green Zone," those athletes who can make positive contributions to a team and form the foundation for team success. Resistant, reluctant, existent and obsessed team members are in the "Red Zone." Those team members make few meaningful contributions, can hinder team success or, in the worst cases, are destructive to what the team is trying to accomplish.

The obvious goal for a coach, Janssen believes, is to attempt to move as many team members as possible from the Red to the Green zone. Within the Green Zone, advancing athletes from compliant or committed investments to compelled behaviors is always the objective. Janssen states that highly successful teams strive to have 80% or more of their team members in the Green Zone. Coaches who categorized the commitment levels of their teams found that best-season teams, on average, contained 20% compliant, 40% committed and 15% compelled athletes. Red Zone commitment athletes comprised the remaining 25%.

THE OBVIOUS GOAL FOR A COACH, JANSSEN BELIEVES, IS TO ATTEMPT TO MOVE AS MANY TEAM MEMBERS AS POSSIBLE FROM THE RED TO THE GREEN ZONE.

As one might suspect, your average no-cut high school track team struggles to achieve that ideal. The reasons may be as follows:

1. Coaches fail to actively recruit Green Zone athletes, taking whoever signs up and walks in the door on Day 1.
2. Coaches fail to adequately communicate and/or enforce commitment expectations with athletes, allowing athletes to define their preferred versions of commitment.
3. Coaches fail to make efforts or take actions to "move" athletes from Red Zone status into the Green Zone. They tolerate sizeable percentages of low/no commitment athletes.
4. Coaches are not allowed to remove low/no commitment athletes from the team.

If the coach is invested in creating a more cohesive group of athletes with similar productive levels of commitment, the first step is to identify what (or who) currently prevents the realization of that goal. A rudimentary inventory of team athletes following a week or two of practices can, at the very least, identify individual team members as Green or Red zone athletes. Attendance and observed efforts, casual conversations, and sometimes the assessments of trusted veteran team members will usually allow the coach to form an opinion about any particular athlete's commitment level.

ATTENDANCE AND PROPER EFFORT

Then, you want to act. Sometimes, promoting acceptable levels of commitment is as basic as communicating to the athletes what is expected. A common mistake made by coaches is to believe all those athletes filling the gym on Day 1 actually know what a sports commitment entails. They don't. Our current culture more often promotes ease than effort. A serious commitment to a sport may be an alien concept to a young adult who has been allowed to pick and choose his/her investment in lower level sports teams or life activities.

At the pre-season team meeting or in the first week of practices, athletes should be offered a specific set of behaviors that demonstrate basic commitment. Two of those are patently obvious, beginning with attendance. Athletes who fail to maintain at least an 80% attendance due to conflicting activities, appointments, family trips, chronic illnesses or "mysterious" injuries—those persons probably cannot demonstrate the personal investment which defines a committed team member. If an athlete holds a sub-80% attendance average after three weeks of team practices, it's probably time to talk.

Showing up, of course, is not enough. There must be effort applied to the tasks of training. And since no one has yet invented a device to accurately measure the level of an athlete's effort, it is up to the coach to make intuitive judgments based on experience and comparisons, knowing full well that some team members may be shocked or irritated to learn that their assumed 100% is really only 65%. Parents may also resist having their athlete told that 75% is not enough. However, if a committed athlete is the goal, those assessments are the coach's job. By definition, there can be no effective commitment without proper effort.

We laud the athletes who, through effective parenting and life experiences, arrive ready to demonstrate commitment. We appreciate the athletes who lack the skill or the experience to demonstrate mastery but who nonetheless persevere, intent on improving. Both those groups provide most of the reasons we coach. But if John Wooden is correct, if coaching *is* fundamentally teaching, and if coaches function as an integral component of an educational institution, then that other less glamorous task is ours also—improving commitment in those who lack it. If you can't simply legislate or demand commitment, you can certainly encourage it.

Commitment can be taught or enhanced by modeling. Coaches need to practice what they preach. Coaches who demonstrate a laissez faire attitude about their teams, who fail to recruit potentially committed and compelled athletes or who seldom promote and publicize their teams within the school or community—those coaches should expect teams that match their own limited investments. Excellent practice-coaches who know all the X's and O's of training are not enough. Program-coaches are required in order to build strong teams with committed athletes. Those are coaches who form alliances with physical education teachers and other coaches to identify prospective athletes—and then actively recruit them. Those are the coaches who make sure meet results are on the morning announcements at the high school, who maintain team web sites, who organize the post-season banquets or parties—coaches who, in other words, build a culture and tradition surrounding their sport.

TEAM IDENTITY

Commitments can also be strengthened through stronger team identity. Many—whether athletes, parents, spectators or administration--like to categorize track & field as an individual sport. If that is true, perhaps we ought to stop staging dual meets and league or sectional championships, all with their team scores.

Theorists have long understood the motivational power of allegiance to a group and its commonly held goals. It makes sense, therefore, that anything a coach does to improve an athlete's sense of belonging to a team could improve that athlete's commitment to teammates and the team.

Special activities, T-shirts, nicknames and post-race award ceremonies are all ways to build team identity within the structure of the season. One of our most enjoyable team activities this past spring was a serendipitous afternoon practice devoted to shoveling off the track so a scheduled scrimmage could go on several days later.

COACHES WHO DEMONSTRATE A LAISSEZ FAIRE ATTITUDE ABOUT THEIR TEAMS. . . THOSE COACHES SHOULD EXPECT TEAMS THAT MATCH THEIR OWN LIMITED INVESTMENTS

The converse, of course, is to avoid practices that can subtly erode a sense of allegiance to team, teammates and the sport. The most familiar example is the expectation on some teams that athletes, when finished with their events in a meet, can be excused to go home with a parent, thereby reinforcing individual agendas over team allegiance. Watching a similar scenario acted out during the 4^{th} quarter of a basketball or soccer game where Johnny and Suzie have been riding the bench would strike most as bizarre, yet track athletes leaving an invitational or dual meet before teammates have finished competing is a common sight.

PERSONAL IMPROVEMENT AND RECOGNITION

Commitment can most directly be strengthened through the improvement and success of the athlete. This is another self-evident point, but how often are marginally invested team members left to "prove themselves" or to catch the coach's eye with efforts/results before they receive the same serious attention as the veterans.

Coaches are usually astute at spotting athletic potential in neophytes. They are typically less adept at identifying commitment potential and developing that critical team ingredient. Some team members, as a result, languish in anonymity for several seasons before dropping out, feeling they've improved to no particular degree or they've contributed in no significant manner.

Recognized improvement and encouraged advancement toward mastery is what keeps many of those 'average' athletes who are not the team stars coming back season after season. Demonstrated improvement creates—or strengthens—their commitment to the sport. After too many seasons of thinking my most talented athletes needed to be the team leaders, I finally began understanding that my most committed team members would more faithfully fulfill those roles, regardless of talent. That has always worked out better.

THE DILEMMA OF COMMITMENT

There is, of course, a price to be paid for commitment, a price paid not only by the athletes and coaches, but by the program. We know this, though it's not often a topic of open discussion. A program with high commitment levels demanded of athletes and coaches invariably—and often by design--shrinks the pool. The size of most elite scholastic track and field or cross-country programs, those requiring high commitment levels, is typical small when compared to others that place more modest demands on team members. And so the vexing question: what should any no-cut track program—an extension of its parent educational institution—attempt to be? Should it (or can it) balance an intrinsic mandate for excellence with that most cherished of American ideals—opportunity for all? And even if such a balance were the recognized and accepted goal, there still have to be standards, so what should they be? Refuse to hold athletes to reasonable standards, to the traditions of the sport, and you get a come-and-go-as-you-please club that teaches little of significance—if anything.

The ability to commit to an activity, an endeavor, remains one of the most fundamental life skills. Teaching life skills in all their critical forms is, after all, the raison d'être of public education. So it seems reasonable to argue that scholastic athletic teams—and our track programs in particular—are positioned well to deliver on that fundamental opportunity to cultivate and demonstrate an ability to commit. There's a well-known poster/meme entitled "10 Things That Require No Talent." The list is described behaviors that should generate a successful season for athletes, and it contains the following items: 1. Being On Time; 2. Work Ethic; 3. Effort; 4. Body Language; 5. Energy; 6. Attitude; 7. Passion; 8. Being Coach-able; 9. Do Extra; 10. Being Prepared.

The list is really just another way of describing commitment. If we are serious about the educational function of athletics, then we want to offer that form of education to as many team members as possible. We want commitment-oriented programs that maintain reasonable standards *and* encourage the pursuit of excellence. As mentioned before, running *that* kind of program is no cake walk. But it's possible.

Jim Vermeulen hs coached cross country and track & field for 32 years in the West Genesee School District in upstate New York. He is a monthly essay contributor to ny.milesplit.com on running topics.

From the Editor

Continued from page 7039

When Matt Centrowitz won the gold in the 1500 in Rio I am sure Glen Cunningham, Fred Wilt, Ryun, Liquori, Spivey, Steve Scott, Don Bowden and anybody else on a long list of great American milers had a collective smile on their faces that "we" finally did it. I am willing to bet that to the last man there was no lament that the winning time was "slow."

One of the things that amazed me was the critical reaction the track community's Boo Birds gave Centro on his historic win. In international competition, the tactic of success is "sit and kick." Front runners wind up as unpaid rabbits with participation certificates. Those who can sprint win. Centrowitz covered the last 400m in 50.7. I'm willing to bet that most of his critics, those invisible masters of the Internet couldn't hit a 50.7 in the 400m if they were in free fall.

The headline for the World Champs in London was "Bolt Got Beat." The U.S. nightly news teased with that headline, not the fact that an American won. And then the Invisibles took over—Gatlin is this, Gatlin is that. But Gatlin did beat Bolt, maybe he did spoil the party but that is not what competitive athletics is about. And of course, there was continual mention of the drug issue.

On the Internet, where the insanity seems to prevail Mike Morgan penned a cogent piece where he critically examined Gatlin's career from a legal, fact-based perspective. The link is sportsintegrityinitiative.com/demonizing-Justin-Gatlin. You should read it. It not only quotes the facts from the ruling bodies that made the decisions but he helps explain why the decisions were made as they were.

Gatlin's first positive was at age 19. He was prescribed Ritalin as an adolescent for his ADHD. If you are not up on your PDF (Physician's Desk Reference) Ritalin is an amphetamine used to treat hyperactivity. The United States prescribes 95% of the Ritalin consumed in the world. While the rest of the world

(continued on page 7064)

POLE VAULT LANDINGS AND INJURY

Head trauma is the most common catastrophic injury to pole vaulters. This piece reveals some work being done to reduce such injuries.

BY DR. BARRY P. BODEN, MD, AND JAN JOHNSON, MS

INTRODUCTION

The purpose of this study was to investigate and report the serious and catastrophic injuries to pole vaulters 2003-2011 and to compare it to our long-term data base of known serious and catastrophic injuries, dating to 1971. And to investigate the potential protective capabilities of materials for padding the hard surfaces around pole vault landing systems. Attention was focused on the padding in and around the plant box since it was reported to be the location of 74% of the catastrophic accidents during the 2003 to 2011 time span (3), and over 50% of the 1971-2016 data. Additionally, the plant box area offered the greatest challenge since several mechanical criteria must be met which limit the amount of padding in this critical area.

ACCIDENT DATA ANALYSIS

Pole vaulting was associated with one of the highest incidences of catastrophic injuries for all high school and collegiate sports (4). A previous report on 32 catastrophic pole vaulting injuries between 1982 and 1998 revealed that 75% of the injuries occurred due to athletes landing partially or completely off the sides or the rear of the landing pads (2). The problem of pole-vaulters landing to the sides or the rear of the landing pad has been significantly reduced due to the 2003 rule change that enlarged the minimum dimensions of the landing pad (2). However, a recent review of catastrophic pole vaulting injuries from the 2003 through the 2011 calendar years revealed 19 catastrophic injuries with 74% occurring in or around the vault box (3). In addition, the report surveyed 3,335 pole vaulters and showed that 77% landed in the vault box one to three times during their career, 6% four to six times, and 0.8% seven or more times.

Our continuing investigation reveals nine additional serious injuries requiring hospitalization between 2012 and 2016 (Diagram #1). They include one college vaulter landing off the side of the pit, resulting in an extensive head injury and hospital time, one college vaulter hit in the head with his own pole on a run-through resulting in a broken orbital and severe concussion. Four plant box landings on an elevated front edge all resulted in severe head injuries and hospitalizations. Two additional box landings resulted from the vaulter stalling out and falling into the box area, causing severe concussions, fractured spine and other broken bones. During this time frame no deaths or permanent paralysis were reported in the United States. However, in Europe a female elite vaulter was paralyzed landing in the box in training.

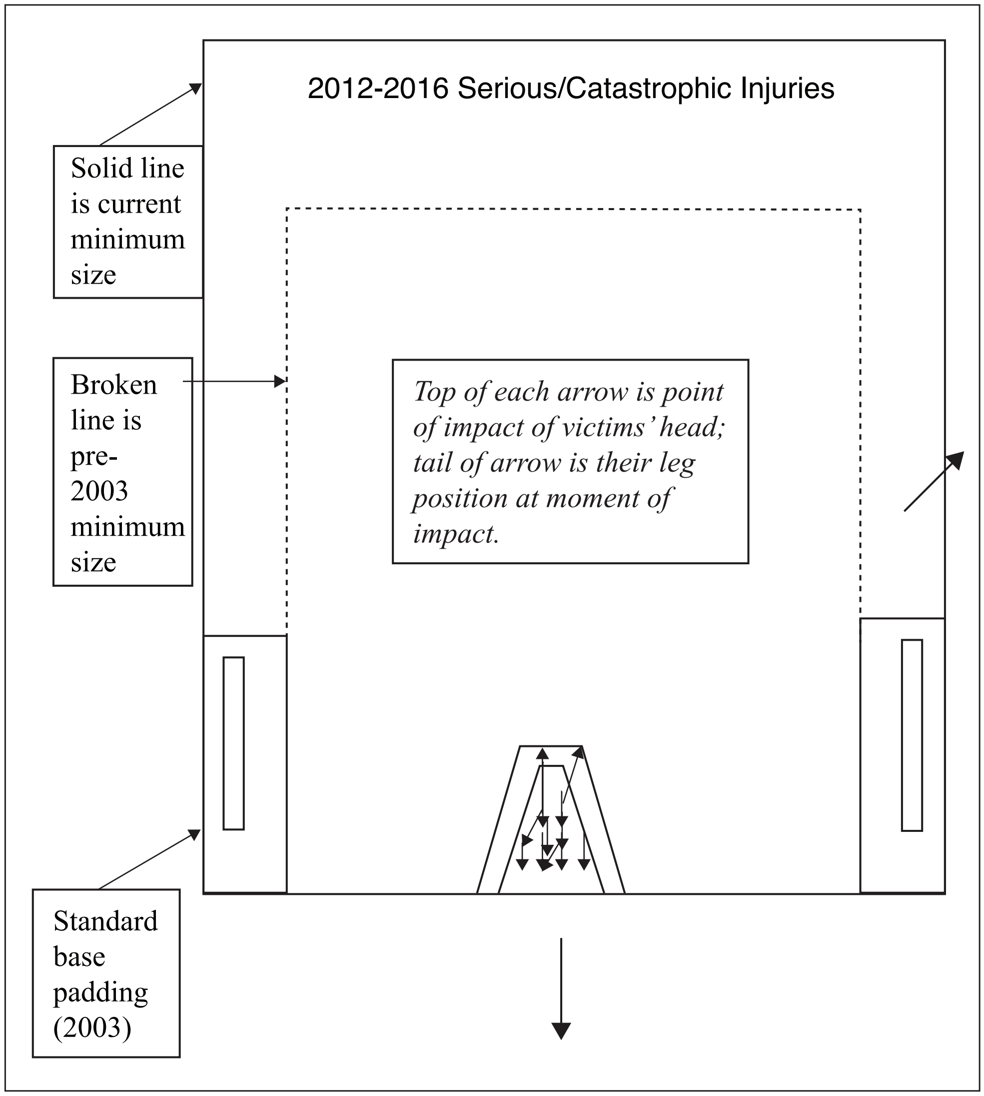


Diagram 1: Landing locations resulting in injuries, 2012-2016.

Additionally, our new survey of 2,505 high school and college vaulters in the United States covering the years 2012-2016 continues to show similar data with regard to three important survey questions:

- When asked how many times they landed in or directly around the plant box: 14% say they have never landed in the plant box area, 76% say they have landed in or around the plant box area 1-3 times, and 6% say they have landed in this area seven-plus times.
- When asked how many times have they have missed the landing pads to the side or landed near the side edge and bounced off on to the ground: 88% say they have never missed or bounded off the edge of a landing pad. 12% say they have done so 1-3 times, and 3% indicate they have done so 4-6 times.
- When asked how many times they have completely missed the landing pads off the rear, or landed near the rear and bounced backwards off the rear edge of the pads: 88% say they have never have done so, 12% say 1-3 times.

Participants were also asked what the nature of any injuries they may have sustained while pole vaulting. No injuries were reported for off the side or off the back landings. This is not surprising considering the relatively few landings in these two categories.

Box landings still appear to offer the greatest danger to pole vault athletes. Among the athletes responding, 382 of the 2,505 (6.5%) of participants had been injured landing in the plant box. Heel bruises accounted for 66% of the injuries. Sprained ankles in the box was the second highest box injury category with 85 sprains (22%) of the injuries reported. It was also reported that five concussions and 22 lower back or buttocks injuries occurred during this time frame all resulting in medical attention or hospitalization.

SERIOUS & CATASTROPHIC ACCIDENT DATA ANALYSIS 1971-2016

The Pole Vault Safety Certification Board has studied serious and catastrophic injuries since the early 1970's. The data sheet below shows the number of known U.S. accidents over this period. The data was divided into five categories based upon the vaulter's landing location.

The data during this time frame is seen in Table 1. The table is designed to show the relationships between the key rule changes and the resulting variations in accident type. Generally, it appears that injuries resulting from landing off the side and the rear of the landing pads have been largely eliminated, since the landing pad sizes were increased in 2003. In fact of the two off-the-rear landings one was of on a system that did not meet the ASTM specification. In addition, of the three off the side accidents, two were on landing pads which were also non-compliant with the ASTM minimum specification. However, one off the side accident which resulted in death was on a compliant pit in 2010.

Two trends that seem related to the rules are the number of off the back accidents (16) between 1987 and 2003 when landing pads could be as short as only 13 feet. The padding of perimeter surfaces as mandated in high school, and the enlargement of the landing systems, including the padding of the standard bases clearly have had a positive effect upon safety.

Year	Freq	level	box	side	back	on p	other
1971	1	1 college	1				
1972	1		1				
1973	1	1 college	1				
		Training poles begin					
1977	2	1 HS	2				
1980	1	1 open			1		
1981	0						
1982	2	1 hs, 1open	1		1		
1983	3	1hs, 1jrhs	2		1		
1984	1		1				
1985	1	open		1			
1986	1	1 hs					
		13' deep landing pads allowed					
1987	1	1 hs	1				
1988	5	3 hs, 1 college	2	1	1	1	
1989	5	1 hs, 4 college	1	1	3		
1990	3	2hs, 1 college		2	1		
1991	4	2 hs, 1 college	1	2	1		
1992	2	2 hs	1		1		
1993	3	3 hs		2	1		
1994	4	4 hs (2 unknown locations)			2		
		New rules in HS only for body weight and pole size					
1995	1	1 hs			1		
1996	0						
1997	4	4 hs	2		2		
1998	2	1hs, 1 coach (college)			2		
1999	1		1				
2000	1	1-college		1			
2001	2		1	1			
2002	6	2 college 4 HS	4	1	1		
	44	**Totals 1987-2002**	14	11	16	1	
		Percentage summary 1987-2	29%	25%	36%	2%	
		New rules in HS only for body weight and pole size					
2003	2	1 female college 1 male colleg	1				
2004	0						
2005	1	1 HS	1				
2006	0						
2007	3	2 college, 1 HS	2		1		
2008	5	3 college, 1 HS	2	1	1	1	1
2009	5	1 open, 2 college, 1 HS femal	4				1
2010	4	2 college	3	1			
2011	1	1 HS 1 college	1				
2012	2	2 college , 1 female	2				
		Box collar Starts					
2013	5	1 HS male, 2 HS female, 1 col	5				
2014	1	1 college male		1			
2015	1	1 HS male	1				
2016	1	1 college male					1
T 1971-2016	31	*Totals 2003-2016*	22	3	2	1	3
		% Summary 2003- 2016	75%	10%	6%	4%	13%
T 1971-2016	87		45	15	21	2	3
		% Total since 1971	52%	17%	24%	2%	3%
		total number of accidents	87				
		open vaulters	8				
		college vaulters	32				
		high school vaulters	43				
		med school	1				
		coach	1				
		jr high school vaulters	2				
		women vaulters	6				
		men vaulters	81				

Table 1: Comprehensive PV Serious and Catastrophic Data composite 1971-2016

Box landing injuries have been steady throughout the 45 years studied in this report. It appears that the new box collar rules have helped prevent some injuries. However, since it only protects the upper edges and perimeter surface of the plant box the vaulter is still exposed to the hard surfaces of the pole slide and end plate areas.

Back landing accidents in the box resulting from correctly planted poles onto defective plant boxes with an elevated front edge (lip) of the plant box seem to be on the rise over the past five years. No data exists regarding this particular scenario prior to 2003, so no valid comparisons are available.

HELMETS?

The majority of the catastrophic injuries to pole-vaulters reported in this study and in the previous study by Boden, et al. (2, 3) were

Pole Vault Area Force Impact Potentials and Fatal Head Injury Probabilities.

Item#	Sample	12.5' Actual Gmax	12.5' Actual HIC	12.5' Actual FHIP	20' Est Gmax	20' Est HIC	20' Est FHIP	8' Est Gmax	8' Est HIC	8' Est FHIP
	Base Line									
1	Head form only (no protection) concrete / 3/8" rollout	628	8196	100%	1005	13114	100%	402	5245	100%
	Helmet									
2	Protec helmet on to 3/8' rubber track surface	471	6830	100%	754	10928	100%	301	4371	100%
	Box Collars									
3	Yellow origional 2.5" saftey max collar with RBDF	338	2253	82%	541	3605	100%	216	1442	3%
4	Yellow origional 2.5" SafetyMax RBDF/ 1/8" HDP	129	748	3%	206	1197	2%	83	479	0%
4	Old Style Box collar (1 3/4" cross link) on concrete	543	7590	100%	869	12144	100%	348	4858	100%
5	Orange Safety Max 3" closed cell foam on concrete	119	947	0%	190	1515	3%	76	606	0%
6	Orange Safety Max 3" closed cell on dirt	107	773	0%	171	1237	2%	68	495	0%
7	Yellow origional Safety Max with 3/4" closed cell foam on top	138	976	3%	221	1562	6%	88	625	0%
	Front Buns and Base Unit Sections									
8	Blue Portapit 1986 30" High	22	41	0%	35	66	0%	14	26	0%
9	Orange Port a pit 1988 only 24" high	34	111	0%	54	178	0%	22	71	0%
10	Green - Yellow kc fiber front bun section 17"	37	125	0%	59	200	0%	24	80	0%
11	Red 1984 UCS 30" high **	21	34	0%	34	54	0%	13	22	0%
12	Inside wedge of front bun section 6" in from edge	461	4498	100%	738	7197	100%	295	2879	95%
	Perimeter Materials									
13	Plush Moist grass	119	807	3%	190	1291	2%	76	516	0%
14	Packed Dry Dirt	408	4278	100%	653	6845	100%	261	2738	96%
15	Synthetic Field Turf	202	1777	10%	323	2843	98%	129	1137	0%
16	6" Loose, dry wood chips	129	812	3%	206	1299	2%	83	520	0%
17	6" Engineered Wood Fiber	165	1214	8%	264	1942	20%	106	777	0%
18	6" Pea Gravel	118	589	1%	189	942	1%	76	377	0%
19	3" wood chips wet and packded	197	1603	3%	315	2565	60%	126	1026	0%
	Combo's Related to Plant Box Area Protection									
20	Concrete and Steel plate plant box pole slide (estimated)	884	10000	100%	1414	16000	100%	566	6400	100%
21	Soft Pan Box 2.5" Skydex with 1/8" HDP	175	1614	0%	280	2582	80%	112	1033	1%
22	Soft Pan Box 5 " Skydex with 1/8" HDP	56	314	0%	90	502	0%	36	201	0%
23	2.5" PRM / 20g galvy	130	1072	0%	208	1715	5%	83	686	0%
24	2.5" PRM &PG / 1" ESP with rubber track surface lamanated	128	780	0%	205	1248	1%	82	499	0%
25	2.5" PRM / 1" EPS / 1/2" rollout runway	118	795	0%	189	1272	1%	76	509	0%
26	2.5" PRM &PG/ 1" Rtec/ #20 galvy	64	329	0%	102	526	0%	41	211	0%
27	2.5" PRM &PG/ 21/2" sky dex / . 20 g galvy	74	326	0%	118	522	0%	47	209	0%
28	2.5" PRM & PG / 1/8" plate steel	284	1388	2%	454	2221	50%	182	888	0%
29	2.5" PRM / 1" EPS / 1/8" PVC high density	134	1123	1%	214	1797	10%	86	719	0%
30	2.5" PRM / 1" EPS (with 1" holes on 8" centers) / .20 galvy	80	445	0%	128	712	0%	51	285	0%
31	2.5" PRM / 1" EPS (matrix) / .22 galvy	101	726	0%	162	1162	1%	65	465	0%
32	2.5" PG / 2.5 PRM/ 3/4" Westmont rubber track surface	93	485	0%	149	776	0%	60	310	0%
33	2.5 PG / 2.5 PRM / 1" EPS / .20 galvy	95	515	0%	152	824	0%	61	330	0%
	Headings and Abreviations									
	BL - Base Line Score		HDP - High density plastic							
	GMR % - GMAX reduction from base line as a percentage		EPS - RTEC Extruded polystyrene foam ASTM C578							
	HIC - Head Injury Criteria		PRM - Packed rubber mulch (Recycled Vulcanized Rubber)							
	RBDF - Rebonded Foam		PG - Pea Gravel							
	HDP - High density plastic		Galvy - Galvanized sheet metal							

Table 2

severe head injuries, so the use of helmets by pole vaulters would seem warranted. However, a fall from a typical pole vaulting height of three meters or higher onto a hard surface would certainly exceed the protection capabilities of a helmet. The highest drop test height specified in the ASTM pole vault helmet standard, F2400-06, is only two meters. The introduction of F2400 Standard Specification for Helmets for Pole Vaulting includes the following statement, "A helmet, however, is not likely to prevent serious injury or death if a vaulter lands in the plant box area or outside of the pole vault pit and strikes his or her head. Clearly the data shows that the helmet only offers very limited protection and only to the head.

GENERAL COMPARISONS OF POLE VAULT AREA MATERIALS

Force impact testing was performed on 33 conditions each of which could simulate potential padding under and around a potential plant box. For each test an accelerometer was mounted in a head form and impact attenuation was performed according to the ASTM 1292 standard specifications (ref *Installed Surface Performance Test (Field Test)* of *ASTM 1292 Standard Specification for Impact Attenuation of Surfacing Materials within the Use Zone of Playground Equipment).* A base line was established assuming an unprotected fall onto a rubberized track surface from a critical fall height (CFH) of 12'5.75" (3.80m). All other materials and conditions were then tested from the same CFH and compared to the unprotected base line. Each testing condition was repeated a total of three times and the average Head Injury Criteria (HIC) or force impact was recorded.

In addition the force impact reduction as a percentage (HICR%) from the baseline test and the fatal head injury probability (FHIP) for each material tested was calculated. Using this method various pole vault area components could be compared to determine relative shock and fatal head impact. Then for each condition using a simple percentage based upon the change in drop height potential estimated force impacts were calculated from 20 feet and 8 feet respectively. Using this method force impact and fatal head injury probabilities could be compared.

RESULTS

The average HIC, HIRC%, and FHIP are recorded for each test condition and material in Table 2. The baseline test (Item #1) simulated the scenario of an unprotected pole vaulter's head impacting a rubberized track surface. The average HIC recorded in this test condition was 8196 HIC, an impact which is 2.7 times greater than the 100% level of probability of a fatal head injury. When a helmet was mounted on the same head form and dropped (Item #2) the average HIC was 6830, reducing the impact only 17% from the baseline. However, the impact was still more than twice the level capable of producing a 100% chance of a fatal head injury.

The investigators make note of large shock attenuation improvement between the yellow rebounded foam safety max (Item #3) and the same collar with 1/8" additional layers of materials (Items #4 and #7) where large improvements were gained by the addition of a plastic cover, or the addition of dense foam over the soft rebounded foam. This of course is similar to the use of different densities of foam in pole vaut landing pits to improve deceleration and thus improve safety.

For the box collar materials tested, the most effective material at reducing impact was the Safety Max 3" (Item # 5) which resulted in an HIC of 947, a 89% reduction compared to baseline and only a 3% probability of fatal head injury. When the same collar was tested on packed dirt (Item # 6) it improved force impact to 773 HIC, a 91% reduction. The impact force onto the wedge foam section of the front bun adjacent to the box collar (Item # 3) revealed an average HIC of 4498, reducing the force impact by only 46% compared to baseline. The protective capability of the older 2" thick box collar (Item #4) that is commonly used in high school and college facilities across the country prior to the 2013 box collar rule was poor with an average HIC of 7590 and impact reduction of only 7% from baseline.

The shock attenuation of the two padded pole slides (items #21, 22) revealed that the HIC was reduced 80% to a HIC of 1614 with 2.75" of the Skydex eggshell padding and 96% to a HIC of 314 with 5" of Skydex eggshell type padding. In each case the FHIP also fell by large margins to 5% for 2 ¾" padding and 0% for 5" of padding.

The perimeter materials: plush moist grass, loose wood chips, and pea gravel all reduced HIC scores by 90% or more, and in turn the fatal head injury probability (FHIP) to 3% or less. Pea gravel was the most effective of these materials lowering the HIC to 589. Synthetic field turf, a popular surface at many facilities demonstrated a HIC of 1777, 79% less than our baseline with a FHIP of 10%. Engineered wood fiber was slightly less effective than synthetic Field Turf reducing the HIC by 85% to an HIC of 1214. Of the perimeter materials tested packed dry dirt (item #14) was the least effective reducing the forces 49% to an HIC of 4278.

All four front buns tested (Blue Portapit®, Orange Pot-a-pit®, Green-Yellow kc fiber front bun section®, and Red 1984 UCS®) reduced the impact forces compared to baseline by at least 98% and lowered the probability of a fatal head injury to 0%. However, (item #9) was a base unit section that by all accounts was too hard (HIC 35) to comfortably land upon from more than 10 feet. We also tested a front bun section 40" in front of zero and found it to be acceptable with a HIC score of 37.

It was observed that the addition of a helmet to the head form slightly improved the HIC 11% relative to the unprotected head form falling on to the same padding materials and did not change FHIP probability. Note: The baseline test shown in sample #1 in fact was on to a rubberized track surface; clearly such a drop onto the steel and concrete planting box would produce a HIC score much higher than the 8196 HIC base line; however no such test was performed because the testers feared damage to the head form and its accelerometer. Clearly however, concrete is harder than 3/8" rubber on concrete.

Items #20-33 in Table 2 demonstrate the potential shock attenuation improvements that may be made using commonly available materials which could potentially be used in the manufacturing and installation of a plant box.

HEAD INJURY PROBABILITIES

Most of what is currently known about the relationship between impact magnitude and head injury risk comes from experiments using cadavers and human volunteers subject to high accelerations and impacts under laboratory conditions (6, 7). The data from these experiments form the basis of automotive and aircraft impact protection standards. There has been no research directly relating the magnitude of an impact from a pole vault fall to the severity of the injuries sustained. Therefore, data from automotive industry experiments were used to provide insights into injury risk in pole vaulting.

HIC is the measure of the likelihood of head injury occurring from an impact force. HIC is considered one of the standard measures of force impact and may be used to determine the risk of head injury. The lower the HIC, the lower the risk of head injury. For instance, it has been demonstrated that scores above 2500 HIC have a 85% chance of a fatal head injury, and a 95% chance of a critical head injury. A 20% level of probability for critical head injury begins at the 1500 HIC level. The 20% level of fatal head injury probability begins at about the 2000 HIC level of force impact to the head. (see Table 3 below). A 40% probability of a moderate head injury occurs at the 500 HIC level and 90% chance of a moderate head injury occurs at the 1000 HIC level. The chart is very useful for the purpose of assessing potential force impact levels and the damage they may cause to a vaulter.

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HEAD INJURY PROBABILITIES DISCUSSION

Table 3 shows the probability of different degrees of injury occurring as a result of impacts with a given HIC score. These "Expanded Prasad/Mertz Curves" are based on data from cadaver experiments

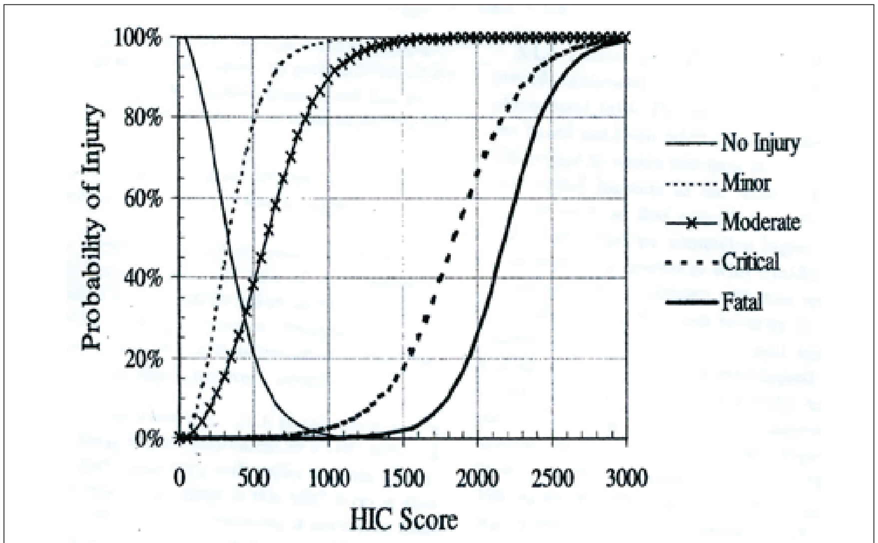


FIG. X1.1 Probability of Specific Head Injury Level for a Given HIC Score

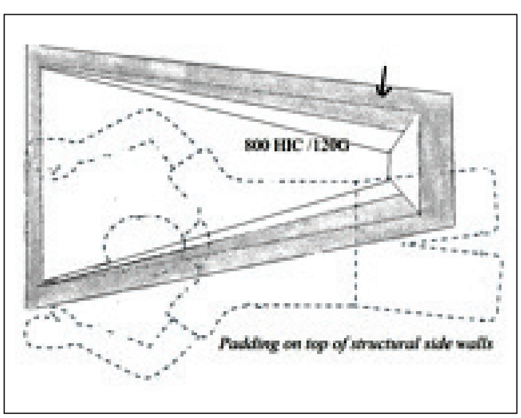
Table 3: Expanded Prasad/Mertz Head Injury Probability Curves

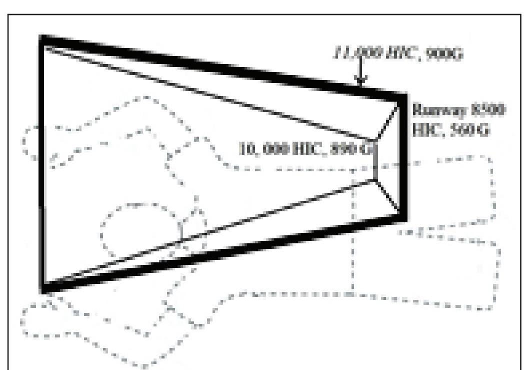
in which the relationship between HIC scores, skull fracture, and brain damage were observed (5,6). The two solid curves in this figure show the probabilities of no injury and of fatal head injury. Broken lines show the probability of minor, moderate, and critical head injuries, defined as follows: *Minor Head Injury*—A skull trauma without loss of consciousness; fracture of nose or teeth; superficial face injuries. *Moderate Head Injury*—Skull trauma with or without dislocated skull fracture and brief loss of consciousness. Fracture of facial bones without dislocation; deep wound(s). *Critical Head Injury*—Cerebral contusion, loss of consciousness for more than 12 hours with intracranial hemorrhaging and other neurological signs; recovery uncertain.

As an example of how Table 3 is interpreted, if a person experiences a head impact equivalent to a HIC score of 500, there is a 79% chance that he/she will suffer a minor injury. At 38 %, the risk of a moderate injury at this HIC level is also significant. The risk of this impact producing a severe or fatal head injury is very low, however. It is also notable that the chance of experiencing a 500 HIC impact without suffering an injury of any kind is only 21 %.

Discussion—HIC injury risk curves should be interpreted cautiously in the context of injuries resulting from pole vaulting. The data on which the Prasad/Mertz Curves are based are from adult cadavers subjected to frontal impact. The extent to which this data is valid for children experiencing non-frontal impacts to the head is not known. Also, a rigid missile such as that specified by this specification produces HIC scores that are somewhat higher than those generated by a cadaver or a head form with lifelike properties. HIC scores determined in accordance with this specification will overestimate the probability and severity of head injury if they are interpreted using Table 3. Consequently, the criteria established by this specification are more conservative than if a lifelike head form were used. The more conservative criteria are warranted by the absence of specific data for the head injury tolerance of children falling from playground

Generalized force impact potentials based upon data in Table 1





Generalized Steel with Concrete Pant Box *FI* values equipment and by the fact that the limiting HIC score of 1000 is set at the threshold of fatal injury risk. As the Prazad-Mertz curves show, a 1000 HIC criterion limits the probability of a fatal injury, but still infers a significant risk of severe, non-fatal injury. The probability of experiencing a 1000 HIC impact with no injury is very low (less than 1%).

CONCLUSIONS

The 2003 rule changes that mandated a larger landing pad have significantly reduced the number of catastrophic injuries from pole vaulters landing off the back or sides of the landing pads. Potential preventive strategies have been researched and developed that will soon be the standard specifications for the industry. These changes may reduce the number of catastrophic injuries in the sport of pole vaulting.

Photo 1: Elite female vaulter landing in the plant box as a result of hand slip off

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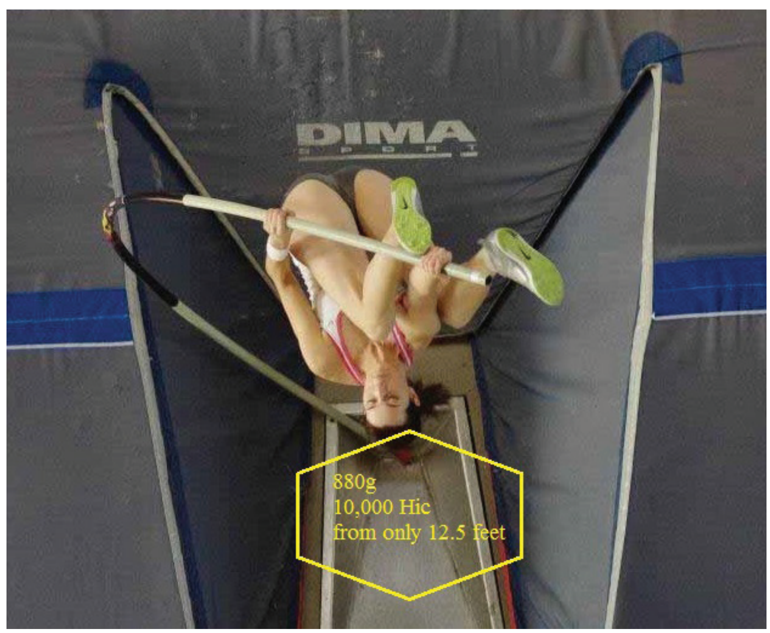

Photo 2 and 3 . All vaulter's must invert directly over steel and concrete every time they vault.

STRENGTHENING THE FOOT CORE SYSTEM FOR THE REHABILITATION AND PREVENTION OF INJURY IN DISTANCE RUNNERS

The importance of strengthening foot structure for long-term success in running and the desirable goal of minimalist shoes.

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INTRODUCTION

While attending a running clinic back in the 70's, I was fascinated by the message of one of the clinicians. The speaker was the late running guru, Dr. George Sheehan. His message that day was clear. If there is a running injury, it is usually associated with a weakness in the foot. He went on to cite muscle imbalances, lack of flexibility, leg length discrepancy and modern running shoes as specific areas of concern. What Dr. Sheehan said 40 years ago has been backed up by research and practice since that time. However, there are many coaches, trainers, doctors and physical therapists who continue to neglect strengthening the feet and ankles as a means of improving performance and reducing the number of running related injuries.

McKeon et al (2015) states "The movement and stability of the arch is controlled by intrinsic and extrinsic muscles. However, the intrinsic muscles are largely ignored by clinicians and researchers. As such, these muscles are seldom addressed in rehabilitation programs. Interventions for foot-related problems are more often directed at externally supporting the foot rather than training the muscles to function as they are designed.

Many athletes are put into rigid orthotics or a supportive "stability shoe" without ever attempting to correct muscle imbalances in the foot and lower leg.

FOOT STRUCTURE AND FUNCTION

McKeon points to "…evolutionary evidence that the foot arch architecture and musculature developed in response to the increased demands of load carriage and running." The medial longitudinal arch flattens as we run, providing cushioning and storing "recoverable strain energy in the stretched elastic tissues."

An absence or collapse of the arches of the foot can have a profound effect, including a loss in spring response, a loss of shock absorption leading to trauma and osteoarthritis, and compression of the nerves and blood vessels which can result in a lack of proprioception.

McKeon suggests that the "Foot Core System" works in the same manner as the lumbo-pelvic-hip core system. In other words, there is a passive subsystem consisting of 26 major bones, ligaments and more than 30 joint capsules. There is also an active subsystem consisting of the muscles and tendons acting on the foot. And finally, there is a a neural sub system, made up of the sensory receptors.

Janda, et al (2006) suggests that the position and alignment of the intrinsic foot muscles is responsible for "immediate sensory information, via the stretch response" and can be "modulated through training."

The muscles acting on the function of the foot can be classified into two groups. The first group are the **extrinsic** muscles, those that originate in the lower leg. They cross the ankle and insert into the foot. These muscles are primarily responsible for dorsiflexion/plantar flexion and eversion/inversion of the foot.

The second group are the **intrinsic** muscles that originate from either the dorsal aspect or plantar aspect of the foot. There are two muscles originating from the dorsal and 10 from the sole of the foot. The two dorsal muscles assist the extrinsic muscles while the plantar intrinsic muscles are responsible for the stability of the medial and lateral longitudinal arches and the anterior and posterior transverse metatarsal arches. An additional function of the intrinsic muscles is the actual movement of the digits.

A study published by Miller, et al in the *Journal of Sport and Health Science* in 2014, found that endurance runners training in what was described as "minimal support footwear" for a 12-week period were found to have a significant increase in foot strength due to a "greater use of the springlike function of the longitudinal arch, thus leading to greater demands on the intrinsic muscles that support the arch.." It seems that the design of the modern, supportive running shoe restricts the stretching and recoil response of the arches.

In addition, the design of the semi rigid sole of the shoe also restricts the function of the intrinsic foot muscles. A narrow and poorly designed toe box would also keep the toes from their natural toe spread on impact. Kerrigan et al (2009) conducted research which shows that wearing a modern, cushioned running shoe with an elevated heel increased torque at the hip, knee and ankle by over 36%, resulting in significant biomechanics changes.

Dicharry (2012), points to the evolution of the modern running shoe as a significant problem in foot strength and biomechanics. He lists four key features of these shoes that lead to these issues. Dual density posts, higher heels, cushioning materials and a narrow toe box, were all cited as actually causing significant problems. He cites studies that have shown that the dual density posts may actually stress the inside of the knee by as much as 38%. This, in turn, may lead to the development of osteoarthritis. According to Dicharry, "elevated heels compromise foot proprioception and throw off normal muscle firing patterns in runners." As for cushioning, he claims that excessive cushioning may delay sensory information to the brain resulting in "a delay in stabilization from the big toe."

DUAL DENSITY POSTS, HIGHER HEELS, CUSHIONING MATERIALS AND A NARROW TOE BOX, WERE ALL CITED AS ACTUALLY CAUSING SIGNIFICANT PROBLEMS.

This big toe plays a huge role in the stabilization and correct function of the feet. Dicharry claims that "80-85% of foot support should come from the big toe, a slightly wider big toe dramatically improves leverage." The narrow toe box design of most shoes inhibits the use of the intrinsic muscles which drive the big toe down and widen it to improve leverage. Dicharry concludes, "shoes don't stabilize the arch. Muscles do —train them!"

Dr. Joel Seedman, in his paper "How to Strengthen Your Ankles and Improve Performance and Prevent Injuries" (2016) cautions, "If a majority of your physical activity is performed in traditional shoes and you do little to train your feet and ankles then you most likely possess faulty ankle and foot mechanics."

A solution would be to gradually adapt to minimalist shoes or even as Dr. Daniel Lieberman, through his studies at Harvard University, has advised, barefoot running. Robbins and Hanna (1987) found a significant increase in foot strength after four months of barefoot walking and running.

However, Dr. Seedman also warns that the athlete must train the feet and ankles before switching to minimalist footwear or barefoot running. According to Seedman, "…don't go too extreme too soon or you'll set yourself up for injuries. Gradually progress into it. For some, fixing your feet and ankles will take weeks, while for others it may take months if not longer."

PROPRIOCEPTION

Numerous studies have shown that proprioceptive training is beneficial for both rehabilitation of injury and prevention of injury. Eils and Rosenbaum (2001) studied patients with chronic ankle instability and found that a multistation proprioceptive exercise program resulted in "significant improvement in joint position sense and postural sway as well as significant changes in muscle reaction times." Diracoglu et al (2005) found that subjects who added balance exercises as well as strengthening exercises to their rehabilitation programs showed significantly greater improvement over those subjects receiving only strengthening exercises. In their review of literature on the benefits of proprioceptive training, Aman et al (2014) found improvement rates above 20% in proprioceptive function.

NUMEROUS STUDIES HAVE SHOWN THAT PROPRIOCEPTIVE TRAINING IS BENEFICIAL FOR BOTH REHABILITATION OF INJURY AND PREVENTION OF INJURY.

There are a number of definitions for the term proprioception. However, Aman (2014) has proposed that "proprioceptive training is an intervention that targets the improvement of proprioceptive function. It focuses on the use of somatosensory signals such as proprioceptive or tactile afferents in the absence of information from other modalities such as vision. Its ultimate goal is to improve or restore sensorimotor function."

Dorothy Voss, one of the leading pioneers of Proprioceptive Neuromuscular Facilitation (PNF), described it "as a method of promoting and hastening the response of the neuromuscular mechanism through the stimulation of proprioceptors. Still other researchers such as Laskowski, et al (1997) refer to proprioception as "a complex neuromuscular process that involves both afferent input and efferent signals and allows the body to maintain stability and orientation during both static and dynamic activities." Using the ankle as an example, the afferent input is acquired through the mechanoreceptors of the foot and ankle—In other words, the sensory neurons of the joint capsules, ligaments, tendons, muscles and skin. The efferent signals then would provide the response of the ankle and foot muscles to the afferent input.

Factors which would affect proprioception include; disease, injury, aging, immobility, fatigue, loose ligaments, surgery, and lack of use. Much of the research into proprioception refers to rehabilitation and re-establishing stability. Inappropriate footwear would certainly be classified as immobility and lead to lack of use of the foot muscles. In addition, the repetitive nature of long distance running would also cause these same muscles to fatigue and possibly lead to injury. Any previous injury to the foot or ankle should also be factored in. As such, proprioceptive training is indicated for all runners.

DEVELOPING FOOT STRENGTH

The average runner pushes off the ground somewhere between 170-180 times per minute, or close to 11,000 times during an hour run. This repetitive motion, while enveloped in narrow, over-cushioned shoes leads to weak feet and ankles and severe muscle imbalances. The program that follows is one that can help correct those imbalances, strengthening the feet and ankles. The end result should be an increase in mobility and stability, injury prevention, and improved performance. The emphasis in this routine is on the "Janda Approach", after the late Vladimir Janda. Janda felt there was a four-step approach to addressing musculoskeletal pain and rehabilitation.

Step One

Normalize the periphery. In the absence of injury, we will simplify this as correcting biomechanics.

Step Two

Restore muscle balance by addressing short/tight antagonistic muscles. Janda felt that "…the coordinated firing patterns of muscle are more important than the absolute strength of muscles."

Step Three

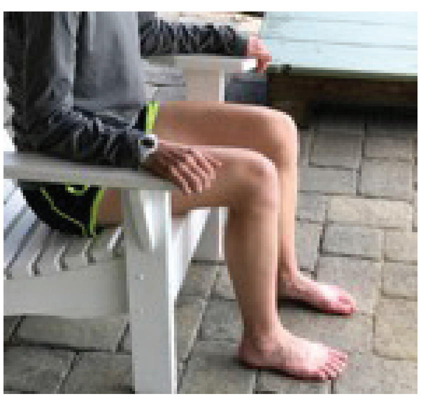
An increase in proprioceptive input by increasing levels of stimulus to the sensorimotor system.

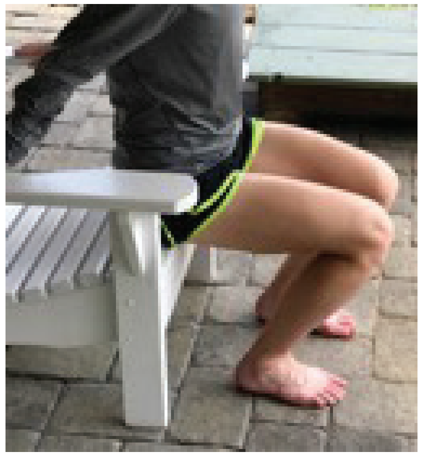
Step Four

An increase in endurance through low-intensity high-volume activity. Janda felt that "Since fatigue is a predisposing factor to compensated movement patterns, endurance is more important than absolute strength."

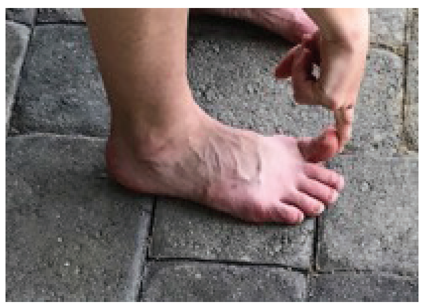
Prior to doing the foot core exercises, the dorsiflexion of the ankle and big toe should be tested. Dicharry (2012) suggests the following:

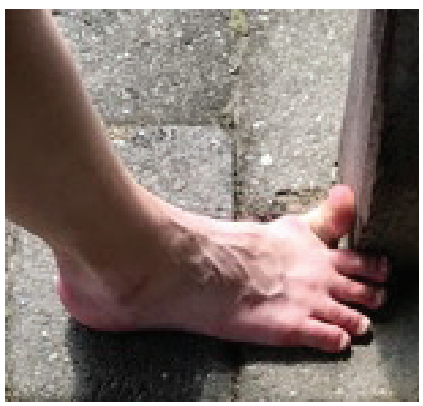
The ankle is tested by being seated, flat footed, and knees at 90 degrees. Slide forward, driving the knees over the toes while keeping feet flat on the floor.





Big toe mobility is dependent on the long toe tendon and is tested by keeping your body in the same position as the ankle test. Now reach down and bend the big toe straight back 30 degrees while keeping the ball of the foot on the ground.





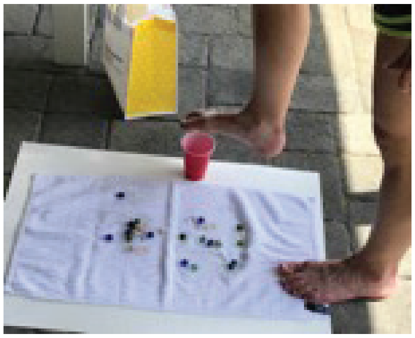
If the results of the testing are negative, care should be taken to stretch the appropriate areas. All stretching should be done using the stretch-tighten-relax-stretch technique of PNF. Care should be taken to stretch the rest of the muscles in the foot and ankle, being careful to work through the full range of motion, prior to completing the foot core strengthening routine. A stretch for big toe mobility is shown here.

FOOT CORE SYSTEM STRENGTHENING ROUTINE

• **Short foot (SF) exercise**
The short foot exercise was developed by Janda, Jung, et al (2011). They found the short foot exercise to show significantly greater gains in strength in both the abductor hallucis and medial longitudinal arch, when compared to standard toe curls.

Start with most of your weight on the target foot. The idea is to make your foot shorter with a higher arch without turning your foot out or curling the toes. Think of pulling the ball of the foot towards the heel. Twenty quick reps per foot.

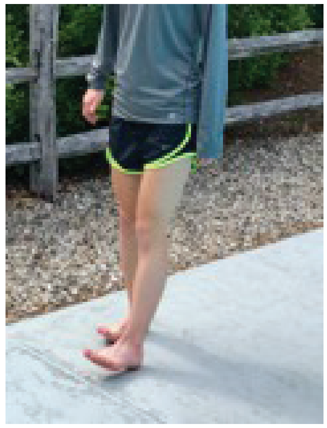
• **Marble Pick-up**
Use toes to pick up marbles from carpet or towel and place them in a collecting bag. Repeat using other foot. Begin from seated position and advance to standing and finally to standing on the balance cushion.



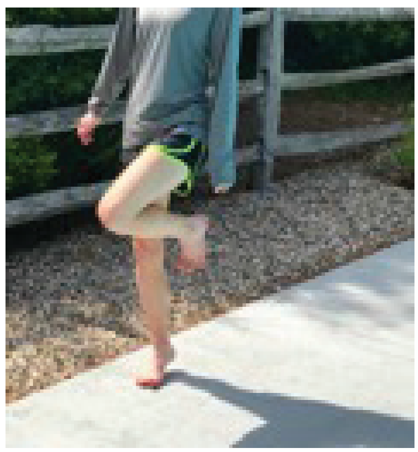
• **Toe drops**
On a step, stand supported by holding rail. Heels on edge of step. Lower the toes to below step level and back up to above step level. Max of 10 reps.

• **Toe rises**
Reverse of position above. Balls of feet on step. Negative heel. Rise far up onto toes and back down slowly. Max of 20 reps. (picture)

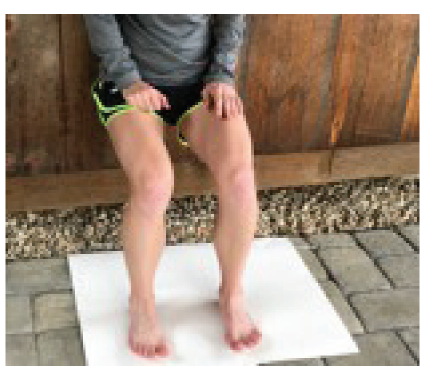
• **Heel Walks**
Dorsiflex the foot and walk on the heels. Max of 25 steps. Exceeding this volume can easily strain the muscles of the lateral portion of the lower leg.

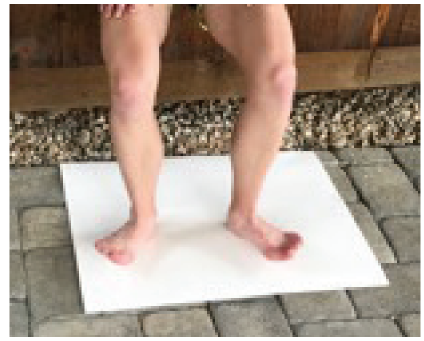


• **Backward Toe Steps**
Walking backwards, on the toes lifting the heel 45 degrees off the ground. (25 reps.)



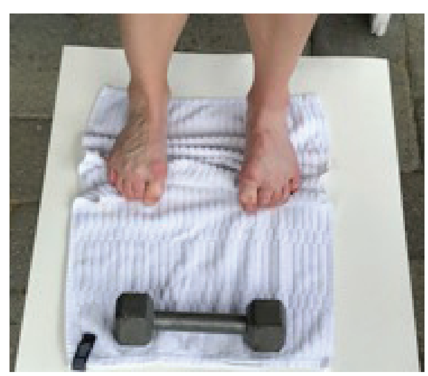
• **Wall Squat with slow heel rotations**
With back supported against the wall and knees at 90 degrees, dorsi flex the feet and slowly rotate the heels so as to point the toes inward and then outward (max of 10 rotations)





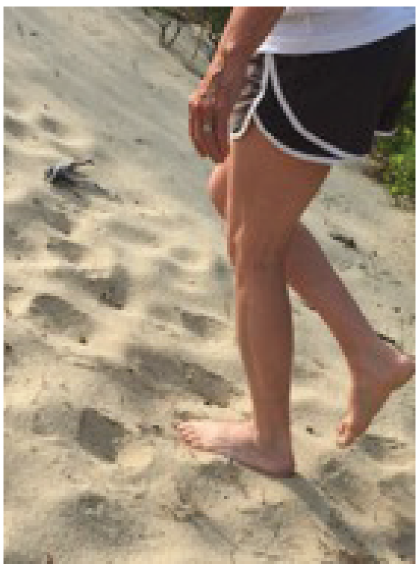
• **Foot writing on cardboard**
Begin with seated position, place crayon between big toe and second toe and write your name. Alternate toes and feet. Progress to standing and finally to balance cushion while completing the task.

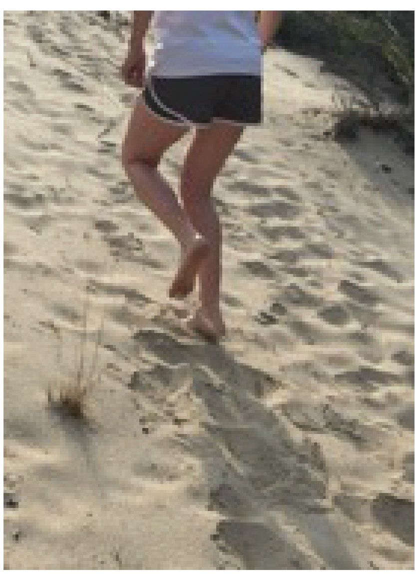
• **Towel Drill (Building mounds)**
While seated, and barefoot, use the toes of both feet together to pull the towel towards you, a little at a time, building mounds under your arch. Weight may be added as you progress.Research by Padilla and Tsang (2012) found the SF exercise to be superior, but this is a viable alternative for those having trouble with the SF.



• **Barefoot walking on grass and sand**
When possible and when safe, go for walks on the grass and sand gradually increasing the distance.

This will not only strengthen the feet, but significant research has shown there to be a "grounding effect". This involves the passing of electrons into the body from the earth resulting in an antioxidant and anti-inflammatory benefit. Gradually work into this as walking or running in sand can easily strain the plantar intrinsic muscles.





• **Toe crunches**
Not as effective as the short foot exercise but can be done in bed or while relaxing. Simply "crunch" the foot and hold for a count of six. Alternate feet 8-10 reps. (Holding longer may result in cramping!)

• **Toe splaying**
Spread the foot by moving the toes away from each other. 10-15 reps Can be repeated several times per day. As a progression you can lift the big toe leaving the four remaining on the ground and then reverse.

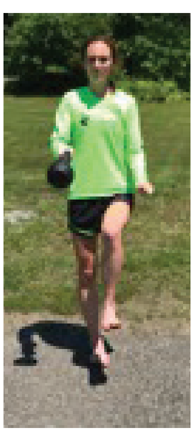
• **Balance cushion (using the following progression)**
Stand with both feet on the cushion for periods of up to 1 minute.
Left foot on balance cushion
Right foot on balance cushion
Eyes closed for all three previous positions
Then, as mentioned above, left foot write name, right foot write name.

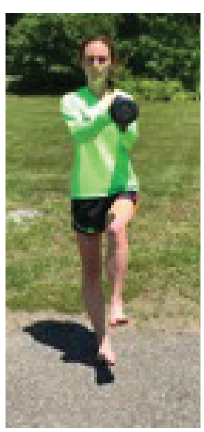
• Single Leg Stand with kettle bell
Holding 5 lb. kettle bell in one hand, support your weight on the opposite foot and hold for 30 seconds. Progress to eyes closed and additional weight.

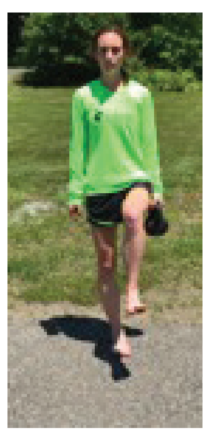
• Single Leg Swap with kettle bell
Start with kettle bell on same side as balance leg. Hold for 10 seconds Keeping good form, firing the core muscles, slowly transfer the kettle bell to the other hand and hold for 10 seconds. Transfer back to start position and hold for the final 10 seconds. There are also a number of exercises for the extrinsic and intrinsic foot muscles that can be done with the use of tubing or bands. I am currently finding excellent results using a device known as the AFX Ankle Foot Maximizer. (pictured below)

CONCLUSION

What has been described here is a simple method to train the intrinsic and extrinsic muscles of the feet. The purpose is to improve performance and decrease the incidence of injury through increased strength, endurance and proprioception. In short, an increase and balance between mobility and stability. As Nelson ((2013) cites, “running barefoot or wearing minimalist shoes are the end game, not the place to start.” I have outlined the place to start with some natural progressions. Although there is a great deal of research on the benefits of foot exercise and PNF training in the field of rehabilitation, there is little research in the area of improved performance in athletes. Further study is suggested in this area.







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INTERVIEW WITH PETER MCGINNIS

Peter M. McGinnis, Ph.D. is a professor in the Kinesiology Department at State University of New York, Cortland, where he also coaches pole vaulters. He is also the biomechanist for the pole vault event for USA Track & Field. He is the author of many articles, particularly on the pole vault. His popular textbook, "*Biomechanics of Sport and Exercise*," published by Human Kinetics of Champaign, IL, is now in it third edition.

BY RUSS EBBETS, EDITOR, TRACK COACH

1. What is biomechanics?

Biomechanics is the study of forces and their effects on living systems. Biomechanics of sport is the study of forces and their effects on athletes.

2. Why is the study of biomechanics important to sport in general and track & field in particular?

The goals of sport biomechanics are to improve performance and prevent injury. These goals can be achieved by applying biomechanics principles to improve technique, equipment, or training. Every track & field athlete strives to run faster, throw further, or jump higher (or longer) while avoiding injury. The study of biomechanics is important to sport and track & field because the goals of biomechanics match the goals of track & field.

3. Can you can give an example of how biomechanics is used in a running, jumping and throwing event?

Running: During the constant velocity phase of a 100m sprint, a sprinter's horizontal velocity is faster during flight phase than during the contact phase of a step. If contact time is shorter, average velocity is faster. Shorter contact time requires larger vertical reaction forces. To become a better sprinter, you must be able to produce larger vertical reaction forces more quickly.

Jumping: The height a pole vaulter can reach is determined by how much potential and kinetic energy he has at takeoff, how much work he does on the pole, and how much energy is lost or not converted to potential energy. Kinetic energy at takeoff has the largest influence on the height reached by a pole vaulter. To vault high a vaulter must be fast.

Throwing: In the shot put, the shot becomes a projectile once it is released and how far it travels is determined by projectile motion equations. Projectile motion equations can be used to determine the optimal angle of release for the shot. This angle is 45 degrees if the projectile is released from the same height that it lands. In shot putting, the shot is released well above the landing surface, so the optimal angle of release is less than 45 degrees. Since it is easier for an athlete to accelerate the shot horizontally rather than vertically upward, the optimal release angle is slightly less than what is predicted by projectile equations.

4. What is the most amazing biomechanical feat you've witnessed that made you say, "Wow!"

At the 2017 USATF Outdoor Championships, I watched Sam Kendricks vault 6 meters (19'8¼") with a grip height of only 4.83m (15'10") on a 4.90m (16'1") pole. Wow! Every other vaulter who has cleared 6m or higher used 5m or longer poles, and none had gripped so low. Also, Sam's velocity over the last 5m of his run was slower than that of any of the vaulters whose 6m vaults I havemeasured.

5. Track & field is very much about the limits of human performance. In what areas are we lagging or being held back? And conversely, in which areas is biomechanics allowing us to move forward?

Inexpensive, easy-to-use devices that provide accurate real-time measurements of important biomechanical variables (especially forces) would be a boon to knowledgeable coaches who want to monitor performance measures of their athletes. On the other hand, tablets and smart phone with the improvements in their video capabilities (resolution and frame rate) along with the various motion analysis apps available have provided coaches with biomechanical tools that were not even dreamed of when I took my first biomechanics course almost 40 years ago!

6. At what age do biomechanical considerations begin to play a role?

Newton's laws have no age bias! Biomechanical considerations play a role at every age, from birth to death. With growth, limb lengths and masses change and these changes affect movement mechanics. By the time athletes are in their late teens or early twenties, growth in limb lengths has ceased and mechanics become more stable. But changes, increases or decreases, in muscle strength and limb mass may still occur and these changes will continue to affect movement mechanics throughout the athlete's career. These changes can occur throughout an athlete's life.

7. Training movements, not muscles, is a coaching maxim most coaches would subscribe to—which side of the issue are you on?

I'm not on either side—movements require muscles, so both must be trained. The movements involved in some events are not possible without a certain level of strength in specific muscle groups. For example, in pole vaulting, a minimum level of shoulder extensor strength is needed to swing upside down on the pole, especially as you hold higher. In this case, the movement can't be trained without the muscle strength to produce it.

8. For someone new to track & field with a burgeoning understanding and application of biomechanics—what are some concepts you recommend one try to master as early as possible?

The concepts of impulse-momentum and work-energy are important to understand since they explain the mechanical bases for many techniques used in track & field events.

In the impulse-momentum equation, average force applied times the duration of that force application causes a change in momentum (mass times velocity) in the direction of the force. If you want to increase the velocity of something (a discus, shot, javelin, human body, etc.), the larger the force you apply and the longer you apply that force, the faster the velocity will be at the end of the force application. Muscle strength largely determines how much force you can apply, but technique determines how long that force is applied.

In the work-energy equation, work done (average force times displacement in the direction of the force) causes change in energy. In track & field events, we usually want to change (increase) velocity or increase kinetic energy. To do this, apply as large a force as possible through as long a displacement as possible. Push and/or pull as hard as possible on an object through as great a range of motion as possible to get that object moving as fast as possible.

9. The Olde English word 'sped' was the word for success. In almost every event (and sport) if one can perform something faster there is potentially a better result. What do you see as three or four critical aspects of speed?

I see force production, rate of force production, and correct direction of the force produced as the three most critical aspects of speed.

10. Tudor Bompa wrote that style is an athlete's personal rebellion against authority. When does "personal style" become counterproductive?

Personal style is counterproductive or detrimental to an athlete's performance if it interferes with or prevents the execution of biomechanically sound technique.

11. What is a "technical model?"

I consider a technical model to be a model of the most effective technique based on biomechanical principles. Jim Hay developed a deterministic procedure for developing a technical model for an activity. This procedure identifies the important movements and positions based on mechanics.

12. How do you define coordination? How would you suggest one improve it?

Coordination is the proper timing of muscle force production in multiple muscles across several joints to produce a desired movement outcome.

13. How can knowledge of biomechanics prevent injuries?

Injuries are a result of mechanical stress (compression, tension, or shear) to bones, ligaments, tendons, muscles, etc. When the mechanical stress exceeds the strength of the biological material, failure or injury occurs. The strength of our bones, ligaments, tendons, muscles, etc. is not static, however. It responds to repeated stress by getting stronger (if the stress is high enough but not too high, and/or the stress is repeated frequently but not too frequently) or weaker (if the stress is too high and/or is repeated too frequently). Knowing this and knowing how external forces impose stress on our bodies structures during specific movements executed during an event or an exercise may help a coach decide what drills or exercises to include in a workout and how many repetitions of the drills or exercises are included in the workout.

INJURIES ARE A RESULT OF MECHANICAL STRESS (COMPRESSION, TENSION, OR SHEAR) TO BONES, LIGAMENTS, TENDONS, MUSCLES, ETC. WHEN THE MECHANICAL STRESS EXCEEDS THE STRENGTH OF THE BIOLOGICAL MATERIAL, FAILURE OR INJURY OCCURS.

14. How does biomechanics explain or underscore the importance of the stretch reflex (stretch shortening cycle)?

The stretch reflex allows an athlete to recruit more motor units than he/she can voluntarily. This thus results in larger muscle forces. By evoking the stretch reflex during the eccentric phase of a countermovement, an athlete can benefit from the greater muscle activation and force during the concentric phase of the movement.

15. Do you feel a researcher would learn more from the study of an outlier like Usain Bolt and his world record 100m or from the study of the movement patterns of an "average" high school runner?

A researcher would learn more by studying both. I would study Usain Bolt to determine the aspects of his technique that are different from other elite sprinters. I would study elite sprinters to determine what aspects of their techniques are different from average sprinters. These differences may indicate what factors are responsible for Usain's success and the elite sprinters' success. To do this, you'd have to study average sprinters to know what they do, however. So, a researcher learns the most by studying a range of performances to determine what factors may be responsible for the best performances.

16. I have heard it said that biomechanics can be broken down into linear and rotary actions or their combination. Is it really that simple?

No, but, biomechanics and mechanics involves developing a mechanical model of the body or object being examined using mathematical equations. The best model is the simplest model that can accurately explain the movements of the object in question. The simplest model is to represent the object as a particle. In that case, only linear motion is possible. The next level of complexity is to model the object as a rigid body—a body that cannot change shape. In this case, linear and angular motion is possible. Analyzing the linear and angular motions of the rigid body separately is a way of keeping the rigid body model simple.

17. Why was Usain Bolt's 100m world record such an anomaly?

Usain's height is an anomaly. He is the tallest person to ever hold the 100 m world record—at least in the last 50 years. It was once thought that an above average height sprinter would have a disadvantage due to his longer limbs and their larger moments of inertia (resistance to change in angular motion). Bolt's performance eliminated those thoughts forever.

The other anomaly about Bolt's record is that in a period of about 15 months he lowered the 100m world record by 16 hundredths of a second or by 1.64%. That is huge and is the greatest percentage change in the 100m world record in the last 50 years.

BIOMECHANICS CAN HELP A COACH OR ATHLETE MAKE THE NEXT STEP BY HELPING THEM UNDERSTAND WHAT TECHNICAL IMPROVEMENTS ARE WORTHWHILE TO PURSUE, WHAT EQUIPMENT IMPROVEMENTS MAY BE WORTHWHILE TO MAKE, AND WHAT TRAINING IS MOST EFFECTIVE.

18. What are some questions or situations that you wonder about and would like to see answered in the next decade?

I have questions about pole vault pole design and construction. Has it been optimized? Are there bettermaterials?

19. Were you ever of the opinion that performance-enhancing drugs have a significant effect on an athlete's biomechanics or the technical model of an event? (What I am thinking here is that the drug influence and the influence of the bench press on the shot in the 80's led to a lowering of the angle of release with a farther throw)

No, I never had this opinion.

20. It might be safe to say that the pole vault is your avocation. What is the state of safety in the vault?

The pole vault is a safer event than it has ever been. Coaches and athletes aremore aware of safety concerns. The pit sizes specified by the NCAA and NFHS rules are now larger than they were 20 years ago. The box collar now specified by the NCAA and NFHS has decreased the chances of injury from falls into the box. Improvements can still bemade, however. The box itself is still a hard, rigid object and landings in the box still cause injuries. The only part of the box that really needs to be rigid is the bottom end of the box that stops the forwardmotion of the pole tip. The upper walls of the box and themost of the slide of the box can bemade ofmaterials which attenuate impact forces. This would further reduce injuries in the pole vault.

21. You have done much work with pole vault helmets but they have never really caught on—any thoughts why?

Helmet use in pole vaulting becamemore widespread when Toby Stevenson (silvermedalist in the 2004 Olympics) was vaulting and following three fatal pole accidents in 2002. Toby always wore a helmet while he was vaulting, and since he was a successful and popular pole vaulter, some young vaulters emulated him and wore helmets. The three fatal pole vault accidents in 2002 also resulted in several statesmandating helmet use by high school pole vaulters. In response, the ASTM began work to develop a standard for pole vault helmets. I helped chair the task group that worked on this standard. ASTM finally approved a standard for helmets used in pole vaulting in 2005. It is still an active standard, but I think only one company actuallymakes a helmet thatmeets this standard. most peoplemistakenly believe that a helmet will completely protect your head and brain from a fall from typical pole vault heights. The ASTM pole vault helmet standard addresses this issue in the introduction to the standard by stating that helmet use is not likely to protect a vaulter from severe brain injury or death from a fall onto a hard surface outside of the pole vault pit. A helmet that would protect your head from a fall from typical pole vault heights would be so large and unwieldy that it would effectively prevent you from vaulting that high. The ASTM pole vault helmet standard only requires impact testing from a drop height of two meters—a typical drop height specified in standards for bicycle helmets, skateboarding helmets, etc. A pole vaulting helmet does offermuchmore protection than no helmet—especially in secondary collisions during the landing from a fall outside the pit.

I really haven't answered the question, but I think pole vault helmets never really caught on because they were notmandated by the NCAA, NFHS, or USATF.

22. Recently we had a javelin throw over 300' and a near two-hour staged marathon. How does biomechanics help a coach or athlete make the next step?

Biomechanics can help a coach or athletemake the next step by helping them understand what technical improvements are worthwhile to pursue, what equipment improvementsmay be worthwhile tomake, and what training ismost effective. In the stagedmarathon, the chosen venue was flat and the surface was smooth, visual feedback about pace was continually provided, air resistance wasminimized by using a pace vehicle and a pack of runners, and special shoes with basically a carbon insole with spring-like properties were used. All these advantages still did not produce a 2-hourmarathon, however, but it was very close. Duplicating this effort in an actual competition would be impossible. But, the event did convincemany that a 2-hourmarathon is a possibility.

23. The technology of prosthetic limbs is improving yearly. While the novelty of athletic feats by these "disabled" athletes is marvelous do you foresee a time when these technological advances will become a technological advantage?

Yes—I think in some cases they already are providing a technological advantage over able-bodied athletes. Determining the standards that define when a prosthesis provides an advantage to a Paralympic athlete over an able-bodied athlete is a very difficult technically, philosophically, and ethically. What is fair?

24. Any recommendations on where to go if one is interested in learning more about biomechanics?

Read a biomechanics textbook or a book aboutmechanics. I can suggest one that I wrote, *Biomechanics of Sport and Exercise*, but there aremany others that are just as good. Enroll in the USATF Level I coaching course or the USTFCCCA coaching course. These include some biomechanics sections.

25. Any last thoughts? (or is there a question you'd like to pose and answer yourself?)

Biomechanics is often used to determine the important elements of technique in an event. Inmy work with pole vaulters,mechanics is used to determine what aspects of a vault Imeasure, and then Imeasure these variables acrossmany vaulters during competitions. Statistical analyses then identify what parameters aremost closely correlated to performance. These findings provide the basis for a technicalmodel. Sometimes, what is revealed as important in the group statistic is not important to an individual. This is oftenmissed by coaches. As a coach, your athletes are all individuals. You'll bemore successful if you coach them as individuals.

26. One of the criticisms of almost any academic pursuit is that often the "smarter" one gets or the deeper one gets into a discipline the more obscure the knowledge can become. There is that old saying about knowing more and more about less and less until one finally knows everything about nothing. How does one draw the line or recognize the line between the obscure and the useful?

In sport biomechanics, the goal is performance improvement. If the knowledge can lead to performance improvement, it is useful. The biomechanical importance and usefulness of a detail about technique depends on themagnitude of its effect on performance. The larger the effect the technical detail has on the performance themore important and themore useful it is. Obscure knowledge about aminor detail thatmay lead technique improvement is not worthwhile to pursue if there aremore useful technical improvements to bemade that will have larger effects on performance.

STRENGTH TRAINING FOR TRACK: A MOTOR LEARNING PERSPECTIVE

Save valuable training time by coordinating strength training elements with the actual demands of your event.

BY DENISE K. WOOD, EDD, CSCS, AWSPCC

Dr. Denise K. Wood has more than 40 years of experience as a professor, coach, and sport scientist who has trained youth athletes to Olympians and professionals in many sports using skill-targeted strength training methods.

She is currently an instructor for USATF's Coaching Education at Levels 2 and 3 in sport psychology and motor learning, and folio reviewer for the National Council for Accreditation of Coaching Education (NCACE).

Dr. Wood was formerly a national champion, member of the U.S. track and field team, and Head Women's Strength Coach/Assistant Track and Field Coach at the University of Tennessee.

She is currently Vice President of Research and Assessment at Huntington College of Health Sciences and Head Strength and Conditioning Coach/Assistant Track Coach at South Doyle High School in Knoxville, TN.

Track and field teaches athletes to learn and perfect running, jumping, and throwing skills. Athletes in track and in many other sports use strength training to boost these foundational skills with strength and power in order to gain an edge over their competitors.

Dr. Jeffrey Ives, however, points out that strength gained in the weight room is often wasted because athletes' muscles are not being trained in ways they actually move in their particular event. It is ineffective for athletes to target muscles and attempt to stabilize joints by isolating them. Ives, a motor behavior expert, asserts that simply identifying the actions of muscles provides an incomplete, if not erroneous, view of how muscles work in the competitive arena.

Improving strength and fitness through conventional and functional training increases the capability for skilled sport performance, but these gains do not necessarily transfer well to the athletic field because coordinated movements are not included as training targets.

Viewed through the lens of motor learning, *strength training exercises are skills*—learned tasks that develop strength and power through the use of resistances. Recognizing lifts and resistance exercises as skills that are made up of coordinated movements opens the door to a treasure trove of evidence-based, motor learning tools that athletes can leverage to enhance performance on the field.

For sport and strength coaches, neuromuscular coordination is the common ground where training sport fitness and practicing skills can be developed in concert to generate more powerful, efficient movements. Using selected exercises, athletes can train the brain and nervous system to simulate and reinforce desired sport movement patterns.

Elite USATF coaches and many sport scientists agree that training the brain and nervous system to function more efficiently goes hand-in-hand with improving both sport fitness and skills. By designing programs that match the movement demands of one's event, as well as the physiological demands, athletes can capitalize both on the transfer of training for sport fitness and the transfer of learning coordinated movements in sport skills.

Transfer of learning is the effect of previously learned skills and experiences on new skills. The transfer of learning concerns the neuromuscular and psychological effects of training and practice, rather than the physiological effects, on competitive performance.

The *identical elements theory* states that positive transfer is due to the similarities in the qualities of motor skills. The more common qualities shared by two skills, the greater the extent of positive transfer.

Transfer of learning applies to strength training skills, as well as training activities and practice drills. The key to optimizing transfer is to match up common movement qualities shared by resistance exercises and sport skills. Greater positive transfer means less time is wasted on strength training exercises that yield little or no competitive benefit.

Elite USATF sprint coaches identify good posture and alignment, acceleration, short touchdown times, and the triple extension as examples of important sprint qualities. They recommend variations of the Olympic lifts, such as the power clean and split jerk, for sprint training because these lifts serve as harmonizing agents that make gains in biomotor abilities more functional to performance.

From a motor learning perspective, these harmonizing agents are the common movement qualities shared by sprints and these ballistic lifts. For example, the power clean simulates certain vertical jumping movements. The split jerk and variations, such as the speed jerk, mimic selected sprinting movements.

When lifting technique is learned correctly, movement qualities transfer well to similar sprinting and jumping movements. These lifting qualities include correct posture and alignment, acceleration, and reactivity for quick touchdown times. Variations of Olympic lifting movements not only mimic the triple extension in sprinting and jumping skills; they also simulate the triple flexion and weight shift that precede the triple extension, which results in more positive transfer.

When combined with low-speed strength and functional exercises, Olympic lifting variations with light to moderate loads serve as plyometrics with weights. Including these lifts in a well-designed program can effectively train the brain with correct neuromuscular coordination patterns within and between muscles, while also developing strength and power to improve sprinting and jumping performances in track and other sports.

Youth athletes to Olympians can save valuable training time and accelerate skilled performance on the field by factoring coordination into the strength training equation. The guidance and supervision of a certified and qualified strength and conditioning professional is highly recommended to ensure safety and to teach correct lifting techniques to athletes at every level.

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USATF COACHING EDUCATION

CALENDAR OF SCHOOLS

Begin your pathway to USATF certification at the Calendar of Schools, where you'll locate all certification opportunities (Levels 1, 2, and 3) and information on special programs. Watch for 2018 USATF Coaching Education Programs dates and locations to be posted soon.

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

Level 1

Oct. 13-15	Marian University - Indianapolis, IN
Nov. 4-5	Nazareth College - Rochester, NY
Nov. 11-12	Carroll University - Waukesha, WI
Nov. 11-12	Tennessee State University - Nashville, TN
Nov. 17-19	Life University - Marietta, GA
Nov. 17-19	Olympic Training Center - Colorado Springs, CO
Nov. 18-19	Virginia Wesleyan University - Virginia Beach, VA
Nov. 18-19	Wellesley College - Wellesley, MA
Nov. 25-26	Residence Inn KC Airport - Kansas City, MO
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	Cerritos College - Norwalk, CA
Dec. 16-17	Allen High School - Dallas, TX

Level 2

Dec. 27-31	Endurance or Sprints IMG Academy – Bradenton, FL

Level 3

Dec. 3-9	USATF/IAAF Academy – Sprints or Youth Specialization IMG Academy – Bradenton, FL

SPOTS FILLING, DON'T MISS TWO OPPORTUNITIES TO EARN USATF CERTIFICATION AT IMG ACADEMY

Program: USATF Level 2 Certification for Sprints/Hurdles/Relays or Endurance
Location: IMG Academy, Bradenton, Florida
Date: December 27-31, 2017
Application Deadline: November 1, 2017

Earn USATF Level 2 certification in Endurance or Sprints/Hurdles/Relays during the intense, five-day program. The program provides an advanced, in-depth education in one event group and teaches the science behind the sport through advanced sport science concepts and training principles. The USATF Level 2 Program is certified by the National Council for Accreditation of Coaching Education (NCACE) and is guaranteed to challenge and advance your knowledge of the sport.

http://www.usatf.org/Resources-for---/Coaches/Coaching-Education/Calendar-of-Schools/Level-2/2017/IMG-Academy.aspx

Program: USATF/IAAF Academy for Sprints/Hurdles/Relays or Youth Specialization
Location: IMG Academy, Bradenton, Florida
Date: December 3-9, 2017
Application Deadline: November 1, 2017

Earn the highest certification level from USATF and the IAAF in this week-long, high-level program. The USATF/IAAF Academy encompasses the scientific base included in the previous levels, while providing coaches with comprehensive knowledge in a specific event group. The course includes some of the world's best instruction, preparing an individual to coach at the national and international level.

http://www.usatf.org/Resources-for---/Coaches/Coaching-Education/Calendar-of-Schools/Level-3/2017/IAAF-Academy.aspx

USATF CAMPUS: OFFERING ONLINE COURSES DEVELOPED BY LEADING SPORTS SCIENTISTS AND COACHES

USATF Campus is an online learning platform available to all coaches, athletes, and educators with an interest in better understanding human performance. Featuring an endurance course developed by USATF Legend Coach Dr. Joe Vigil and a series of sports science courses from Dr. Christine Brooks, USATF Level 2 Sports Science Director, the offerings provide science and evidence based research for peak performance.

Courses Available:

- Basic Principles of Endurance Training
- Physiological Development Through the Athlete's Lifespan
- Energy Systems and Motor Performance Abilities in Athletes
- Training Science
- Acute Fatigue Due to Training and Competition
- Sport Specific Strength and Power
- Chronic Fatigue Due to Overtraining

Enroll now at courses.usatf.org; most courses can be completed in as little as three hours.

Earn CEUs for USATF Coaching Education Programs

In partnership with the Department of Kinesiology, School of Public Health—Bloomington, Indiana University, USATF offers CEUs (continuing education units) to individuals completing USATF Coaching Education Programs, including Level 1 and 2 certifications. Use the credit to renew certifications and stay current in your field. Click below for a listing of approved for credit courses and certifications.

http://www.usatf.org/Resources-for---/Coaches/Coaching-Education/Earn-CEUs.aspx

From the Editor

Continued from page 7060

celebrates childhood, the US tries to drug it into adulthood.

If you read Morgan's article you'll have a perspective on Gatlin's second positive. It is a classic case of "he said—she said." Honestly, I have met Gatlin but I do not know him well. Nonetheless I am leaning towards his explanation of events. Morgan misidentified the "other party" as a physical therapist. Actually, he was a massage therapist who has made a career of mid-identifying himself. I'll stop there.

Wherever the truth lies Gatlin was guilty of poor judgement and it cost him four years. For most athletes that would have been the end of a career. Gatlin did his time, got back into shape, came back and beat Bolt. Headline: Gatlin Beats Bolt.

If you Google images for "Drug Free America" you can find a cartoon picture of the U.S. pharmaceutical industry's chemical solution for every phase of life. Right or wrong it is just the way life is today. With apologies to John 8:7—Let he who is without sin cast the first pill.

As a track & field fan I offer a sincere thank you to Usain Bolt for an unparalleled career and to Justin Gatlin, 2017 World 100m Champion—congratulations.

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