TRACK COACH

2017 / ISSUE 220

The official technical
publication of
USA Track & Field

USATF

TRACK COACH

Summer 2017 I 220

TRACK COACH

FORMERLY TRACK TECHNIQUE

220 I SUMMER 2017

The official technical publication of USA Track & Field

USATF

ED FOX....................................PUBLISHER
RUSS EBBETS.................................EDITOR
TERESA TAM.........PRODUCTION & DESIGN
FRED WILT......................FOUNDING EDITOR

PUBLICATION

Track Coach is published quarterly by Track & Field News, 2570 W. El Camino Real, #220, Mountain View, CA 94040 USA.

The Fall 2017 issue (No. 221) of Track Coach will be e-mailed to subscribers about October 1, 2017.

SUBSCRIPTIONS

$20.00 per year, U.S. or foreign. Track Coach became a digital-only publication in 2015.

BACK ISSUES OF TRACK COACH

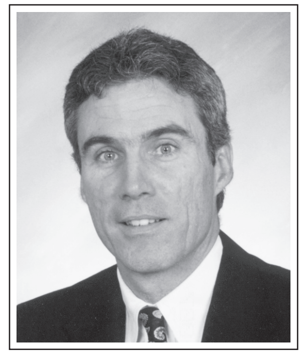
Many back issues of Track Technique/Track Coach, #92-208, are available singly at $5.50 (U.S. delivery)/$9.50 (foreign delivery) each post-paid. No issues previous to #111 are available.

To order, send your check to

Track Coach
2570 W El Camino Real,
Suite 220,
Mountain View, CA 94040

FROM THE EDITOR

RUSS EBBETS



PURSUING THE HORIZON

In the time it took me to handwrite this sentence – they missed breaking a 2-hour marathon. Sure, it was staged. Loop course, a wind shield, pacers, probably sucking fluids from a tube and special shoes. Special shoes, maybe next fall for New York we'll get to see Spike Lee resurrect Mars Blackman in his bicycle cap pandering, "Kipchoge – is it the shoes?"

You don't see it much anymore, the speculation on the ultimate limits of human performance. It used to be common fodder for sportswriters everywhere. Give the old crystal ball a cuff or two and see what pops up. It makes for an interesting story line for these prognosticators of the pen and may generate some conversation. But in the end all these stories have the certainty of a coin flip.

This guessing is news, of sorts, and beats the only other time we make the headlines with some freak accident, a not-me positive or the lone star redemption from a heart wrenching illness/injury/tough break to fulfill a lifelong dream to complete a 5k/10k/marathon. You fill in the details, you get the picture.

But these staged events do have a place. We have to do something so the athlete gets the idea, even if it is qualified with countless "if's." Anyway we all do this all the time in practice. Doubt it? How about sprints running with the wind or downhill? Maybe throwing a lighter implement or jumping off a box or springboard? One can even vault or high jump over an elastic bar that resists a little "nudge" and possibly opens the door to possibility.

Technical innovations help push the envelope. Today we have "tuned" tracks that offer a consistency from one venue to the next. Mention "cinders" to today's generation and that has about as much meaning as talking about "the boards." The what?

Foam mats allow vaulters and high jumpers to do their thing much more safely and with little regard for a 17 mph landing. Rule changes have expanded landing areas to help mitigate risk and produce spectacle.

And then there are the shoes. While the "sock shoe" movement always reminded me of The Emperor's New Clothes fairy tale today's shoes offer significant choices for protection, economy of motion, and even style. While I'm not sure the coefficient of friction is reduced by florescent green I have no doubt somebody at the big shoe companies has already looked into it.

CONTINUED ON PAGE 7022

THE EVOLUTION OF PREP VAULTING

MONDO DUPLANTIS, THE GREATEST HIGH SCHOOL VAULTER OF ALL TIME?

David Bussabarger traces the history of male prep vaulting in the U.S.—from Lee Barnes in 1924 to the present day. He then provides perspective on Mondo Duplantis's 2017 accomplishments.

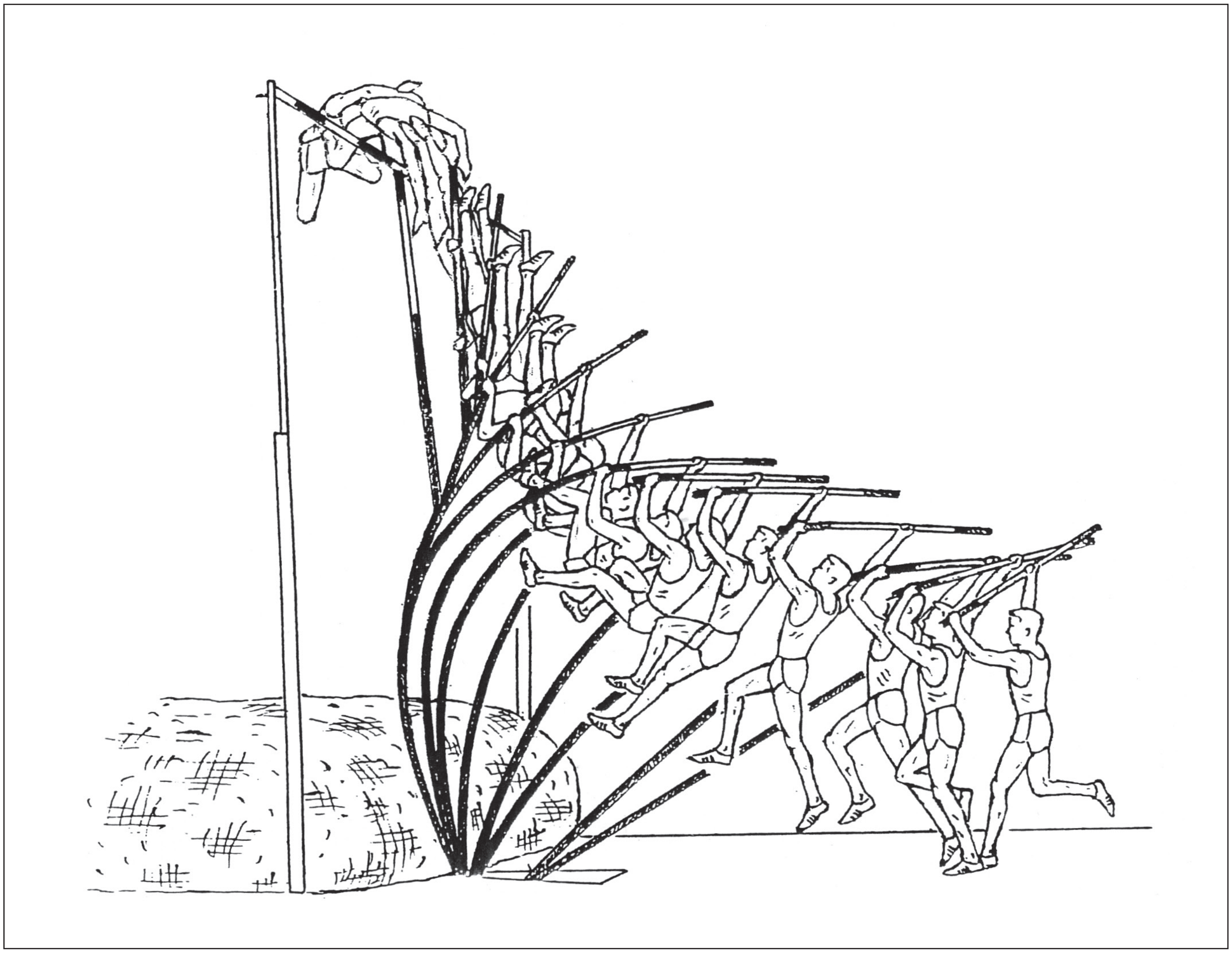
BY DAVID BUSSABARGER

To begin with, some background information about the history of pole vaulting is necessary. Pole vaulting performance is time relative because of changes that have occurred over the years in poles, runways, landing pits, training theory and the development of the understanding of technique. The last point was particularly critical when vaulters made the transition from rigid metal poles to bending fiberglass poles and technique had to be virtually reinvented.

The first elite fiberglass vaulters, starting in the early 60's, were all accomplished metal pole vaulters when they made the switch to fiberglass poles. Some, such as John Cramer. Ron Morris, Manfred Preussger and Henry Wadsworth, were among the best rigid vaulters of all time (note that the world record with a metal pole was 15-9¼ by Don Bragg set in 1960). As a result nearly all the best early fiberglass vaulters at this time looked essentially like rigid vaulters who bent the pole slightly or moderately by today's standards (30 to 40 degrees). The great exception to this trend was John Pennel. Pennel was the 18th man over 15 feet with a metal pole at the young age of 20. He switched to fiberglass in 1962 and rapidly adapted to the new pole, setting seven world records in 1963, culminating with the first ever jump over 17 feet (5.20). Pennel's technique was far ahead of his time with many technical adaptations that are still used today.

The introduction of fiberglass poles initiated the development of foam landing pits, which gradually replaced sand or sawdust (Pennel landed in sawdust on his first 17-footer!). Foam pits quickly evolved from piles of loose scrap foam to professionally encased foam pits by the late 60's.

Early runways were composed of either asphalt or cinders. In the late 60's synthetic surface tracks



John Pennel (USA) over WR 16'8-3/4"/5.10, 1963

were first introduced and were also available for runways (for those who could afford them). Over the years the design and the exact materials used in fiberglass poles have also improved significantly. Finally, the understanding of fiberglass technique has gradually evolved and improved in the decades since the poles were introduced. Although disagreements regarding what constitutes correct technique still exist, competent coaches are now commonplace.

The United States has a storied history of great prep vaulters. Lee Barnes, born in 1906, was the first American high school vaulter to reach world class status by winning the 1924 Olympics at age 18 with a jump of 12-11½ (3.95) with a bamboo pole. Barnes also had the highest jump in the world that year with a mark of 13-2⅛ (the WR at the time was 13-9¾ by the Norwegian Charles Hoff set in 1923). Two years later, after graduating high school, he set two WRs in the same meet, topping out at 14-1½ (4.30), and becoming the third man over 14 feet.

The next great American prep vaulter was Jim Brewer, born in 1938. Brewer became the first prep and junior vaulter to clear 15 feet in 1957 and was the 10th vaulter ever over 15 feet. At the time Bob Gutowski held the WR at 15-8¼. Also set in 1957, Gutowski's vault broke the great Dutch Wamerdam's world standard of 15-7¾. Brewer actually used an early fiberglass pole to set his record, but did not bend it and used conventional rigid pole technique. He later went on to set a PR of 15-4 while attending USC.

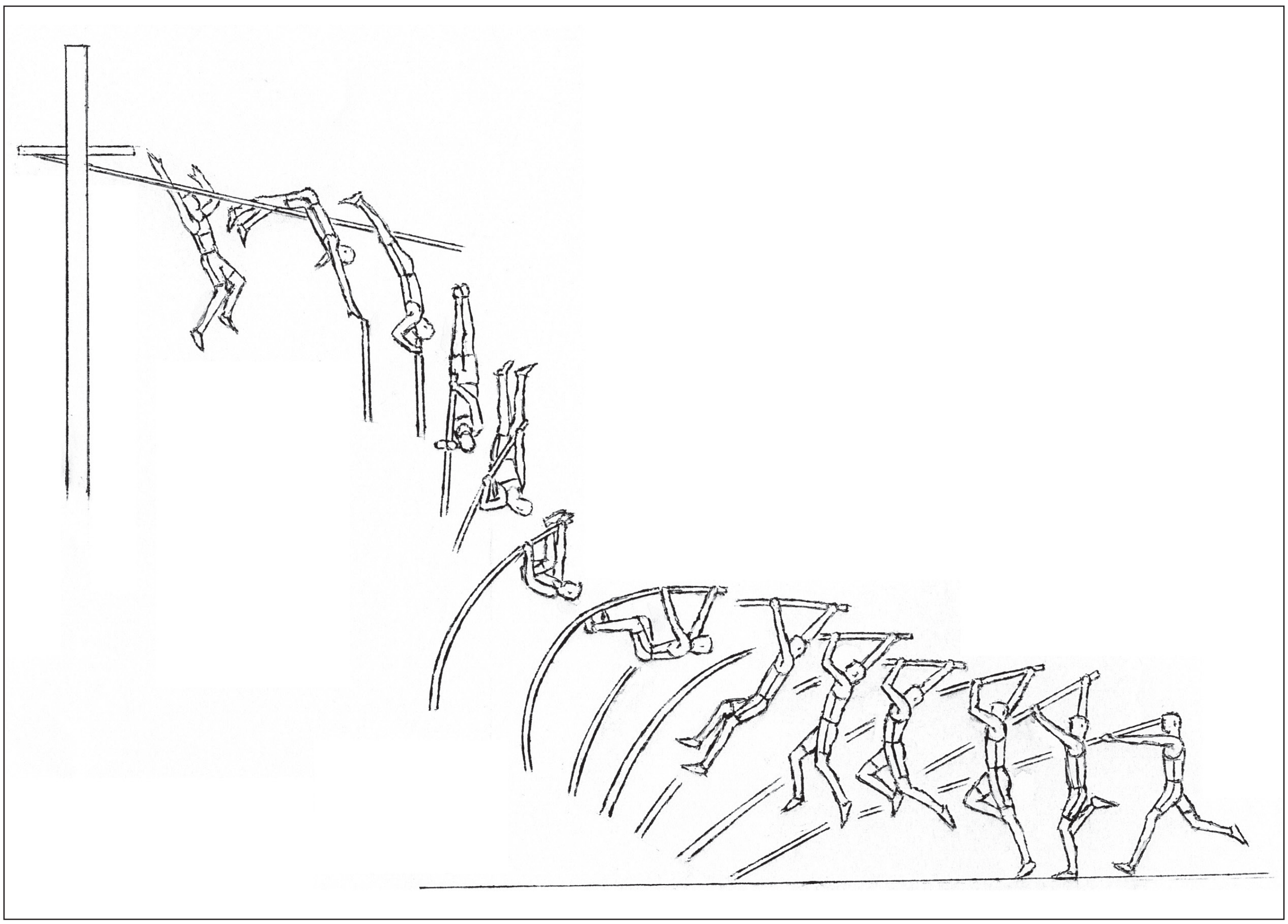
Based on his total career accomplishments, Paul Wilson, born in 1947, is arguably the greatest American prep vaulter of all time to date. Using a bending fiberglass pole, Wilson was the first high school vaulter and junior to clear 16 feet (4.87) in 1964 as a high school junior. Also note that Mark Savage had broken Brewer's high school record the year before with a jump of 15-½. In 1965 Wilson improved to 16-6¾ (5.05) as a prep senior. His jump was the fourth highest in the world that year and the 10th highest vault of all time (the world record was 17-4 set in 1964 by Fred Hansen).

Moving on to college Wilson became the fifth man over 17 feet (5.20) as a freshman at USC. The following year he topped a world record 17-8. Wilson's career ended soon after due to injury.

Casey Carrigan, born in 1951, was the next great American prep phenom. Carrigan, who came from a family of vaulters, cleared 15-7¾ (4.77) his sophomore year in high school in 1967. In 1968 Carrigan shocked the vaulting world by breaking Wilson's national record and becoming the first high schooler over 17 feet (5.18). Even more shocking was the fact that his vault came in the 1968 Olympic Trials (won by Bob Seagren with an new WR of 17-9), placing him third and on the Olympic team. Carrigan was the 18th man to clear 17 feet. Note also that this performance took place at a time when Americans dominated the pole vault (7 of the first 10 men over 17 feet were Americans). Unfortunately Carrigan failed to make the finals at the Olympics. In his senior year in 1969 Carrigan vaulted 17-4 ¾ (5.30) at the Golden West Invitational. After his clearance he attempted to break John Pennel's then WR of 17-10¼ (5.45), but it was not to be.

College did not agree with Carrigan and his vaulting carreer floundered as a result. Several years after dropping out of college he regained his form and achieved a lifetime best of 17-10¼ (5.45).

Joe Dial, born in 1962 and only 5-8 tall in high school, broke Carrigan's national record with a leap of 17-5 in 1980 (Dial's junior year in high



Mondo Duplantis

school). 1981 was a banner year for American prep vaulting with three vaulters breaking the national record, Dale Jenkins, Greg Duplantis (who was only 5-6 tall) and Joe Dial. Dial had the last word, becoming the first high school vaulter to clear 18 feet and 5.50 with a vault of 18-1¼ (5.52).

Dial went on to have a highly successful career in college and as a professional, setting several American records, culminating with an AR 19-6½ (5.96) in 1987, which was the second highest vault all-time behind Sergey Bubka's 19-9¼ (6.03). Dial also set a short-lived world indoor record of 19-4½ (5.91) in 1986.

Mondo Duplantis is a member of a new generation of top high school vaulters whose fathers were also elite fiberglass vaulters (Joe and his son Tommy Dial, Dave and his son Deakon Volz and Paul and his son Paulo Benavides are a few other good examples). As previously mentioned, Mondo's father Greg is a former HSR setter with a PR of 19 feet (5.80) set in 1983. So Mondo was born and bred to be a great vaulter. Coached by his father, Mondo began vaulting at age 5 in a backyard pit and soon afterward began setting age group records year after year. In his freshman year in 2015 Mondo vaulted 17-4½ and was the fifth highest high school vaulter that year. In 2016 he became the first high school vaulter over 18 feet and 5.50 indoors. Outdoors he improved to 18-1. That same year senior Chris Nilsen vaulted a high school record 18-4¼ (5.60), relegating Mondo to number two on the HS list. Note that this writer considers the American high school record at this time to be relatively soft. As previously mentioned Dial jumped 18-1¼ (5.52) 35 years ago

ERROL ANDERSON/THE SPORTING IMAGE

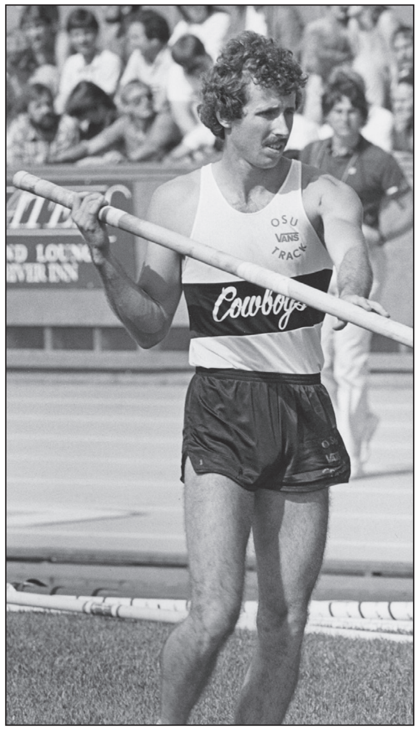
Mondo Duplantis

and Maksim Tarasov of Russia set a WJR of 19¼ (5.80) 27 years ago.

This year, at age 17, Mondo has literally exploded, upping his indoor record multiple times and becoming the first high schooler to top 19 feet (5.82) at the National Scholastic Indoor Championships (the seventh highest jump in the world indoors and a WJR). Continuing to stupefy, Mondo then broke Nilsen's outdoor record with an incredible 19-4¼ (5.90) leap at the Texas Relays (Mondo's highest vault at the time this article was written). To put this mark into perspective, at this date 57 vaulters have now cleared 5.90 or better. As good as he is, in this writer's view Mondo will need to jump at least 6m to be in the elite company of the other preps mentioned in this article.

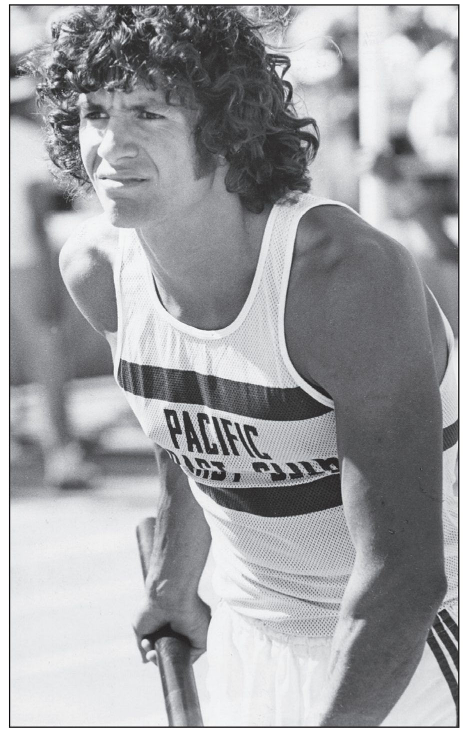
Mondo can be described as a "penetration style" vaulter. Historically

Paul Wilson



JEFF JOHNSON

Joe Dial



CHIP GANE

Casey Carrigan

one of the the most commonly accepted principles of early fiberglass vaulting was that the vaulter should emphasize rocking back as fast and early as possible in order to be able to take maximum advantage of the recoil of the pole. As a result nearly all early fiberglass vaulters moved very directly from the takeoff to the rock-back (stunting the potential development of the takeoff and swing). Again, the single most important exception to this rule was John Pennel, who pioneered the development of pronounced forward drive at takeoff (penetration action), followed by "full" development of the swing and a relatively late rock-back action.

In the early 1970's Jan Johnson and Dave Roberts developed this style even further by increasing the penetration action of their takeoffs. As a result both vaulters were able to raise their hand grips substantially and quickly became world class vaulters. The penetration style (and its many possible variations) then became highly influential and soon nearly all elite vaulters utilized its principles. This trend continues to this day, with its most notable exponent being WR holder Renaud Lavillenie. Note that in the writer's view, the great Sergey Bubka, who was a disciple of the "free takeoff" (a takeoff style that advocates not bending the pole until the vaulter is off the ground), nonetheless also had a very effective penetration action during the takeoff.

In this writer's judgment Mondo's technique represents a new level of mastery of the penetration style. Lavillenie's technique is certainly highly effective, but also appears to the writer to be rather contrived. Mondo's technique is extremely smooth and natural looking, making his vaults beautiful to behold and highly efficient.

Mondo currently stands 5-11 and weighs 145 lbs. and uses a hyper-stiff 16-5/195 test Spirit pole, gripping at about 16-3 (which translates to an excellent push-off of 3 ft., 9¼ in. on his record vault). Much of Mondo's improvement this year can probably be attributed the introduction of physical training and conditioning to his vaulting program by his mother. However he still has minimal muscular development in his upper body, so there is still a great deal of room for improvement in that regard. If Mondo stays healthy and continues to improve there is little doubt that he will become the greatest high school and junior vaulter of all time and possibly even the greatest vaulter of all time.

Illustrations by David Bussabarger.

AN ANALYSIS OF HAMMER THROW FACILITY SAFETY FACTORS IN NCAA DIVISION I

Adapted from a study which first appeared in *The Sports Journal,* July, 2010.

BY LAWRENCE W. JUDGE AND JEFFREY PETERSEN

ABSTRACT

The purpose of this study was to determine the level of compliance with NCAA and IAAF hammer facility recommendations at division I universities in the United States. A 35-item survey instrument was distributed to 279 applicable schools with a 28% response rate. A total of 78.1% participants in the study reported compliance with the NCAA minimum recommendations, and 38% also met the IAAF standards. An ANOVA (exploratory data analysis)of the coaches' overall perception of hammer facility safety demonstrated significant differences for facility factors including the gate height, gate positioning, cage manufacturer, landing area security, and response time to maintenance issues. The NCAA may need to examine their present hammer facility guidelines and consider alignment with the new standards of the IAAF.

INTRODUCTION

The hammer throw, one of the Olympic and internationally recognized field events in track and field, was developed into a competitive event centuries ago in Ireland, Scotland, and England. The hammer throw has changed considerably since its origin. This includes equipment changes (such as more precisely-manufactured hammers and smooth-soled shoes that permit faster spinning), training methods, and throwing distances (now in excess of 280 feet for the best men and 250 feet for the best women in the world). One aspect of the throwing event that has not changed, however, is the inherent danger associated with this event. Athletes, coaches, and spectators participating in the event are at risk; steel hammers that weigh four kilos for women and 16 pounds for men are hurled through the air at great speeds and significent distances, and are sometimes difficult to spot in flight (2).

Due primarily to safety concerns, the throwing circle is protected by a C-shaped cage for the safety of officials, athletes, coaches, and spectators. At the inception of the hammer, there was no safety cage used. The hammer cage was originally designed to prevent the hammer from exiting the thrower's hands in unprotected directions, such as out of the back, sides, and in dangerous angles from the circle. Prior to 2004, the last significant change to hammer cage design that increased the gate height was in 1994-1995 (6). Even with the safety precautions of the cage and the reduced throwing sector, the hammer throw has met considerable resistance from state high school associations and collegiate athletic administrators in the United States (2).

In August 2003, the international governing body of track and field, the International Amateur Athletics Federation (IAAF), approved rule changes affecting hammer throwing safety cages. After the 2001 IAAF Congress' decision to reduce the landing sector angle to 34.92 degrees and after several deaths in throwing accidents, there was greater urgency to examine and improve hammer cages (6). The problem with earlier hammer cage specifications and design is that implements could still land on the track front and back straightaway even when the cage gates were operated correctly. In the new design, modifications were made to augment safety by increasing the length and height of the gates as well as decreasing the opening between the front posts. Studies of the trajectory of the hammer necessitated that the minimum height of the additional two side panels and the gates be increased to 10m (4). The new IAAF rule standards came into force January 1, 2004 (8).

The new IAAF hammer cage design has worked well in terms of reducing the risk of hammers landing on the

Figure 1: IAAF Compliant Hammer Cage with 10m Gates at a European Venue

Figure 2: NCAA Compliant Hammer Cage with 8m Gates at an American NCAA Venue

Figure 3: Non-compliant Hammer Cage with 3.5m Gates at an American NCAA Venue

track as displayed in Figure 1 (6). However, the new IAAF specifications have not been adopted by the NCAA rules committee. Figures 2 and 3 demonstrate the variance in non-IAAF compliant cages of American hammer facilities. Are the colleges and university's across the United States putting themselves at risk for a catastrophic accident and ensuing litigation by not adopting the IAAF hammer cage? The following study examined current NCAA hammer facilities in relation to safety considerations.

RESEARCH QUESTIONS

The following research questions guided this study of hammer throwing facilities at NCAA Division I institutions in the United States:

1. What are the basic characteristics of NCAA Division I hammer facilities?
2. To what degree do NCAA college hammer facilities meet NCAA and IAAF standards?
3. How do the basic hammer facility characteristics relate to facility safety?

METHODS

A 35-item survey instrument was developed to collect data regarding the hammer facilities at NCAA Division I colleges and universities throughout the United States. This survey was developed by the researchers and reviewed by experts in the area of facility design and management and was approved for use via the Institutional Review Board. This survey was formatted for online completion using the InQsit system. An email explaining the study was sent to all head track and field coaches in the United States with a hyperlink to the online survey. The head coaches were instructed to complete the survey themselves or to forward it to their throws coach if the school had one. SPSS version 15.0 was used for all descriptive and ANOVA statistical analyses with an alpha level of .05 established for significance for all tests.

RESULTS

Of the 269 NCAA Division I universities that competed in track and field, a total of 75 valid responses were obtained representing 28%. Those coaches completing the survey were experienced with the hammer throw with a mean value of coaching experience of 10.24 years (+/- 7.46 SD) with a range of first year coaching up to 39 years of experience. Additionally, 56.2% of these coaches had prior experience competing in the hammer, and all were coaching in track and field programs that fully included the hammer event. The basic characteristics of the hammer facilities at these universities are included in Table 1.

In addition to the basic facility characteristics, both the knowledge of and compliance with NCAA and IAAF standards were assessed. A total of 78.1% of facilities were reported to be in compliance with NCAA standards for the hammer with 17.8% not in compliance and 4.1% unsure of their level of facility compliance. The NCAA has established hammer throw facility specifications, but only 51.4% of the coaches surveyed were aware that the NCAA does not require compliance with their specifications. However, 82.4% of the coaches expressed that the NCAA should require all member institutions to comply with the established specification found in Rule 1, Section 9 of the NCAA Track and Field rulebook (8). For the IAAF standards, 38.0% of the facilities were compliant with the standards put into effect in 2004. There were 69.9% of coaches aware of the IAAF standards with 30.1% not aware of the international governing body facility standards. As a whole, 53.4% of the coaches surveyed favored an NCAA adoption of the IAAF facility standards for the hammer.

In regards to safety for the hammer facility, a number of questions provided insight to the cost, construction, age, maintenance, and accident history for the hammer facilities. Reported hammer cage costs in U.S. dollars included: 9.9% under $10,000; 35.2% in the $10,000-20,000 range; 16.9% in the $20,000-30,000 range; 9.9% in the above $30,000 range; with 28.2% unaware of cage costs. The reported age of the hammer cages were highest at the newer end with 27.5% 1-3 years old, 18.8% 4-5 years old, 20.3% 6-8 years old, 5.8% 9-10 years old, 24.6% 11-15 years old, with 2.9% unsure of the cage age. Information on

Table 1

Facility/Cage Characteristics	% agreement
Dedicated Hammer-Only Facility	50.0%
Hammer Facility Located Inside the Track Oval	26.4%
Hammer Facility Located on the Campus Grounds	85.1%
Hammer Cage Including Gates	87.5%

the manufacture and installation of the hammer cages is summarized in Table 2. The maintenance staff was reported to regularly respond to requests for repairs to the net or cage for 74.6% of the facilities, with the speed of maintenance staff response to repair requests ranging from, 14.3% immediate, 8.6% within a day, 18.6% in 2-3 days, 30.0% in 4-7 days, and 28.6% in more than a week.

Table 2

	University Personnel	Local Company	Commercial Manufacturer/ Professional Track Contractor
Cage Manufacturer	12.7%	11.3%	76.1%
Cage Installation	44.3%	17.1%	38.6%

Table 3: Hammer Facility Mean Safety Ratings for 2-Item Factors

Category	Yes Response Mean Value (+/- SD)	No Response Mean Value (+/- SD)
Hammer Only Throwing Facility	4.05 (+/- 0.94)	3.58 (+/- 1.36)
Cage Inside the Track Oval	4.00(+/- 1.11)	3.81 (+/- 1.16)
Cage On-Campus	3.83 (+/- 1.17)	3.80 (+/- 1.32)
Cage Gates Present *	4.05 (+/- 0.91)	2.56 (+/- 1.74)
Gates Properly Positioned in Practice *	4.17 (+/- 0.88)	3.06 (+/- 1.26)
Cage Maintained Properly *	4.19 (+/- 0.94)	3.06 (+/- 1.11)
Landing Area Security in Practice *	4.23 (+/- 0.95)	3.65 (+/- 1.20)
Landing Area Security in Competition *	4.17 (+/- 0.90)	3.17 (+/- 1.29)
Practice Accident in the Past	3.43 (+/- 0.79)	3.95 (+/- 1.12)
Competition Accident in the Past	3.25 (+/- 1.26)	3.90 (+/- 1.13)
Cage Meets NCAA Specs *	4.18 (+/- 0.87)	2.31 (+/- 1.32)
Cage Meets IAAF Specs *	4.41 (+/- 0.80)	3.50 (+/- 1.19)

The accident history for the hammer was reported in two areas: practice accidents and competition accidents. For practice situations, 9.9% of coaches reported accidents with the throwers themselves involved in 28.6% of the accidents, other throwers in the area involved in 42.9% of the accidents, the coach involved in 14.3% of the accidents, and unaware bystanders involved in 14.3% of the practice accidents. Competition accidents were reported in 5.5% of the facilities with half of the incidents involving the thrower themselves and half involving coaches.

A final analysis of the coaches' overall perception of hammer facility safety was conducted using a 5-point Likert scaled question ranging from very unsafe to very safe with 1 being very unsafe. The mean value for the whole study was 3.82 (+/- 1.18 SD), with additional analysis conducted for multiple factors to determine if they have a significant impact on overall perception of facility safety as determined by one-way ANOVA. There were 10 factors that significantly impacted overall cage safety including: whether the cage had gates, $F(1,70) = 16.35$, $p < 0.001$; gate positioning during practice $F(1,68) = 17.11$, $p < .001$; cage maintenance $F(1,69) = 17.75$, $p < 0.001$; landing area security in practice, $F(1,70) = 4.47$, $p = 0.038$; landing area security in competition, $F(1,68) = 13.17$, $p = 0.001$; gate height, $F(4,65) = 14.69$, $p < 0.001$; cage maker, $F(2, 68) = 3.79$, $p = 0.028$; maintenance repair speed, $F(4,65) = 3.48$, $p = 0.012$.

A summary of these mean safety ratings according to the seven 2-item factors are summarized in Table 3. Three items, (gate height, cage maker, and speed of maintenance response) required further evaluation via Tukey post hoc analyses. For the five gate heights, the safety ratings increased as the gate height increased with the lowest height being significantly less safe than all other heights as summarized in Table 4.

Post hoc testing of the cage maker factor revealed that commercially manufactured cages had significantly greater impacts on overall safety than cages fabricated on-site by university personnel (Table 5). The speed of maintenance response factor post hoc testing demonstrated that hammer facilities that had maintenance repair requests acted upon within one day had mean safety ratings significantly higher than facilities where maintenance requests took more than a week for action to be taken. Table 6 displays the general trends for maintenance response speed in relation to overall facility safety.

Table 4: Mean Safety Ratings According to Hammer Cage Gate Height—subsets represent significantly distinct groups of means

Gate Height	N	subset 1 for alpha=.05 mean values	subset 2 for alpha=.05 mean values	subset 3 for alpha=.05 mean values
Less than 10'-0"	3	1.00		
10'-1" to 15-0"	4		2.75	
10'-1" to 15-0"	12		3.58	3.58
20'-1" to 25'-0"	32			4.06
20'-1" to 25'-0"	19			4.52

Table 5: Mean Safety Ratings According to Cage Maker—subsets represent significantly distinct groups of means

Cage Maker	N	subset 1 for alpha=.05 mean values	subset 2 for alpha=.05 mean values
University Personnel	9	3.00	
Local Company (i.e. local fencing contractor)	54	4.02	4.02
Commercially Manufactured (i.e. Gill, AAE, etc)	8		4.12

Table 6: Mean Safety Ratings According to Speed of Maintenance Response—subsets represent significantly distinct groups of means

Maintenance Response Time	N	subset 1 for alpha=.05 mean values	subset 2 for alpha=.05 mean values
More than 7 days	20	3.50	
4-7 days	21	3.81	3.81
2-3 days	13	3.92	3.92
1 day			4.83
Immediate	6	4.60	4.60

DISCUSSION

The seemingly slow progress in meeting safety challenges for the hammer throw internationally has now been overcome by the new IAAF rules. However, in the United States there continues to remain some reluctance by NCAA Division I colleges and universities to adopt the new IAAF standards for safety. A total of 78.1% participants in the study reported that they were in compliance with the NCAA minimum recommendations, but only half of the facilities meeting NCAA standards also met the IAAF standards (38.0 % of the total sample). Alarmingly, the remaining 21.4% of the participants reported their facility did not even meet NCAA recommended standards or that they were unsure if the facility met NCAA standards. The coaches were very supportive of mandatory facility requirements of member institution hammer facilities with 82.4% of respondents desiring mandated minimal requirements.

The NCAA recommendations still remain far below the IAAF standards for safety (5,8). In the NCAA rule book it states that the purpose of the hammer cage is to contain, but not interfere with, the flight path of the implement (8). The recommended minimum height for the NCAA hammer cage is 6.15 meters, and the rule book states that the height should be increased to 8 m whenever possible. The gates are stated to be panels of suitable material between 2.74 and 2.90 m in width with a fixed cage opening of between 8 and 9 m. It is also stated in the rule book that, "Cage configurations that are more restrictive than the minimums set forth in this rule may only be used with the consent of each participating institution" (8). These standards are far below the IAAF standards of a smaller 7-meter opening and gates that are 10 meters in height and 3.2 meters in length (6).

American universities have found themselves involved in litigation because of accidents involving the hammer throw (2). Rucker v. Regents of the University of California is an example of a case in which the University of California was forced to pay a settlement for 2.25 million dollars because of an accident involving the hammer throw (7). An errant throw by a hammer thrower resulted in a triple jumper on the team being struck in the head and sustaining permanent brain damage during a practice for the team. The University has since changed its policy so that other track members are not practicing anywhere in the vicinity of hammer throwers while they are on the field (7). However, a cage meeting the IAAF standards might prevent this type of injury.

Professionals often consider the practices of their peers to determine the appropriate safe and proper standard of care (1). It was interesting to note that 53.4% of the coaches surveyed supported the adoption of the IAAF facility standards for the hammer. This standard of care is almost universally based upon a commonly accepted standard rather than local or state practice. The IAAF has established guidelines for the construction of hammer cages that reduce the risk of accidents by decreasing the danger zone. Almost one third (30.1%) of the participants in the study were not aware of the IAAF facility standards. The standard of care, as well as the "legal" standard used to judge provider practices in the event of an accident, claim and suit, is often based upon the standard of care owed to clients by various professionals. In the event of litigation, particular practices are generally examined by expert witnesses, who, based upon the professional standard of care, may support or criticize the services in question (1).

According to Laurel, Wilson, and Young (2004), the mathematical calculation method of the release velocity gives an 83° danger zone for the pre-2004 cage design. The pre-2004 IAAF cage design is the same as the current NCAA Division I recommendations. The danger zone for the new IAAF cage is approximately 53°, thus reducing the danger zone by 30°. The new design considerably reduces the danger of a hammer thrown by a right handed thrower from a cage located near the 1500 meter start from landing on the main straightaway (6). The NCAA Division I colleges and universities may be putting themselves at risk by not exercising a standard of care for facility construction that is consistent with IAAF guidelines.

There have been several fatal accidents and close calls over the years in the United States involving the hammer throw (2). In the 1980s, during the Bakersfield-Cal State Los Angeles dual meet, a sportswriter was killed by hammer at Cal State Los Angeles. In 2005, a thrower at the University of Southern California, was seriously injured when the hammer bounced off the cage and struck him in the face (N. Bryant, personal communication, May 21, 2009). Participants in the present study reported accidents in practice (9.9%) and in competitions (5.5%). These reported accidents may have included incidents requiring medical attention but were not fatal. A facility that meets the current IAAF standards may have prevented the fatalities of the past and the accidents reported in the present study.

THERE HAVE BEEN SEVERAL FATAL ACCIDENTS AND CLOSE CALLS OVER THE YEARS IN THE UNITED STATES INVOLVING THE HAMMER THROW

Proper maintenance of the hammer cage and facility equipment means longevity and safety. The maintenance staff in the present study was reported to regularly respond to repairs to the net or cage for 74.6% of the facilities. The type of maintenance necessary for facility upkeep demands an understanding of the types of materials and the equipment being dealt with. Cage maintenance is often a chore balanced between maintenance, grounds and the coaching staff. The protective netting or in many cases chain link fence surrounding the hammer ring must be kept in good repair. The speed of response to repair requests on the hammer facility ranged from: 14.3% immediate, 8.6% within a day, 18.6% in 2-3 days, 30% in 4-7 days, and 28.6% in more than a week. If the hammer facility continues to be utilized when maintenance is required, it increases the possibility of an accident. Over half of the participants in the study (58.6%) reported that it took at least four days for a repair request to be completed. Coaches indicated that their facility was the safest when maintenance requests were handled in a day or less. Devising a maintenance schedule for the facility can ensure appropriate, essential, and regular upkeep. Utilizing a hammer facility for practice or competition that is not properly maintained is an unnecessary risk.

The analysis of the coaches' overall perception of hammer facility safety demonstrated factors like the height of the gates, the manufacturer of the cage, and response time to maintenance issues significantly impacted safety ratings. The trend for safety ratings, as noted in Table 4, increases as gate height increases, which is consistent with the IAAF recommendations of increasing gate height to 10 meters. The factor of cage manufacturer revealed that commercially manufactured cages had significantly greater impacts on the overall perception of safety than cages fabricated on-site by university personnel. Most commercial manufacturers will abide by industry standards for safety. The speed of maintenance response established that hammer facilities that had maintenance repair requests acted upon within one day had mean safety ratings significantly higher than facilities where maintenance requests took more than a week for action to be taken. This demonstrates that in addition to proper initial construction, cage maintenance significantly contributes to overall hammer facility safety.

CONCLUSIONS

Because of its limited popularity and miniscule textual coverage, the hammer throw remains the most ignored and misunderstand event in track and field in the United States. The mystery surrounding the event in the United States may contribute to the reluctance of the NCAA to adopt the IAAF cage specifications. The new IAAF hammer cage design has helped reduce the risk of hammers landing on the track. However, the new specifications have not been adopted by the NCAA. Colleges and universities across the United States may have to examine their present designs to determine the best way of improving the safety of the cage to match the new design adopted by the IAAF. The NCAA Division I colleges and universities may be putting themselves at risk by not exercising a standard of care for facility construction that is consistent with IAAF guidelines. The NCAA may have to examine their present facility requirements to determine the best way of improving the safety of the cage to match the new design adopted by the IAAF.

APPLICATIONS IN SPORT

This investigation has several important implications for colleges and universities as well as individuals supervising track and field programs. First, the standard of care for hammer facilities has been elevated by the IAAF. Although not established as a universal standard by NCAA colleges and universities in the United States, the IAAF hammer cage may be considered a reasonably prudent guide for determining venue safety as noted in this investigation. It would be prudent for organizational leaders to plan and provide for at least the IAAF approved cage during the approval of any future track and field facility updates.

The NCAA Division I colleges and universities may be putting themselves at risk for negligence and potential litigation by not exercising a standard of care for facility construction that is consistent with IAAF guidelines. Four key elements must be present in order to legally establish negligence: 1) duty, 2) the act or breach of duty, 3) proximate cause, and 4) damages (9). These elements are often viewed as a progressive chain in which each successive "link" must be present.

Although this paper has focused specifically on the hammer throw, the basic facility design concepts and practices noted have application to numerous other sport venues where protection from flying projectiles is required. Other sport events and venues can benefit from an examination of safety standards from other venues, other regions, or even internationally. For example, the protection of spectators from foul balls in baseball or the protection of auto racing fans from flying debris of wreckage could both benefit from an examination of the protective equipment and measures in place at various venues and leagues regionally, nationally, and even globally. These types of comparisons and research can not only improve safety for all, but can lead toward the establishment of accepted industry standards.

REFERENCES

Cotton, D., Wolohan, J. (2007). *Law for Recreation and Sport Managers (4th ed.)*, pp. 460-466. Dubuque, IA: Kendall Hunt.

Connolly, H., (2006). *History of the Hammer Throw.* Retrieved from http://www.hammerthrow.com/technique/articles/history.htm

Dunn, G. & McGill, K. (1991). *The Throws Manual.* Palo Alto, CA: Track and Field News Press.

Gutiérrez, M., Soto, V.M., & Rojas, F.J. (2002). A Biomechanical Analysis of the Individual Techniques of the Hammer Throw Finalists in the Seville Athletics World Championship 1999. *IAAF New Studies in Athletics,* 2,15-26.

IAAF. (2008). International Athletics Federation Rulebook. Retrieved from http://www.iaaf.org/

Laurel, B., Wilson, D., & Young, R. (2004). Hammer throw safety cages. *IAAF New Studies in Athletics,* 19(1), 47-51.

Lewellyn, T.G. (2008). Alameda County Injury Attorney: Our Successes. Retrieved from http://www.lewellynlaw.com/lawyer-attorney-1076265.html

NCAA. (2008). *NCAA Division I Track and Field Rulebook.* Retrieved from http://www2.ncaa.org/…/media_and_events/ncaa_publications/playing_rules/fall/cross_country_track_field/index.html

Van der Smissen, B. (2007). "Elements of Negligence", In D. Cotton & J. Wolohan (Eds.). *Law for Recreation and Sport Managers* (4th ed., pp. 36-45). Dubuque, IA: Kendall/Hunt.

AUTHOR PROFILES

Lawrence Judge—Lawrence Judge is a professor and coordinator of the graduate coaching program at Ball State University. Dr. Judge is the National Chairman for Coaching Education for United States Track and Field (USATF). He was recently named a Research Fellow by the Society of Health and Physical Activity (SHAPE) America (formerly AAHPERD). Dr. Judge has tutored former American record holders Dawn Ellerbe and Erin Gilreath in the women's hammer throw.

Jeffrey Petersen—Dr. Petersen is an associate professor and coordinator of the graduate sport manage-ment program at Baylor University. Dr. Petersen's research interests include sport management pedagogy and the design and management of sport facilities. He is a regular presenter at conferences and annual meetings organized by SHAPE America and was recently honored as a research fellow.

Corresponding Author
Lawrence Judge—lwjudge@bsu.edu

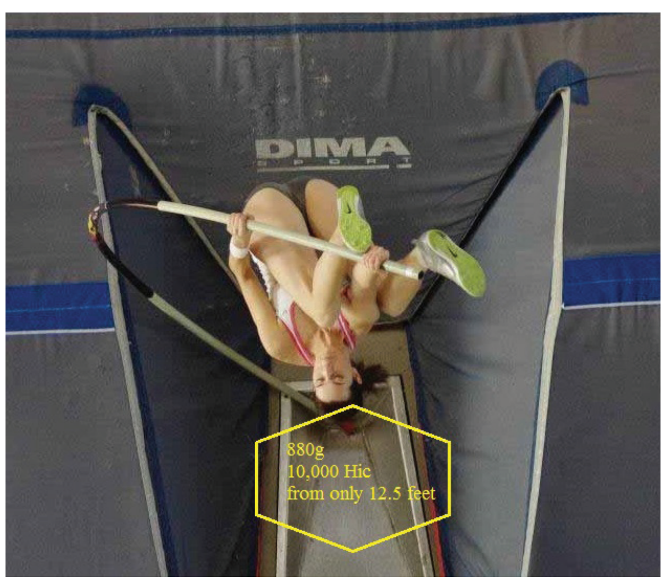
CAUSES AND EFFECTS OF POLE VAULT PLANT BOX LANDINGS AND POTENTIAL IMPROVEMENTS

Olympic medalist Jan Johnson has spent years coaching the pole vault and organizing vault camps around the country (particularly at his home base in Atascadero, CA). He has long been a proponent and activist for pole vault safety. This study by Johnson, Boden and McGinnis concentrates on some of the most common safety issues regarding the vault box.

BY JAN JOHNSON, MS, AND BARRY BODEN, MD

INTRODUCTION

Plant box landings have long been a major cause of serious and catastrophic injuries to pole vaulters. With the advent of rubberized runways with underlaid concrete in the late 1960's pole vault plant boxes became extremely hard and unyielding. Our force impact data shows that a fall from only 12.5 feet is in fact three times greater then an impact capable of causing a 100% probability of a fatal head injury. The purpose of this study was to first analyze the causes of



Generalized potential force impacts on the bottom of a typical plant box from only 12.5 feet.

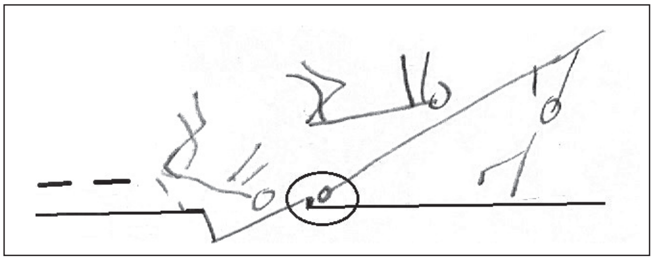


Diagram 1: Pole tip caught on front edge, hands slip off, land on back in box.

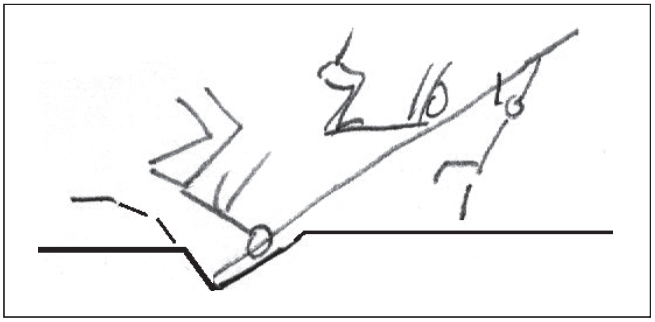


Diagram 2: Hand grip slip, or tip of pole misses box completely, land on back in box.

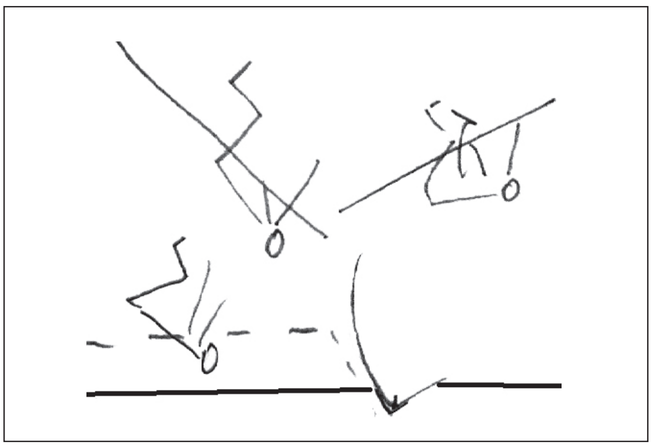


Diagram 3: Pole break, land in box

pole vault box landings and analyze the approximate fall heights and potential force impacts associated with each kind of accident. And to develop box installation strategies to remedy the problem and thus improve pole vault safety.

BOX LANDING CAUSES

Generally, plant box landings may be divided into three basic categories based upon potential fall heights. There is a slightly different cause and effect within each category. The following diagrams (1-3) show the basic mechanisms associated with problematic plant box landings.

Category 1: Lower-Level Accidents

Several combinations of factors may contribute to a plant box landing and the ultimate safety of the vaulter. In Diagram #1 the tip of the vaulter's pole catches on an elevated front lip, or his/her takeoff step is too close as seen in Diagram #2. In either case the vaulter is unable to maintain his/her grip on the pole and as a result; the vaulter lands on his/her back from a fall height of approximately 4-7 feet on the pit just beyond the plant box or in the plant box. Elevated front lips are extremely dangerous and commonly seen nationwide. They are typically the result of a poor installation, a worn runway, or excessive freeze thaw which over time elevates the front edge of the plant box.

Category 2: Mid-Level Accidents

In Diagram #3 The vaulter's pole breaks and he falls in a horizontal direction toward the front edge, center of the landing pads. If the vaulter is lucky he will land on the pads, if he is not: he will land in the plant box. The typical fall for this type of accident is between 6 and 12 feet depending upon how high the vaulter is gripping the pole and at which portion of the jump the pole breaks.

BAIL OUT TO FEET

Oftentimes a vaulter may take off sensing that he/she does not have sufficient speed to safely invert and make a complete jump. In these cases they typically "bail out" on to their feet on to the padded areas on the sides of the plant box. However, occasionally depending upon their

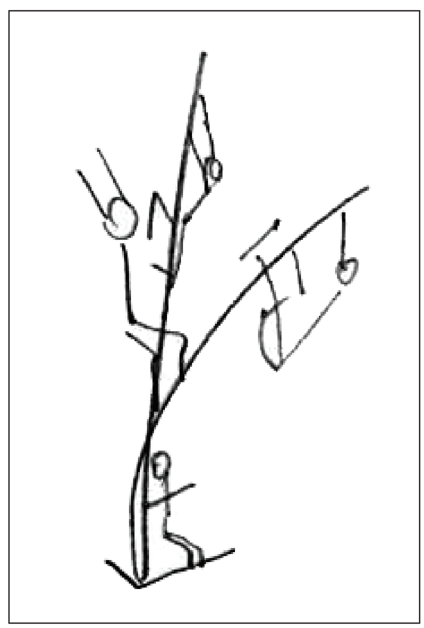


Diagram 4: Stall out, land on feet in box

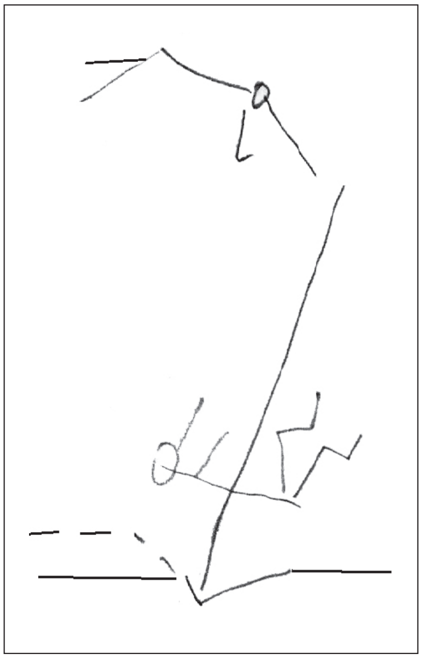


Diagram 5: Complete an entire vault but land short in the box

orientation they may come down directly into the plant box area as seen in Diagram #4. Our camp survey data indicates that 86% of all vaulters have landed in the plant box at least once. The typical fall height for these kinds of landings is between 6 and 15 feet. Leg and foot injuries in pole vaulting are highly correlated to these types of landings.

Category 3: High-Level Accidents

Higher-level plant box landings dominate our data base of catastrophic and serious injuries in pole vaulting. They are typically a result of insufficient speed at takeoff or poor takeoff efficiency, resulting in the vaulting pole not rotating to vertical. The vaulter, instead of bailing out and landing on his/her feet as in diagram #4, elects to invert in an attempt to clear the crossbar, but since the pole has not rotated sufficiently to vertical, the jumper lands short of the landing pads.

SHORT LANDINGS

In diagram #5 the vaulter failed to recognize that he/she did not have sufficient takeoff speed or efficiency to complete a jump and land safely on the landing pads. In fact, once the vaulter has committed to inverting there is very little chance that they can get their feet back under them for a safer foot landing.

This mechanism is often seen in our data base of catastrophic and serious injuries in the pole vault. The fall height is typically between 13’ and 17’. Generally, the higher the fall height the greater the injury. For this reason those who pole vault high carry the most risk and have the highest percentage of catastrophic injuries based upon participation numbers. (Boden et al 2012) This sub-group typically bend the vaulting pole more, grip the vaulting pole higher, and jump higher, and in doing so take more risks.

ADDITIONAL PLANT BOX DANGERS.

The unyielding nature and overall hardness of traditional steel with poured-in concrete plant boxes is only one portion of the problem. Two other common deficiencies also greatly increase the risk to pole vault participants. They are damage to vaulting poles and elevated front edges.

Photo 4

Photo 5

Photo 6

VAULTING POLE AND PLANT BOX SURVEY'S

Photo #4 shows in ascending order the 4 ratings we chose to use for classifications. Photo #5 shows some additional examples of wear caused by friction wear in the plant box . Photo #6 shows how the bottom of the pole bends and rotates and sweeps to the side so that frictional damage occurs. All poles, if they are jumped on enough, will show wear and tear in this area.

SAMPLES OF PLANT BOX DEFECTS

The common plant box problems (beyond the overall lack of shock attenuation) are divided into several categories. They are: 1. Elevated front lips commonly resulting in planting mishaps and back landings in the box. 2. The likelihood of broken poles often resulting in back landings in the plant box, is also increased as a result of frictional degradation and a poor end plate design. 3. Extremely hard, anvil like, edges on the upper rim, including the end plate thus increasing both the amount of hard surfaces and the degree of hard surface in a critical area. Photos 7-11 show some variations in these categories.

Notice the elevated front lip with no visible means of correction. Additionally, the hard anvil-like edges which increase potential force impact forces especially shown in Photo 7.

Notice the highly visible dark area on the upper left portion of the end plate where vaulting poles rub in a sweeping motion. Also notice the irregular front edge where the box meets the runway creating a hazard shown in Photo 8.

In this photo the effects of freeze thaw, (expansion and contraction) have separated the runway surface from the front edge of the box thus setting the stage for an elevated front lip shown in Photo 9.

The irregular front edge is showing the abrasions of many impacts at the important point of entry. It is also easy to see the marks on the lower portion of the end plate, discolored where the pole tip strikes just above the pole rotational junction with great force. Additionally, the top edge of the end plate is showing extreme wear. Note the pole bends and sweeps to the left for a right handed vaulter. We estimate that 90% of all vaulters are right-handed, shown in Photo 10.

At this prestigious university the bottom of the pole strike area was indented nearly ½" (shinny area) from pole tip impacts over a 15-year period (Photo 11).

Excessive concrete with two highly objectionable front edge irregularities (Photo 12).

BOX LANDINGS FREQUENCIES AND INJURIES

2,505 pole vault camp participants (90% high school, and 10% college vaulters were surveyed regarding their frequency of plant box landings and any injuries they might have sustained. 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 times or more.

382 of the 2,505 (6.5%) had been injured landing in the plant box. Heel bruises accounted for 66% of the injuries. Sprained ankle 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.

	A	B	C	D	E	F	G	H	I	J	K
1					Stage 1	Stage 2	Metal	Top Edge			
2	Location	Total	Perfect	Cupped	Split	Elevated	Anvil	End P	Padded	R.Ledge	10,000 H
3		Boxes	Condition	E Plate	lip	lip	Edges	scrapes	Box	Hop	Install
4	Illinois	75	46	8	19	14	75	75	3	2	73
5	Ohio	54	30	3	11	23	50	52	0	0	54
6	Colorado	8	1	0	2	1	8	8	1	0	7
7	California	210	71	30	16	29	203	206	11	0	198
8	Wisconsin	45	14	7	22	16	45	45	3	2	43
9	Texas	21	9	0	1	5	21	21	0	0	21
10	Kansas	11	5	0	2	3	11	11	0	0	11
11	Florida	15	5	0	3	3	15	14	0	0	15
12	Oregon	42	11	2	6	14	42	41	0	0	42
13	Penn	30	11	2	10	6	30	27	1	0	30
14	Indiana	22	6	1	4	6	22	22	0	0	21
15	Totals	533	209	53	96	120	522	522	19	4	515
16			39%	25%	18%	23%	98%	98%	4%	1%	97%

Table 1: Plant Box Inspections

Photo 7

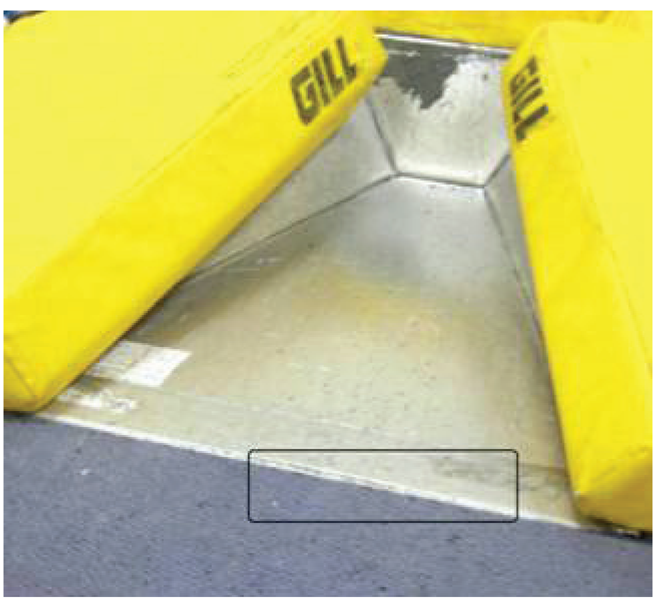


Photo 8

Photo 9

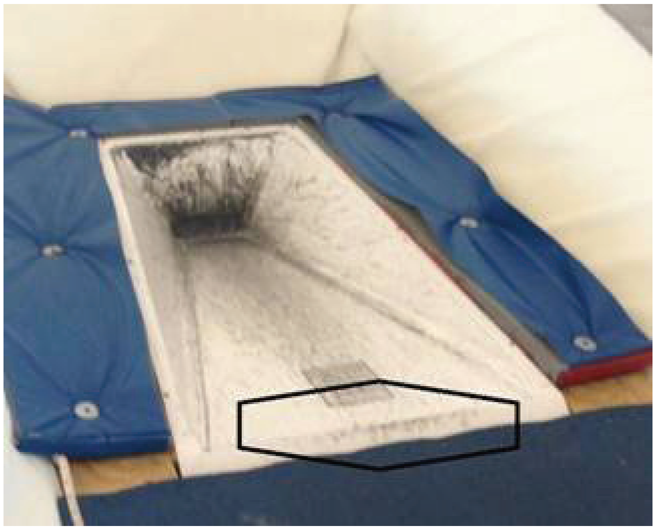


Photo 10

Photo 11

Photo 12

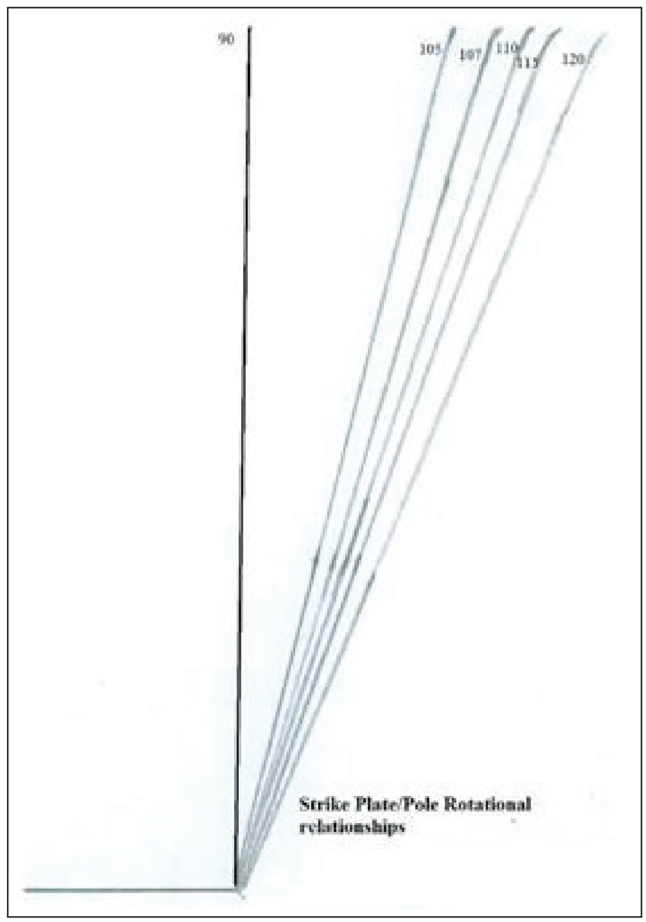


Diagram 6: The end plate angle and protection can be improved greatly by padding the top 2 or 3" with rubber track surface and commonly available padding materials. We show the current endplate angle 105 degrees, and what increased angle would look like. Our research shows that an angle between 108 and 112 degrees would be most beneficial.

CURRENT STATUS QUO AND SUGGESTED FORCE IMPACT LEVELS

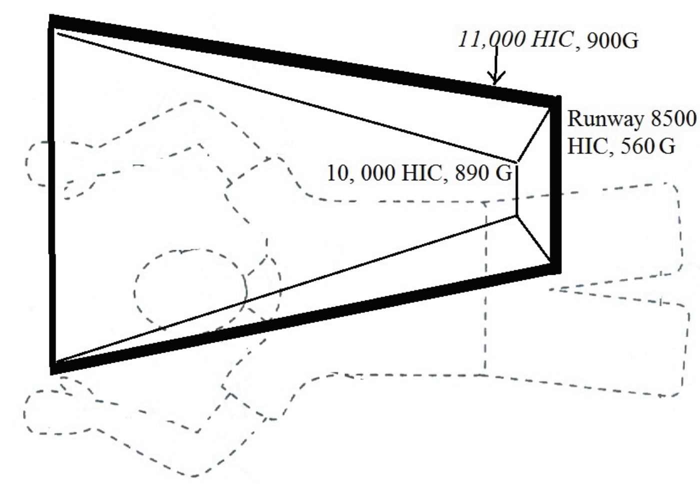
The levels of potential force impacts to nearly the entire area of the plant box are 10 times what they could be for reasonable safety. Pole vaulting is in fact the only sport where the athlete must turn upside down completely over a hard surface. Certainly, in men's and women's gymnastics no such arrangement would be permitted. Even football goal posts and sideline walls in HS gymnasiums are padded better then pole vault plant box areas. Below in general terms we show what is currently the impact standard (Diagram #7) and what could be done with minimal expense. Additionally in Diagram #8 we

Approximately how many times have you landed in or around the plant box area?								
0 times		1 to 3 times		4 to 6 times		7 plus times		total
450	18%	1902	76%	139	6%	15	0%	2505
Box Area Injuries								
ankle in	lower back	concussion	tail bone	shoulder	elbow	Heel	Butt	
box	box	box	box	box	box	box	bruse box	
85	**11**	**5**	**6**	**7**	**3**	**254**	**11**	**382**
22%	2%	1.50%	1.50%	2%	1%	66%	2%	% of Inj
0.030%	0.004%	0.002%	0.002%	0.002%	0.000%	6.500%	0.004%	% of Part.

Table 3

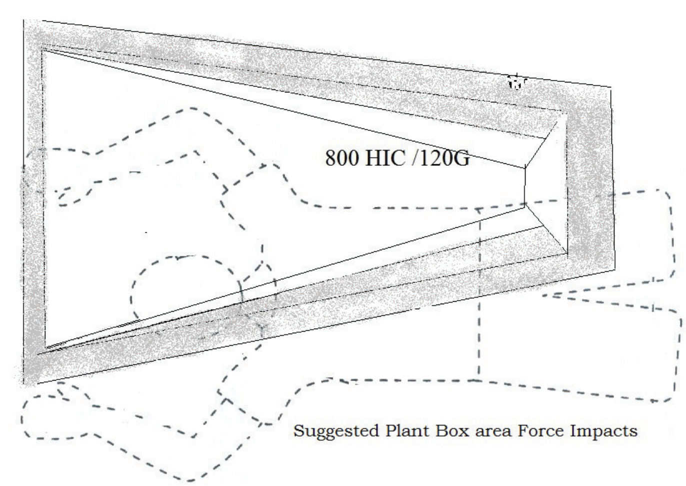
In the Box Injuries 1971-2016	
Hand slip off pole and head hit in box	10
Pole tip to elevated lip	?
Stall and land short in the box	27
Total	36
sever concussion	48
Skull Fractures	28
Tempoary paralysis	2
Perment paralysis	3
Fractured vertbrae	8
Severed Brain Stem	3
Broken or seperated shoulder	4
Fractured Tailbone	5
Punctured lung	5
Broken Ribs	5
Broken arm/shoulder	6
Broken hip	2
Broken Pelvis	1
Death	7
	79
In the Box Injuries 2012-16	
Pole tip to elevated lip	4
Step too close hands slip off	1
Stall and land short in the box	2
hand slip	1
threw pole into box rebounded into h	1
off the side	1
Total	10
sever concussion	6
Skull Fractures	3
Tempoary paralysis	1
Fractured vertbrae	1
Broken or seperated shoulder	1
Fractured Tailbone	2

Table 4



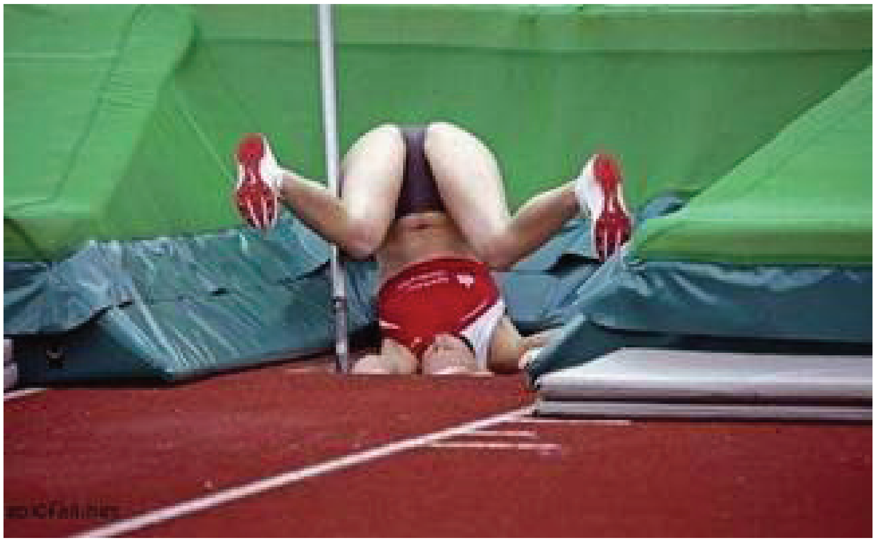
Generalized Steel with Concrete Pant Box *FI values*

Diagram 7



Suggested Plant Box area Force Impacts

Diagram 8



show how the end plate could be curved outwardly and padded to a high degree thus reducing friction and increasing safety.

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. (Boden, et al 2012). The addition of the current box collar appears to have helped reduce the severity of some falls and thus improved safety. However, safety can still be improved many fold by offering protection to the entire plant box area and improving the undesirable design flaws and unnecessarily hard surfaces which currently exist.

Note that we did not test unpadded asphalt or concrete, although unfortunately, they are very commonly seen in many pole vault use zones (PVUZ).

Our research and testing indicates that the entire plant box and its surrounding area can be padded to a very high degree by the use of commonly available materials simple installation methods.

REFERENCES

National Federation of State High School Associations, Track and Field and Cross country Rule book 2016, PO box 36124.

ASTM Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment1 100 Barr Harbor Drive, West Conshohocken, PA 19428.

Boden BP, Pasquina P, Johnson J, Mueller FO: Catastrophic injuries in pole-vaulters. Am J Sports Med 29:50-54, 2001.

Boden BP, Boden MG, Peter RG, McGinnis PM, Mueller FO, Johnson J: Catastrophic injuries in pole-vaulters: A prospective 9-year follow-up study. American Journal of Sports Medicine, 2012.

Mueller FO, Cantu RC: NCCSIR Twenty-eighth Annual Report. National Center for Catastrophic Sports Injury Research: Fall 1982-Spring 2002. Chapel Hill, NC, National Center for Sports Injury Research, 2010.

ASTM Standard Specification F 1162—02 Standard Specification for Pole Vault Landing Pits, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

FROM THE EDITOR

Continued from page 7002

One common question I have posed to many coaches I've interviewed over the years is how does one convey the thought of *possibility* to an athlete, get them to believe they are the person to do something exceptional or something that has never been done before. It always seems to give the coach a moment of pause. And it often generates a response that begins with, "That's a good question…"

The pursuit of personal excellence is at the core of running, jumping and throwing. In fact, the "personal best" was probably another contribution track and field has made to the larger world of sport. So whether it is the quest for improved strength, speed or stamina the sport offers the continual possibility, the continual challenge of greater and greater limits.

Stephen Crane, author of the American Civil War classic "The Red Badge of Courage", is credited with the short poem that pretty much sums up our common pursuit.

I saw a man pursuing the horizon
Round and round he sped
I was disturbed at this;
I accosted the man.
"It is futile," I said,
"You can never –"
"You lie," he cried,
And ran on.

PSYCHOLOGICAL PRINCIPLES FOR THROWING

This piece is adapted from *Long & Strong,* January 2010. Corbett is a kinesiology, certified strength and conditioning specialist [NSCA] and a USA weightlifting senior coach. Much of what he espouses here applies to all athletes, not just throwers.

BY PAT CORBETT, B.S.

Here are four principles for training and competition that you can incorporate to enhance your training. The following three principles are part of a philosophy attributed to five-time swimming Olympic gold medalist Matt Biondi:

1. Believe in your training.
2. Be eternally optimistic.
3. Be willing to risk.

The fourth principle is, "know your job." This aspect will be explored in depth later.

- **Believe In Your Training**

To train at a high level, you must first believe that what you are doing is the best way. To be the best you must also seek out the best. There are many coaches out there who can help you excel but you must be diligent in your evaluation of yourself and your coach. Make sure that your training is of a progressive nature and that you can see each stage unfold.

- **Be Eternally Optimistic**

Being positive with yourself may be the single most important aspect of your athletic career. Your ability to excel will, in the end, be a reflection of what you think and how you think. Positive, realistic self-talk can take you as far as your abilities will allow. But without it, you will not reach your full potential. Being eternally optimistic then becomes as important a part of your training as any of the physical attributes you possess. So, stay positive!

- **Be Willing To Risk**

Many athletes have talent but they also have fear. This fear, bom from an experience or some psyche they have developed, can be a big obstacle. A fear of failure or even a fear of success can leave a thrower far behind in his/her progress. Leaving our comfort zone is often more than some athletes can handle. But risk and going beyond and outside of our normal confines of training are essential to growth as a thrower. Risk is a part of life and in order to know how far we can go, we must step outside the boundaries we have created and search every path for the best ways to achieve success.

SPORTS PSYCHOLOGY?

Many psychologists and coaches speak of sports psychology. But when broken down, it is simply psychology. The ability to apply mental abilities/strengths, whether it is in the business, academic, scientific or athletic world, is still just that, mental strength. It is not necessary to break them down and call them business psychology, academic psychology, scientific psychology or sports psychology. But what is the best way to train for this psychology? One way to train for this psychology and the many psychological obstacles that we must overcome as a thrower is to simply know your job, and then do your job.

Throwing competitions have a unique form in that individual competitors see their competition and what they are doing at the time they're doing it. This is quite different from many other events or sports where your competition is right in front of you. In many sports it is a matter of action and reaction: call a play and see what happens. Make a move and settle for the results. Because many competitions force you to deal with an opponent who is right in front of you, there are many times when you must change your initially desired move to adjust for your opponent's move. Many variables are out of the individual's control as to the final outcome of each play or competition.

But a thrower has control of almost every variable. Outside of the physical environment, a thrower has complete control of every aspect of the competition with no limits on her/his execution of a throw. Short of knowing how far competitors will throw, the pressure is then squarely on the shoulders of the individual thrower. Thus, the need for mental training is indeed great.

YOUR COMPETITIONS ARE A DIRECT REFLECTION OF HOW WELL YOU PREPARED.

How can you develop mental abilities that will focus and calm you and get your emotions under control? You can accomplish this by simply knowing your job and doing your job. This is achieved by knowing what to do, how to do it, then doing it over and over. It doesn't take a motivational speech, pump up music or an inspirational quote. It only requires you to know what to do, and then to do it.

In the throwing ring, all your sweat, work and training time are put on display. Your competitions are a direct reflection of how well you prepared. Your teammates can support you, but they can't help you throw any farther. It is ALL up to you. Again, the most important thing is to know your job and do your job.

Carrying the entire weight of a competition can be a daunting task for any athlete, but if broken down to its simplest form, it can be quite easy. If you can remember this formula during training and competition, you can minimize the stress and improve performance: "What is your job? Know your job. Do your job." This may seem to be a repeating mantra, but that is really the end game for success in the ring. Repeating and practicing some simple ideas and then performing them. And the word job may seem to carry the idea of work or some other negative connotation, but job is used to simplify what we are trying to achieve as throwers. When heading to the training field, pack your lunch and go to work. But as with all things we love to do, never forget that this should be fun! With this in mind, training and the ideas of training and competition as a job should be less onerous.

First, "Know your job." But what is your job? Through the course of your career you will get to know what your job is, and technique will improve through consistent, smart training and experience. You will also develop specific training practices that work best for you. In the course of this training, you will get to know strengths and weaknesses (these weaknesses should be addressed in some way during every training session to facilitate improvements and change them to strengths). All of this training teaches you what to do and how to do it correctly.

This, then, is your job: To do things right (and do them right all the time). Your training emphasis should always be to master the technical aspects of your event. This is only possible through carefully planned and directed drill work and thousands of throws. A wise man (Ted Nugent) once said, "Do everything so slowly that you cannot possibly make a mistake." Although the throws are performed at high speeds, the beginner should always progress at a slower pace to insure the mastery of proper balance, posture and positions throughout the throw. That is, throw better, not harder.

As an athlete in an individual sport where the outcome is based on who is on top of his/her game on a particular day, it is important to remember that your job is not to win. Your job is to throw as well as you can. You have control over what you can do and nothing else. Do not concern yourself with other athletes and what they are doing; they only become distractions from your performance. Your job is to relax, focus on your technique, start in the right posture, be balanced, hold and hit your positions through the throw and finish. When you can focus on your throw and nothing else, success will take care of itself.

As you progress in your training, you become more astute in the knowledge of your own technique and what parts need to be refined. As you get better (which is the reason you train, to get better), you add intensity and speed to your technical skills and drills. As your confidence builds through each training session you become more able to relax and focus on your task: "Doing your job." How do we know our job? We know our job by training correctly and consistently and through years of experience, and competitions. We train correctly by mastering the basic skills and then progressing to the more complex drills until we can put them all together to complete a throw.

This is accomplished through constant repetition of the basic skills (through drill work) to more complex skills (through drill work). When specific skills are mastered, we develop cues and triggers that become consistent with certain stages of the throw. These cues, although few and simple (compared to the complexity of any throw), make it easier to relax and put you in a position to be successful. Here are some examples of cues used by throwers and coaches:

"Relax, Relax, Relax."
"Get over the left."
"Slow, quick, quick."
"Slow down in the back of the ring."
"Squeeze the knees."
"Stay long and loose."
"Block, finish, rhythm."
"Eyes on the shot."
... and there are many more.

You must develop your own trigger words or adopt the cues that your coaches have used. Remember, your job is to throw with precision technique, not to throw harder. If you throw better, you throw farther. Focus on your technique rather than results.

One way to develop your cues or trigger words is to go to a quiet place and make a list of words that suit you. This list should be broken down to a few simple words or phrases. These words should clarify in a general sense of what you need to do at a given moment or for a specific element of your throw. Relate these to your coach and use them frequently. These words will become part of your training and can help get you through difficult training bouts and also settle you down when emotions are high and the competition is big because of their familiarity.

So, "What is your job?" Depending on your event (discus, hammer, javelin, shot), your job will vary. It is always, however, to execute the best throw possible, with the best possible technique. How do we know our job? Through years of training and competition. How do we do our job? We do our job by mastering each stage of the throw and moving from basic to complex skills.

Ultimately we want to build success in competition through success in training. When we experience success on a consistent basis in training, it becomes easier to translate this success to competitions. So, success becomes something we get used to, and competition anxiety becomes less of a factor. In essence it is practiced success.

Although knowing and doing your job in any sport may seem to be a simple process, the throws are extremely complex neuromuscular movements and take years to master. Be patient! Expert throwers become experts by consistent, focused and intense training over the course of many years. The throwers who have made it to the highest level set long and short-term goals. They drilled and trained on their own and wore out many a throwing shoe. They also maintained the spirit of youth by having tun. This is paramount to the success of any thrower. More than anything else, this will keep you going and make those days when training is the last thing you want to do more bearable. And remember, take the time to know your job and then do your job.

Author's Note: Many times during the course of an athletic career the word luck is used. This is a friendly

CONTINUED ON PAGE 2027

From the Mailbox

Bussabarger Responds to Coach Bemiller

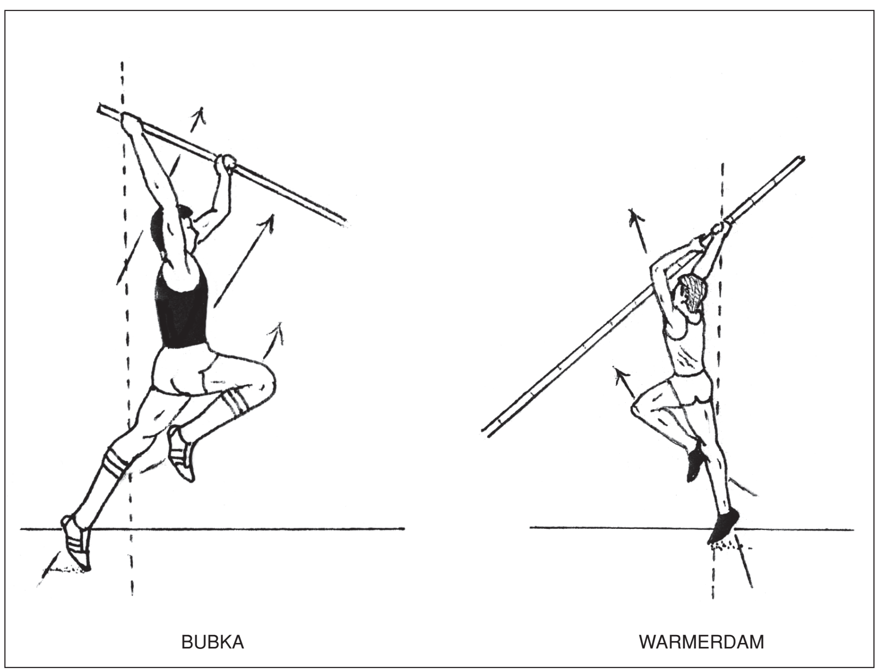
In response to Coach Bemiller's criticisms [*Track Coach* #218] … first I would like to state that my analysis of Petrov's free takeoff was a personal interpretation and summary of his writing based on the following sources.

1. "From Beginner to Bubka," by Alan Launder and John Gormley (both of whom this writer has debated with extensively on the site Pole Vault Power)

2. An article written by Petrov in the 1985 edition of the XIII Congress of the European Athletics Coaches Association

3. Two articles written by Petrov and published in *The Vault Standard,* from the early 80's.

As to the takeoff point, it is an almost universal belief today that the vaulter should take off "out". By "out" the writer means that the front of the vaulter's takeoff foot should be behind the perpendicular plane of the top hand at the completion of the plant. A pertinent question is where does idea come from? I would argue it comes primarily from Petrov. In his book Launder states that Petrov's concept of the free takeoff was largely based on the great Dutch Wamerdam's takeoff (who happened to take off "out" like nearly all successful stiff pole vaulters). To quote Roman Botcharnikov from Launder's book, "An athlete using a flexible pole should copy the stiff pole vaulter and spring STRAIGHT UP at takeoff to drive the pole upwards and forwards." Petrov modified Wamerdam's takeoff by also insisting that the vaulter should press the arms upward at the instant he/she springs off the ground. To quote Petrov: "Then comes the straightening of both arms with the right hand, which ends the takeoff, giving the body an extended position in all joints." (I interpret this to mean that the vaulter simultainiously



Notice that both vaulters' takeoffs are "out". Also the high spring-off angle of both vaulters minimizes forward pressure against the pole at the instant of takeoff. Illustrations by David Bussabarger.

presses the arms up and springs vertically off the ground.) Assuming this is correct, then the vaulter must assume a perpendicular position from his/her top hand down to the toe of the the takeoff foot, meaning the takeoff point is “out”.

A critical problem with Petrov’s free takeoff is the fact that if the vaulter springs vertically and presses the arms up at the instant of takeoff, a great deal of forward drive/kinetic energy will be lost. I contend that Bubka was able to overcome this problem because he was so fast and had speed to burn, so to speak.

Note that a vaulter can spring vertically at takeoff and still achieve an acceptable takeoff angle based on the residual speed of the vaulter pushing him/her inward after leaving the ground, but his/her forward force of movement(penetration action) will be diminished. Coach Bemiller reports that Petrov states that “of great importance is the depth and of body advancement forward during the takeoff.” However, as previously stated, this conflicts with the mechanics of the execution of the free takeoff. This statement also conflicts with Bubka’s statement (taken from Launder’s book): “Before fiberglass vaulting, vaulters put their focus on moving (rotating) the pole, then when fiberglass poles appeared many people put their focus on bending the pole. It is more important to concentrate more on moving the pole towards the plane of the bar, rather than being aware of bending it.” So at the very least Petrov’s concept of the takeoff is self-contradictory, if not mechanically flawed.

This writer finds it ironic that Olympian’s Tim Mack and Lawrence Johnson, both of whom were trained by Coach Bemiller, completely deviated from Pertrov’s free takeoff concept. Both vaulters completed the vertical extension of the arms just before the beginning of the takeoff and typically took off well “underneath” (the toe of the takeoff foot being well ahead of the perpendicular plane of the top hand). In addition both vaulters sprang off the ground in a forward to upward direction. As a result both vaulters had excellent forward takeoff drive or penetration.

A final question arises as to where the idea that fiberglass vaulters should mimic the takeoff of rigid vaulters comes from. Petrov simply appears to have ignored the technique of the best fiberglass vaulters at the time he developed his theory in the early 1980’s and simply invented the idea out of whole cloth. Furthermore the free takeoff and its emphasis on generating pole rotation during the execution of the takeoff versus bending the pole is obviously highly problematical given that current elite vaulters have to bend poles as much as 50lbs overweight.

David Bussaberger

PSYCHOLOGICAL PRINCIPLES FOR THROWING

Continued from page 7025

comment which seems to be the equivalent of hello or goodbye in its impact on us and it is appreciated by most throwers. But in reality, luck has nothing to do with it; you can’t luck your way into a good throw. Now, if your competition somehow misses the meet or starting time, fouls every throw or slips in the ring and breaks an ankle, that may be luck, but is most unlikely. The overall competition would suffer and maybe your motivation to compete at a higher level would also disappear. Luck is not part of anyone’s success. Success comes from “successful” practice and training.

You succeed in competition because you have already been successful in your training. When success in your training becomes part of your everyday practice, nothing is a surprise and your success in competition merely reflects what you have already achieved in your training. Again, what is your job? Train the way you compete through proper technique and progressive intensity. Train correctly, do the little things flawlessly and the big throws will come.

“You must master the simple before you can ever expect to approach the complex”

Pat Corbett

“Fundamentally, the marksman aims at himself.”

Zen in the Art of Archery

CALENDAR OF SCHOOLS

Looking for a USATF Coaching Education Program in your area? View the Calendar of Schools for all certification opportunities (Level 1, 2, and 3) and information on special programs.

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

Level 1

July 7-9	University of Albany - Albany, NY
July 7-9	East Tennessee State University - Johnson City, TN
July 14-16	Nassau Community College - Garden City, NY
July 21-23	Johns Hopkins University - Baltimore, MD
July 21-23	Savannah State University - Savannah, GA
Aug. 4-6	Bishop Gorman High School - Las Vegas, NV
Aug. 4-6	Yale University - New Haven, CT
Aug. 5-6	Central College - Pella, IA
Aug. 11-13	Providence Day School - Charlotte, NC
Aug. 12-13	Highline College - Des Moines, WA
Sept. 29-Oct. 1	Community College of Philadelphia - Philadelphia, PA
Oct. 13-15	Marian University - Indianapolis, IN
Nov. 4-5	Nazareth College - Rochester, NY
Nov. 11-12	Cardinal Stritch University - Milwaukee, WI
Nov. 17-19	Life University - Marietta, GA
Nov. 17-19	Eastern Michigan University - Ypsilanti, MI
Nov. 18-19	Tennessee State University - Nashville, TN
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. 9-10	Houston Baptist University - Houston, TX
Dec. 15-17	Public School 9 - New York, NY
Dec. 16-17	Allen High School - Dallas, TX

Level 2

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

Level 3

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

INTRODUCING A SECOND LEVEL 2 SCHOOL DECEMBER 27-31, 2017

USATF

USATF Coaching Education is pleased to offer the coaching community an additional opportunity to earn Level 2 certification in 2017. Complementing the July offering at Cal-State University - Fullerton, a second Level 2 for the event disciplines of Sprints and Endurance, will be offered December 27-31 at IMG Academy, Bradenton, Florida.

Traditionally held in July, the week-long course provides coaches an advanced, in depth education in one event group of their choice and are taught the science (biomechanics, physiology, psychology and training theory) behind the sport. Certified by the National Council for Accreditation of Coaching Education (NCACE), the USATF Level 2 Program combines classroom instruction, hands-on training, technical video analysis and group projects in its presentation of the curriculum.

Eligibility requirements and the application process will follow the same guidelines for the summer Level 2 School. More information about the December Level 2 offering will be released soon and posted to the Calendar of Schools.

2017 USATF/IAAF ACADEMY TO OFFER SPRINTS AND YOUTH SPECIALIZATION EVENT DISCIPLINES

The USATF/IAAF Academy returns to IMG Academy, Bradenton, FL, December 3-9, 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. The Sprints and Youth Specialization event groups will be offered at the 2017 academy.

A summary of application requirements is outlined below:

- Coaches living in the United States must have successfully completed the USATF Level 2 Course for the specified event group. For the Youth Specialization event group only, all Level 2 event groups are eligible to apply for entrance.
- International coaches must have successfully completed the IAAF Coaches Education and Certification System (CECS) Level IV course.
- Minimum 5 years of coaching experience.
- All coaches must be actively coaching track & field.

Click the link below for more information on the USATF/IAAF Academy.
http://www.usatf.org/Resources-for---/Coaches/Coaching-Education/Three-Boxes.aspx

EXPAND YOUR COACHING KNOWLEDGE AT USATF CAMPUS

The online learning platform is available to all coaches, athletes and educators with an interest in better understanding human performance. Users can access valuable information about the sport of track & field to use towards certifications or continuing education hours for work completed. Use the site as your personal profile for tracking all your extended learning needs.

USATF Campus offers:

- Access to courses for athletes and coaches which are applicable to all sports, in addition to specialized track and field courses
- Professional development which is affordable and convenient
- Evidence-based information from leading sport scientists and coaches
- Training tips and words of wisdom from Legend Coaches

Click below for a listing of available courses and detailed course outline of each offering.
http://courses.usatf.org/

MASTER COACH FALL MENTORSHIP GRANT APPLICATION DEADLINE APPROACHING

Shadow a Master Coach at the Chula Vista Olympic Training Center in three days of "on the field" observation. Four emerging elite coaches will be afforded this opportunity and receive up to $800 towards travel expenses. Applicants must be members of the USATF Coaches Registry and possess a Level 2 certification in the event requested. Applications are due July 31, 2017. For more information and additional eligibility requirements, click the link below.

http://www.usatf.org/Resources-for---/Coaches/Coaching-Education/Special-Programs/2017/Coaching-Enhancement-Grants.aspx

USATF™

USATF.ORG