


A Throws Master Class

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Success in each of the four throwing disciplines in athletics calls for strength, power and an effective technique. Although in recent years little is truly new in the broad strategies of how these demands are met, the role of the coach remains central for integrating and customising all aspects of preparation for each individual athlete. To do this, coaches need knowledge, practical experience and a passion for the sport. This is especially true when they are working with elite throwers.

For this NSA Roundtable, Consultant Editor Nikos Apostolopoulos has brought together an international panel featuring a top coach from each discipline for a wide-ranging conversation about how they see their role, the state of the sport and the key aspects of training. The result is a real master class with something for every aspiring coach.

The four panel members are:

Don Babbitt, the Associate Head Track & Field Coach of the University of Georgia, USA, who has guided more than 50 athletes to major international competitions in all four throwing disciplines but is perhaps best known for his work with US shot putters Adam Nelson, the 2004 Olympic Champion, and two-time world champion Reese Hoffa.

Derek Evely, a Canadian who has worked at every level to the sport from club coach to Director of the Loughborough High-Performance Centre in Great Britain from 2009-2012. He has a special interest in the hammer throw, his

most notable athlete being world junior champion and 2016 Olympic bronze medallist Sophie Hitchon (GBR).

Petteri Piironen, the head javelin coach at the IAAF-accredited Kuortane Sports Institute in Finland who is best known for his work with Julius Yego (KEN), the 2015 World Champion and 2016 Olympic silver medalist.

Vesteinn Hafsteinsson, from Iceland who has coached major event medallists from at least seven countries including 2008 Olympic gold medallist and 2007 World Champion Gerd Kanter (EST).

Some of the responses have been edited to improve clarity and remove repetitions.

NSA *Please tell our readers a little bit about your background as a coach.*

Babbitt: I have been coaching track and field for 33 years now. I am currently coaching at the University of Georgia, in Athens, Georgia, where I have been since 1996. Before that, I had coached at the high school, junior college, and NCAA Division II level. I have been working with elite level athletes since 1993, and have had over 50 athletes compete in the various throwing events at the World Championships, Olympic Games, and other major championships over the years. Looking back, I had never really planned on being a coach, I started doing it for fun because I loved the sport, and it just kind of took off from there.



Derek Evelyn

Evelyn: I was a terrible athlete but I bleed athletics, so after my career I remained in the sport as a coach and have done that for the past 30 years, 22 of them professionally. While these days I am primarily a throws coach, I have coached Shane Niemi (CAN), a world junior championships bronze medallist in the 400m, and I was the development coach (until 21 years old and first season performance 1:48.08) for Gary Reed (CAN), who took a silver medal in the 800m at the 2008 IAAF World Championships in Athletics.

Piironen: My own sport career ended with injuries in the year 2000. I was a student at Kuortane High Performance Training Center and my coach was the internationally known and respected coach Kari Ihalainen. Kuortane has long operated as an international training center for javelin throwers and in addition to my own sports career I helped Kari in coaching different groups. When Kari started working for the Finnish Athletics Federation, I took his place as a javelin coach at the Kuortane HPTC. I have been coaching daily now for approximately 17 years. During my coaching career, I have worked with different levels of from elite athletes to Finnish sports students.

Hafsteinsson: Since the age of 8 I wanted to be a coach as all my mentors and people that I looked up to were coaches themselves. At the age of 14 I wrote my first detailed training programme for two 12-year-olds. During my career as an athlete I also coached on all levels: kids,

juniors, my own competitors, parasport athletes, and veterans. I have now been coaching for at least 20 years, working as a private entrepreneur to over 43 athletes from 10 countries.

NSA *How were you educated as a coach? What do you consider the most significant contribution of your coaching education?*

Babbitt: Initially, I had no formal training as a coach. I did study Biology and then got a Master's degree in Exercise Science, so this provided a good scientific background for my coaching education. As a young coach I spent a lot of time at the track and watched/observed and asked lots of questions. My primary mentor was Art Venegas, who coached me in the javelin. In addition there was also Harold Connolly, from whom I learned a lot about the hammer. Since then I have been able to travel the world to meet and learn from many great coaches, as well learning from both USATF and IAAF coaching courses. However, the most significant contributor to my education, I would have to say is Art, with whom I continue to have a relationship to this day.

Evelyn: I have a Physical Education degree and the minimum level of formal coaching education for participation on Canadian senior national teams. I would estimate that 90% of my education in athlete development has been through:

- Mentorship (Higgins, Bondarchuk, Pfaff),
- Self-education and exploration,
- Discussion and communication with world-class colleagues who have been more successful than I (Tyler, Van Comennee, Hafsteinsson, Francis, McMillan, Behm, Reider, Babbit).

If there are coaches I regret not having the opportunity to directly study the practice of it, would be Art Venegas and Didier Poppe.

These days it is a very good time for developing coaches to learn but in many ways I do not envy them. While there is a wealth of information on everything under the sun and

all of it is only a click away, by the same token the simple chore of ploughing through it all can be at best tiresome and at worst confusing or misleading. Therefore, I always recommend to young coaches: find a quality mentor and study, study, study... but also allow for extended periods where you let yourself process the information you have learned. For a while you must forget the websites, papers and videos and allow yourself to experiment, investigate and realize. Collect your own results and data and look for cause and effect relationships in the approaches you have experimented with. Experiment, but remember that although coaching decisions are, at times, based on an educated guess, no system or approach should ever be implemented with *blind* faith. This is critical but often overlooked.

Piironen: I studied the Finnish education system's levels 1 to 4 (out of 5 levels) with levels 3 and 4 being a special degree in coaching. Besides coaching education, I have worked with many different sports, including team sports at a national league level as well as with junior teams. As a coach, I think the most important thing is to gain different experiences by working in a diverse environment with other experts. In addition, I have a relatively wide international coaching network that help me to stay current with what is happening worldwide.

Hafsteinsson: I have BSc in Health and Physical Education but the most important factor in my success as a coach is the experience I gained in my youth. I had unbelievable mentors as a kid in my father, older brother, teachers, and coaches in my little town of Selfoss in Iceland. In addition, another major influence was that as a young athlete I trained with some of the best throwers in the world who lived and trained in San Jose, California, USA. These included Mac Wilkins, Wolfgang Schmidt, John Powell, Art Burns, Jim McGoldrick, Ben Plucknett, Brian Oldfield, Ed Burke, Gregg Tafrales among others. My philosophy is that you use the knowledge that you get through education/research and combine that with experience as well as some common sense.

NSA *What do you see as the common denominators across the various throwing disciplines with regard to technique and training?*

Babbitt: The commonalities can only be put in very general terms since we are talking about four very unique disciplines. Speed and power generation is key to high-level success in the throws, and there are common ways to do this across all four disciplines that include weight lifting, running, jumping, etc. Balance and coordination, especially in the delivery phase, are also essential for success. Technically, for all of these events, lots of quality repetition is required for mastery as well, I think there is no way around that, and ultimately no quick solutions.

Evely: I have observed many different examples of exceptional coaching behaviour and systematic methodology. In fact, it was my job to study these for four years when I worked at the Canadian Athletics Coaching Centre. This experience led me to a strong belief that there is no single 'model' or 'system' that will lead to success in any athletics discipline but rather there are principles that are commonly adhered to in good coaching practice.

Technique: I once overheard two throwing "greats" discussing technique and one commented that there is no such thing as a "Russian" or "American" or "European" technique but rather there is only rational and irrational technique. Take what you want from that anecdote. There are many interpretations of technical perspectives and models and while it is true that one cannot deny the laws of physics it is also true that some interpretations of said laws can be deceiving. Nonetheless, in contemporary elite coaching practice there are effective commonalities I have noticed across the event groups:

- a respect, of course, for the basic principles of throwing mechanics (e.g. summation of force, etc...), which is an obvious statement but important to mention;

- in the rotational heavy throws, a regard for the importance of linear speed and translation (not only the javelin!);
- the existence of the concept of “movement flow” in intensive movement (think: Godina, Kanter, Sedykh, Murofushi).

In addition, the hammer is distinct in that the athlete must negotiate significant forces from the implement in the execution of technique (the centripetal forces of the ball). This brings with it certain considerations when choosing exercises for specific strength and motor development. In this sense, it is closer to the pole vault than the other throwing events.

Training: The training methods of most successful throws coaches who consistently produce world class results (regardless of event) include the following:

- the consistent, year-round implementation of specific workloads;
- use of complex methods of training (i.e. all exercise classifications are present in most, if not all, cycles of development);
- the methodical use of specific development exercises to achieve form;
- a systematic and rational approach to loading.

Piironen: The javelin throw differs distinctively from the other throwing disciplines and its training varies from them. It is the only throwing event where you run during the performance. Another difference is that the weight of the implement is much lighter. Therefore you highlight more speed running in order to move your body as fast as you can with a strength build up in a short period of time for maximum performance. In the other disciplines, absolute maximum power has much bigger role. The similarities between the disciplines is that the athlete produces the power from the ground up, through their body all the way to the implement.

Hafsteinsson: You get good at what you do. I work with discus and shot put and the more you throw, the better you get. Keep it

simple stupid (KISS) principle. The simpler your technique is the less chance of a failure.

NSA *What is your view of the current situation in the throwing events?*

Babbitt: These are interesting and changing times for the throws. You can see that the dominance of Europe is beginning to diminish and more high-level throwers are starting to emerge from places like the Caribbean, Africa, South America, and Asia. I think that quality coaching is starting to reach athletes in these areas and the physical talent level is tremendous. This is happening for a variety of reasons, but now with the Internet, Skype, and other technologies it is much easier to get information necessary to improve in these technical events. In terms of age, I think you see some throwers have longer careers and there is a bit better understanding of how to maintain one's physical shape over the long haul.

Performance development for both genders seems to have levelled off in the majority of the throwing events. Women's hammer may be one exception (and given that it is still relatively new) where we are seeing a steady progression in the world record. I think the main challenge at this point in bettering performance in the throwing events may be to recruit (and retain) the best athletes from the ever more competitive world of sports (especially team sports). One example of a win in this battle is Lawrence Okoye, who left rugby for athletics and subsequently set the GBR discus record.

Evelly: It is becoming a better time to be a clean thrower. While globally we may never be in a completely doping-free state and there is still much work to be done, it has become far more realistic for a clean thrower to produce a result that will win a medal at a major championship. Some may think I am naïve, but I have faith in my colleagues who practice in such a fashion because I have been a witness to their success. I also think the re-emergence of coach development and mentorship as a

priority in pockets of Western athletics culture, along with better access to information and online sharing, has contributed to an overall rise in coaching competence relative to where it was even 10-15 years ago. To me the capability of today's young coaches is very promising for the future.

Piironen: In the men's javelin there has been a change of generation in the last two Olympics starting at the 2012 Olympic Games in London. In the women's javelin this same transition started in 2016. Like in every sport, there are always ups and downs, with the javelin appearing to peak as suggested by the current results. Also, the javelin is being globalised, with the last few years seeing top throwers from every continent. Men are usually on top of their throwing career when they are 25 to 30 years old, at best they can throw the javelin until they are 35. Women are usually on top a bit earlier, when they are 20 to 30 years old.



Vesteinn Hafsteinsson

Hafsteinsson: I am generally a positive person. I am super happy with the development of the discus and the rotational shot put for men. There is a new generation of throwers from all around the world in both events and they are throwing very far. On the women's side it is thinner with some traditions still existing in different parts of the world but, still, a positive development in some ways.

NSA *Have the throwing techniques in your event evolved over the past years and if so, how?*

Babbitt: In the shot put I don't think the techniques have changed that much in that there has been nothing really new or innovative lately. What you have seen on the men's side is that the rotational technique has increased in popularity as evidenced by the vast majority (80%+) of the finalists in major championships are now rotating instead of gliding. This was the opposite back in the 1980's. I think the training methodology has allowed throwers to throw far for a longer period of time as evidenced by the high number of competitions in which throwers like John Godina, Christian Cantwell, and Reese Hoffa have thrown over 21m in their career. On the women's side the performances have stagnated over the past 25 years and many of the traditionally strong throwing countries have dropped off a bit. It will be interesting to see if the rotational technique becomes the dominant technique for the women. The rotational throwers are beginning to break the 20m barrier, but we will see if it continues. I do think that if the female rotational throwers begin to take the top spots in high-level competition, the event will quickly change to being dominated by the rotational style.

Evely: As in methodological and periodisation science, the degree of formal, academic research into specific biomechanical study by *true experts* has declined somewhat. There are fewer publications and formal studies on the mechanics of the throwing events, especially those that were once written by scientists who were actually throws coaches. The scientist/coach positions that were once relatively common rarely exist these days. Therefore, resources are scarce and today the coaches capable of writing such material are too busy simply trying to earn a living. In my mind this has led to a change in how techniques are evolving and it may not necessarily be a bad thing. While in some events the overall technical competence has devolved, in others it

has either evolved considerably and/or there are more athletes across the board displaying a truly world-class technique. Typically, where techniques have evolved in a positive way there exist full-time, committed, world-class coaches experimenting and adapting their own technical models. The only difference today is that they are not publishing their findings academically but they are sharing rather less formally online and through clinic work. Since many operate outside of a strict academic or ideological paradigm, I believe this is leading to a blending and coming together of former models or elements of those models as these coaches experiment and solve the technical issues presented to them.

Piironen: In the javelin there haven't been any specific changes in technique in the last years. The training has changed in diverse directions with speed conditioning being emphasised more. I did some research into whether the development of equipment has affected results during past 30 years but couldn't come to any sure conclusions. What I have noticed is that there are more anatomically shorter throwers now on the top. For instance, Julius Yego, who is under 180cm has a PB of over 90m. There are also other examples of javelin throwers who have thrown close to 90m. So it can be possible that new carbon (stiffer) javelins make it possible for shorter throwers to achieve really long throws. Older steel and aluminium (softer) javelins needed more strength in order to throw great distances. Nowadays, if you have a good technique and a relatively good clean pull you can achieve a high release speed with a lower strength level and shorter pulling distance. In addition, training nowadays is more focused on technical issues because of the variety of new equipment. Stiffer javelins fly better but the thrower needs to have clean pull to get that advantage.

Hafsteinsson: I am not so sure if they have. Some coaches would say that everything was better before and that discus technique has not gotten better since the 1980s. In one way

you can say that guys like Wilkins, Schmidt, Powell had such a good feel. I say yes they looked great but later on and even today there are guys with very simple effective techniques who can throw as far or even farther than they did. Kanter, the Harting brothers, Dacres are all good examples. In the rotational shot put you can say the same. Baryshnikov and Oldfield had some very good aspects in their early development of their spin but what about Crouser, Waltz, Kovacs and some other modern throwers? They are really doing great jobs. On the women's side I do not see as many discus throwers who have good technique and I do not have an answer why that is. But I like Perkovic and Samuels. In the rotational shot there is a huge development since it is new for the women and, from my point of view, totally unbelievable that more women are not using it. Anita Marton is doing a great job here along with some Americans.

NSA *Do you see any performance reserves within the current techniques?*

Babbitt: I think the margins are very thin at this point for getting more out of the current techniques. The question is finding the right athlete that can work within the technique and the confines of the seven-foot shot ring to develop longer throwers. Perhaps what a guy like Tom Walsh is doing with his very dynamic and rhythmic approach to the rotational technique (almost like discus) can generate greater distances, or a guy like Ryan Crouser, who is over 2m tall, and has a very smooth and efficient rotational technique for a man his size, may be able to take the event to a new level.

Evely: It is tempting to say that techniques are becoming more and more refined and that we have exhausted or come to the limit of our ability to execute them. But of course, this would be ridiculous because every time we hint at such a thing someone comes along to make us reconsider. I do not think there are reserves so much as there are limitless, unique ways to express model techniques. Our cur-

rent technical models serve their purpose; they provide us with an anchor or starting point on which to develop an individual's technique. From this we must find our own paths based upon the unique movement and morphological characteristics of the athletes we work with.

For example, I once had the great pleasure to spend a day or two with Dani Stevens (then Samuels). She explained her current (at that time) path that de-emphasised a former, unique characteristic in her throwing - one she had achieved early success with - because of subtle pressure from the 'experts' in the throwing community. This made me question why someone would want to interfere with such a wonderfully unique characteristic when all other elements of the technique were exceptional. Sometimes in our quest for perfection we hamstring our ability to express ourselves in our own distinctive and inspiring way. This, of course, speaks to the art of technical coaching.

Piironen: In the past it was important to do more pure strength training and upper body throwing force, with this forming the basis of performance. However, presently, performance ability is built by developing the explosive strength abilities of the lower body (legs). The javelin allows high performances in many ways, but in my opinion it is more common to develop speed and performance skills in today's training, rather than focusing on strength. Also, it appears that strength training is more focused on VBT (velocity based training) than maximum strength training. Crossfit-like training is an example of this with many javelin throwers are using it, including today's number one thrower Thomas Röhler.

Hafsteinsson: Yes I do. I think the Hein-Direck Neu start can be developed and lead to longer throws. Of the top male discus throwers in the last few years only Julian Wruck and Erik Cadée have seriously tried this technique. We did some biomechanical studies in Estonia with Gerd Kanter on this with great results.

I think there is more to be done here. I also think the double pivot as Nikolaj Sedjuk did a few years ago can be developed. In the rotational shot put I am not sure, I think it is harder to change. I think we are too conservative in the sport, we are scared to try something new and different.

NSA *Do you use technology (e.g. motion analysis) to evaluate the technique of your athletes? If so, can you give us a short example of how you use it?*

Babbitt: Yes, I will often use 'Coaches Eye' or 'Coach My Video' on my iPhone. These apps are pretty fast and you can play back the video in just a few seconds. I usually use it during practice with athletes who like visual feedback right away so I can point out a position or look at the throw at various speeds. With others, I will wait until the end of the session to go over the throws, or review the throws at a different time.

Evely: I use my iPhone to video about 20-30% of the throws in training. In the early cycles of our training year I will allow some comparative observation, either directly in a throwing session or away from it. I find it useful to compare past and present videos/stills of technical elements we are working on to resolve issues but also to instil confidence in positions the athlete has acquired. I am cautious in this however, athletes can be obsessive creatures and that is not always beneficial.

Piironen: In my own coaching, I use some smart phone apps to analyse technical performance. We also regularly measure performance in strength and condition. In addition, we co-operate with the KIHU (Research Institute for Olympic Sports) by doing larger scale body movement analysis measurements and javelin flight path testing. With mobile apps ('Coach's Eye') I follow the steps and flying/contact time measurements and javelin attack angles among other things.

Hafsteinsson: On an everyday basis I use my eye as a coach with a little simple camera or an I-pad. Once or twice a year I get a biomechanical analysis on the best athletes I am working with. Very often I use video analysis for athletes to look at together and criticise each other. It is a simple concept that I use daily to maximise my time and knowledge with the athletes. But, I would not have gotten the success I have had without the help of my science and research people within the different countries I have worked in

NSA *What are the most important physical qualities of a thrower?*

Babbitt: There are lots of things that are important to throwing far, but being naturally quick and explosive is probably the most important. Some elements of this can be trained, but the top throwers are usually a little more talented in this way than others. To go into more detail about these qualities, I think they can be quantified as being able to exhibit good foot speed, good vertical jumping ability, and great body awareness.

Evely: Speed and explosive strength are No. 1. Athletic prowess (movement and learning intelligence) and limb length compete for a very close second.

Piironen: Good sense of rhythm & balance, explosiveness, and flexibility are important qualities in my point of view. But more than anything a javelin thrower needs the ability to produce force in a short period and good javelin specific mobility, especially in upper body area. The actual throw takes approximately 100-110ms in men and 120-140ms in women. During that time, they should be able to impart as much force as possible to the implement.

Hafsteinsson: Strength, power, speed and flexibility are the most important. You have to be extremely powerful to throw far and you build that up with tremendous strength that enables one to maximise the speed of release. Of course, you have to build up maximum

speed during the younger years throwing very far with lighter implements. Afterwards, one needs to build more general strength along with the specific strength to be able to get as much power as possible. This is all useless if you lose your flexibility. The best example I have on this is the Swede Daniel Ståhl, he is strong as a bull, very powerful and fast but at the same time he is super flexible.

NSA *Can physical qualities differ between types of athletes or at different stages of an athlete's career?*

Babbitt: Of course. In general, you will have a range between power throwers, who are generally big and strong, and throwers who are more speed based in their approach, but may not be as big or as naturally strong. For optimal success, you will need to train each type of athlete a little differently to maximise their ability to throw far. You cannot just coach them all the same way. You can't coach someone to be tall or big, but you can make improvements in their speed, agility, and strength to a certain extent. It is important to be able to know the limits of what you can teach or improve in an athlete, and know when to back off. This is where experience comes in after working with many types of athletes in many different situations over the years.

Evely: There is an infinite number of ratios how the qualities needed for performance are expressed in individuals across a population. And this is represented in the throwing community at large at almost any meeting you observe. This is what makes throwing so interesting (I usually cheer for the short one). However, if you are relatively deficient in one quality or ability you had better be very exceptional in the others if you want to succeed at a high level. Regardless of distribution, the sum-total of the qualities must exceed a high baseline for competition in elite throwing circles. Therefore, it is rare these days to find someone at the top who is truly deficient in one quality against the others.

As for the different stages of an athlete's development, yes, there are distinct phases in which the three main motor abilities naturally peak in the *general population*: first endurance (early adolescence), then speed (adolescence), then strength (early adulthood). In the trained population (our focus) we want to prolong these peaks where we can. Consequently, in the training of young throwers, we are primarily concerned with controlling interference in the natural development of the second two. Therefore, early specialisation is to be avoided. We must enable and enhance skill development in the early stages of growth while doing our best to allow the natural development of strength to occur prior to specialising this essential quality.

I believe strongly that the development of absolute strength has limits in relation to its tenure in the high-performance athletes' long-term training. That is, once maximal strength has been developed to its optimum level, further increases do not exponentially (or even necessarily) lead to better results. One important concern for a coach is to monitor where an athlete is on this course and design programmes accordingly. I know from my study of intensification (from Francis and Bondarchuk) that later in an athlete's career volumes of specialised work may need to be decreased to allow for utmost intensification in the most specific abilities. I believe this idea also applies to the relationship between maximal strength and throwing performance. Some recent work for Altis I have done with P.J. Vazel has confirmed and supported this belief.

Piironen: Yes! The javelin can be thrown far with very different training approaches. In previous years, we have seen very different types of throwers throw long. There are still so called power throwers but these days there are more and more speed-based throwers with good technical skills. Obviously throwers who based their throwing on speed and good technique have longer careers while athletes focused on high strength levels are more at risk for injuries.

Hafsteinsson: Every individual is different and as a coach you should never really generalise on this matter. During the individual career of an athlete these qualities can change or differ in relation to how you train. You can lose some qualities you had as a young athlete with wrong training.

NSA *How do you ensure the transfer of physical qualities into the technique?*



Don Babbitt

Babbitt: There are many different ways to do this. Exercises that most closely resemble the actual event provide the best indicator or transfer to the actual event, or technique in this case. Therefore, being able to exhibit improvement in throwing heavy or light implements does a good job in this transfer. Each athlete will usually develop their own personal indicators as to what works for them. For example, the late and great, Harold Connolly told me about these Greek amphitheatre steps he used to run, training at my old high school when he was competing in the 1960s. He said that when he hit a certain time he knew he was ready to break 70m in the hammer. He figured this calculation out over time, and it worked for him.

Evelly: The first thing I do is try to choose exercises that transfer efficiently. This is achieved through research, data collection, and experi-

mentation. Some exercises transfer naturally better than others, but this can be highly individual. Next, I try to load in a manner that I believe enables a better transfer; I avoid large, acute rises in intensity and volume but rather keep the distribution of loads consistent from cycle to cycle (upper intensity ranges, moderate overall volumes). I prefer smaller, more frequent and consistent doses of work, to larger, infrequent loading designs.

Piironen: I think the technical performance is the basis for all training. By analysing the technical performance, I determine what kind of physical training the athlete should do. Sporting performance tells us what kind of training the athlete needs. However, the athlete's training history is important when planning the training. The focus is the same for everybody, to produce a lot of force in a short period. Performance training should always support the development of technical skills so that the technique can be improved better or to get more power to the performance. The anatomy of the athlete is also important for determining the physical training needed.

Hafsteinsson: There is no guarantee anywhere for that. I have a philosophy to never get away from the event. We throw all year around and we can always throw pretty far no matter what we are doing in the weight room or how tired or worn out we are. Then in our periodised programme this is just mathematics. You as a coach have to keep track of the amount of throws done in each period of the year and then the tonnage done in the weight room. It is all about calculating out the volume and intensity in regulation with the adaptation and variation process for each athlete.

NSA *How do you evaluate the effectiveness of training? What are the most important test exercises you use (for sprint, strength, power, etc.)?*

Babbitt: Once again, this depends on the type of thrower. For shot put, in developing throwers there is usually a pretty good corre-

lation between the improvement in the major weight lifting exercises, such as bench press, squat, clean, and snatch and improved throwing distances. Especially when they are young and first developing. For me the Olympic lifts seem to have a better correlation than the power lifts. I usually look at these improvements based as a percentage of body weight rather than an actual amount since this should be looked at in terms of body size (and leverage too). Stand throws with heavy implements, or with standard weight are also good indicators of training effectiveness. Sprint and jump tests (20m sprint, stair sprints, flying 20m, standing long jump, and vertical jump, etc.) if done regularly, and in similar conditions, can also be good indicators of training effectiveness if the results are good, or of overtraining if the results are down. These must be done in regular intervals in similar conditions to be reliable.

Evely: In throwing we are fortunate in that we have a highly specific 'measurable' that we can use in daily training: the throwing result. Therefore, I measure this quantity daily to evaluate the effectiveness and peculiarity of the athlete's response to training. This I learned from Bondarchuk. I generally use no other test exercises, however in recent years I have found that measuring bar velocity in global strength exercises crucial in helping to support the daily throwing measurable. I have found that the two responses parallel each other closely.

Piironen: In my opinion the most important measurements are the athlete's movement speed, strength production, and mobility. To follow them I use following measurements:

- Speed: 20m flying start and 30m standing start;
- Sport specific strength: Throwing shots overhead forward (men 4kg and women 2kg);
- Maximum strength: snatch/clean, front/back squat, pullover;
- Strength producing ability: counter movement jump, drop jump 20cm and 40cm block (contact time and height), isometric

leg extension with force time curve, hip area mobility, upper body mobility.

However, many athletes have their own tests to measure performance, but the ones I mentioned are those most commonly used by javelin throwers.

Hafsteinsson: I test very little. The only thing that matters is how far you throw. In shot put we throw more or less far and measure in some practices each week all year around. In the discus where we throw in the net in the winter we still throw hard some sessions and less hard in others. In the weight room, I, as a coach, can always estimate the max for my athletes and we very seldom go for max. I sometimes use some vertical and standing long jumps and some overhead and forward throwing, but it depends very much on what each athlete likes. The only thing I need as a coach is the estimated max in the weight room and how far you throw in each period.

NSA *How do you roughly structure a training year? When do throwers benefit from double periodisation?*

Babbitt: For shot put, double periodisation is usually needed since there is competition in both the indoor and outdoor seasons. Autumn is usually used to breakdown and adjust technique while also making improvements in strength, power generation, flexibility, coordination, and ultimately speed-power. Attention to the full throw and developing a rhythm for performance will begin in the late fall and transition into the early winter. Tapering will begin in the middle of the competition season in mid-winter until the end of the indoor season at the end of winter. There will then be another transition period that will extend for a couple of months until mid to late spring in which we try to make some slight improvements/increases to the general training elements I had mentioned for the fall. Once this period is over, there will be another tapering period going into the late spring and early summer when our major championships are held here in the

US. It is necessary to taper this early in the US (relative to major championships such as the Worlds, Olympic Games, or Diamond League) because success at this time will allow one to have a chance to compete later in the summer (such is the requirement for a country of 320 million).

Evely: I believe athletes can benefit from multiple peaks in a calendar year provided they are permitted to achieve said peaks in an organic and individual fashion. Most throwers I have worked with, when presented with a training stimulus that does not appreciably wave load volume and intensity, peak 4 – 6 times a season, however the exact number is individual and depends upon the peculiarities discussed in my previous answer. I find this preferable because with each peak comes overall growth in specific abilities. Therefore, our structure of training (cycle length, frequency, distribution) is largely dependent upon the athlete's response to training and planned only in short to medium term time frames (2 – 4 months in advance). This represents the "Bondarchuk System" as I understand it.

Piironen: The autumn is a time to develop your basic skills and conditioning. It is also time for more experienced throwers to rehabilitate themselves. The actual training starts around November – December with strength based training. In January-February starts javelin specific training (technical & javelin specific strength training) and at the same time we start focusing more on speed training. In March-April we return to basics before we start preparing for the competition season. In May, we start preparation for the competition season. Competition period is planned week after week based on the athlete's current technical and physical situation.

Hafsteinsson: I look at the most important meets. Structure the days and weeks before these and then make months and big periods and sometimes a rough skeletal of four year plan. The plan is all about the volume and intensity of throwing and lifting. I listen very

much to each athlete what they like to do, thereby involving them in the system that I use. Shot putters very often have to have a double periodisation since they also compete indoors. However, I think it is also good for discus throwers to compete indoors, since there is a long lay over without any meets during the winter months. I personally believe that it makes it more fun and can be very effective.

NSA *Can you give any advice on supplementary measures, such as physiotherapy, nutrition, mental training or medical check-ups?*

Babbitt: These are all very helpful measures and should all be considered if one is looking to achieve a maximum performance. However, having said that, you want to make sure you manage each of these areas and not let them “get in the way” of training either. I think the steady use of physiotherapy goes a long way to insure good training. In many cases, it does not have to be much, but if it is steady and consistent it can be very beneficial. For nutrition, it is important to eat well and maintain a steady, balanced diet that meets the needs of training. Getting enough protein for example in times of heavy training. In terms of mental training, I think it important to know and understand one’s self, and how you will react to certain stresses and situations. When this knowledge is unlocked and understood, it will go a long way to helping performance.

Evely: To me, athlete health and wellness begins with proper load distribution (i.e., coaching). After that, regular physical therapy, medical treatment and monitoring are the most critical elements in a high-performance athlete’s “performance life”. This cannot be overstated. These come before psychology and nutrition, in my opinion (although those are important too). Get your coaching, medical/therapeutic intervention and access to training camps in place before you start worrying about your supplement sponsorships or which spiritual advisor you are going to hire.



Petteri Piironen

Piironen: I have been trying to build a team around me with experts from different areas to whom the athletes can turn to if necessary. I try not to interfere with areas where I don’t have enough knowledge. Depending what my athletes need, experts are available to them from different disciplines.

Hafsteinsson: I think this is the big difference of modern times. Nobody gets on the podium without continuous physical therapy. Without the experts from different countries that I have worked with the athletes I coach would not have gotten one medal. I, as a coach, am proficient with the technique, periodisation, training programme, and some mental issues. Everything else I leave for the experts. Why should I be average at everything instead of being the best at one thing?

NSA *Which mental qualities are specific to throwing athletes? How do you train these?*

Babbitt: I think the mentality in some ways is similar to that of teeing off in golf. The execution of the movement needs to be long and loose, but explosive, with a certain degree of accuracy and reproducibility. This is going to come with lots of repetition and practice, and an understanding of what one’s “go to move” is. What I mean by that is when you really want to throw hard, what technique or habit do you

revert to? To be successful, it should be a more dynamic version of your sub-max rhythmic throw. However, many times when things do not go well, it is a movement that you do not normally see when throwing comfortably. This is the main mental aspect that needs to be trained, and it can be honed through meet simulations and exercises of that nature.

Evely: Like any athlete, the ability to perform under pressure is critical to success in athletics. Specific to throwers is the ability to counter competitor's throws in competition, answer to your own foul throws and maintain composure in the stadium warm up throws. All of these are related to technical composure, which itself is related to emotional stress. I believe an outstanding competitive ability exists in our bodies the way speed does; largely inherent but also, to a point, trainable. The coach's job is to create the atmosphere and environment where these abilities can manifest themselves. Sport psychology is useful mostly when it provides athletes with concrete strategies for dealing with competitive and training stresses/situations and *only* if it does not interfere with the coaching process. Consider this: Sophie Hitchon won the world junior championships on her last throw, made her first Olympic final on her last throw and won an Olympic bronze on her last throw... all three in front of big crowds and all three with national records. As much as I and others would like to share credit for this tendency and despite the outstanding level of support and coaching she currently receives no psychologist or coach taught her that... that's a natural gift: the 'assassin's' competitive mind set.

Piironen: Confidence, passion and sense of direction. With good training, coaching and athlete engagement you will get what you deserve. Sometimes there are situations where an athlete needs help and then it is good to talk with a sport psychologist. However, the main thing is to have good quality training with a passion for the sport.

Hafsteinsson: Well, the will to train is the most important and then in combination with the continuity of the coach they make a winning team. Then of course these throwers are supposed to perform when it counts in less than a second and stay in a circle. This is hard to do. Some can from the beginning, but very few. The rest have to develop the ability. My way of coaching this is simple, do model training. Put yourself in the situation that you compete in as often as you can and thereby master it. Then I am very hard on no fouls and not always throwing with the right wind in the discus.

NSA *With regard to the preparation of throwers, what exercises would you recommend in the basic training of the young throwers?*

Babbitt: There are many answers to this question. If I had to narrow it down to a few exercises (other than actual throwing) I would say multi-throws (with a medicine ball for example) such as overhead throws, underhand throws, throws for height, etc. Also, learning how to run and jump properly will serve them well the rest of their careers. However, careful attention should be paid to how much volume is accumulated in training these during the formative years so that injuries are avoided.

Evely: Like all other developing athletes, young throwers need a wide base of movement experience. The career of a thrower from young potential to the elite ranks charts a path from multidirectional / multilateral to singularly directional and highly focused, specific training. The precise exercises along this path, to some degree, are less important than the existence of the progression itself. Nonetheless, I have three general rules I try to stick to when developing young throwers:

1. Develop and preserve speed and technique qualities at all costs and always consider this when programming and applying loads.
2. Cultivate primarily unilateral and contralateral exercise patterns for a minimum of two years before the introduction of bi-

lateral global strength exercises and abilities. Even then, such patterns should remain a staple in your exercise inventory.

3. Delay the implementation of specialised loads and activities until you are sure that speed and strength development have nearly completed their natural course.

Piironen: The fact that you become a thrower by throwing is still correct, but training should be as versatile as possible at a young age. Specialising young isn't necessarily good for you. Use all sports that engender development of rhythm, speed and balance and this will provide a good base for javelin training.

Hafsteinsson: Well it depends on how young they are. But, they should do all the throwing and drills possible when they are young and learn the basic technique before puberty. Then they should learn technique in the Olympic and power lifts as early as possible. Wait with the loading until they get older and but they should throw as far as possible with the strength they have. They should keep running and jumping and take care of their flexibility.

NSA *At what stage do you think athletes should specialise in one discipline?*

Babbitt: I really think this depends on what the athlete's ultimate goal is. If it is to win an international medal, then it probably needs to be about the time they enter the senior ranks. If they are just having fun and enjoying the sport, there is not really a need to specialise at all.

Evely: I coached Dylan Armstrong from the age of 14 to the age of 24. If I made a mistake with him it was that we focused on the hammer throw too early. I believe we simply committed too many throws to the hammer at the expense of the shot and discus in his youth and junior years. Of course, we trained for the shot and discus, but we focused too much on the hammer. And while I was very careful and progressive with the strength loads, we began to develop maximal strength loads in his junior years (18-19 yrs.). In retrospect, I should have

delayed that another two years. Thankfully when he was 22 we were able to shift focus to the shot and two years later Dr. Bondarchuk arrived. The rest is history. So, to answer your question, I think one should absolutely not specialise in an event group until youth, then in a single event until entry into junior.

Piironen: I think that you should choose your sport around 16-18 years. However, one can still do other sports but the focus should be on the javelin throw or in the sport one choses.

Hafsteinsson: Learn technique early and specialise later, do everything as long as you like it, other events, etc. But if you want to be world class later and you have learned the event before puberty then you need to specialise around 17-18 years of age.

NSA *Please provide our readers with the one piece of advice you consider most important in the training of throwers.*

Babbitt: Keep it fun and enjoyable. Athletics is a hard sport. Probably 98% of the time is dedicated to training and about 2% to actually competing, so training has to be made fun as well. Many team sports involve much more playing and competition time, relative to training time, so they are naturally "more fun". If one is able to do this the kids will stay in the sport, and since throwing is a sport of repetition you must keep at it for a while to achieve your best results. Throwers usually take the longest of the track & field disciplines to reach their best form so keeping it fun is very necessary.

Evely: Whatever you do, do not compromise speed and technical abilities. Live by that rule and you will succeed.

Piironen: Like I mentioned before, passion is the most important feature. You become a thrower by throwing.

Hafsteinsson: The slowest process gives the fastest results.