

# NSA ROUND TABLE 30: THE ROLE OF SPEED IN THE THROWS

*The following is a round table question – answer format discussion on the role of speed in the throwing events. The NSA Round Table is a staple feature of most NSA editions. Re-printed with permission from New Studies in Athletics.*

- **Ekkart Arbeit** was GDR head coach for throwing events from 1982 to 1990. He worked from 1991 to 1994 for the Italian federation FIDAL as a special consultant for throwing events and since 1995 has been the director of the Sportinstitut Baltic, an institute for performance diagnostics, rehabilitation and training at Zinnowitz, Germany.
- **Anders Borgstrom** has been Swedish national coach for the javelin throw since 1971 and head coach and team manager of the Swedish athletics team from 1984 to 1988. He is now working at the Sport Gymnasium in Karlstad, Sweden. He was also the leader of the biomechanics team for the throwing events at the 1995 World Championships in Athletics in Goteborg.
- **Carl Johnson** has been a British Athletic Federation national coach since 1969. Between 1972 and 1995 he had spells as national event coach for the hammer, chief coach for the throws and technical director coach education. He is now the BAF chief education officer.
- **Yuriy Sedykh** was one of the Russian School of hammer throwers which has dominated the event for the last 40 years and is still the world record holder with 86.74m (1986, cf. NSA photosequence 22 in NSA no. 3 / 1992, pp. 51-59). He is now a freelance coach in Paris, France.
- (Questions by EEB, Jim Alford)

## **1 What particular sort of speed ability would you look for in a potential shot, discus, hammer or javelin thrower?**

ARBEIT

In the throwing events release velocities must be attained which are much higher than those achieved in the sprints and jumping events. The range of velocities which must be realized for top-level performances in the throws extends from 13.50m/sec in the shot put to 31.50m/sec in the javelin throw.

Throwing movements are, of course, not cyclic but acyclic, i.e. single movements with the terminal link of the kinetic chain being accelerated to the highest

possible velocity. Naturally, the masses to be accelerated in this way are very different: 7.26kg (men's shot put and hammer) and 600g (women's javelin).

Since the throwing events are concerned with accelerating certain masses, the performance determining factor is not so much speed as the ability to discharge energy in an explosive way, i.e. speed-strength.

Speed-strength is a phenomenon which is closely related to neuromuscular control. Its basis is maximum strength, which has a regulating function.

Velocity in the approach, turn and glide is also important. Here the athlete must achieve a high velocity before reaching the power position and initiating the final acceleration.

These different types of velocity are limited by the state of technical training. A higher initial velocity will lead to a significantly better muscular pre-tension, if the kinetic energy of the total system, consisting of the athlete and the throwing implement, is checked to such an extent that the pre-stretch of the athlete's muscles will create a store of potential energy, which will later be released in an explosive movement. Thus, the dynamic structure of the throwing movements includes different types of "fast movements", which are realized by different modes of muscular work and which, therefore, must be developed by different training forms.

The role of speed in the throwing events is, in fact, ambiguous and should be viewed differently for each event. While the shot put and the hammer throw belong to those speed-strength events which are dominated by maximum strength, the javelin throw is a speed-strength event which is dominated by speed.

## BORGSTROM

If I concentrate on the javelin, which is my special event, I look mainly for two abilities. Since the kind of speed required is the result of both strength and co-ordination, I like to find a young athlete who shows great speed in single movements (action speed) but who also shows a very natural and "clean" pattern of movement in technical exercises. The potential javelin thrower must, right from the beginning, possess a natural technique in javelin (or ball) throwing. I don't think that this is required when looking for a potential thrower in the 'heavy' events.

## JOHNSON:

I do not think we can distinguish greatly between events — they all require power combined with agility. By power I mean the ability to express maximum force in

minimum time. By agility I mean the capacity to link power application in a dextrous, nimble way.

SEDYKH:

In my view, the innate quality of leg speed is basic for all the throws. A fast arm is also important in the javelin, discus and shot. The 'fast legs' concept is not necessarily related to sprinting or jumping tests. It is primarily concerned with rotating speed. Not all great athletes have very high indicators in the generally accepted tests for speed, like the 30 meters and 60 meters sprints, the standing long jump or the standing triple jump. I myself am an example of that.

## **2 What sort of training do you consider most beneficial in the development of speed in the various throwing events?**

ARBEIT

In my opinion, speed training is an inherent part of throws training. During the last five to six years the training of my athletes has always included three sprint training sessions per week. This sprint programme at first comprised 5 x 60m runs pulling a tyre and 2 x 120 m runs pulling a tyre, carried out in intensity range 3.

After about 9 weeks the programme was changed to 6 to 8 x 30m pulling a tyre and 2 x 80m pulling a tyre, carried out in intensity 2 for a period of six weeks on Mondays, Thursdays and Saturdays.

These programmes were combined with hurdle jumps and general explosive throws.

Immediately prior to and during the series of competitions the resistance runs were eliminated, and 6 to 8 x 30m runs were carried out twice a week in intensity range 1.

Resistance runs (runs while pulling a tyre) led to significantly better sprinting times with all my athletes.

Two adaptation effects were aimed at:

- development of sprinting strength,
- improvement of anaerobic capacity.

Although the improvement of anaerobic capacity is not necessary for single throws, it is required for the effective organization of throws training.

This training was carried out by all throwers regardless of their special event.

For athletes over 20 years of age who have carried out a good general, athletic training during childhood, with an emphasis on speed and speed-strength as well as co-ordinative abilities, speed training can be reduced to short sprints.

If factor analysis is applied, the role of sprinting ability within the performance structure changes significantly. While during adolescence there is a highly significant correlation between throwing and speed (sprint) performance, the significance of this correlation is reduced at a later training age, when the athletes' performance ability has increased.

**BORGSTROM:**

Especially in the javelin throw, but also in the shot and discus, you must be able to increase the speed of the implement considerably in a very short time. This does not apply so much in the hammer throw. This means, for instance, that a world class javelin thrower must be able to accelerate the javelin from about 30 km/hour to more than 100 km/hour in just a little more than 0.1 of a second from the plant of the left foot (right handed thrower) to the delivery! In other words, the thrower has to develop a very specific ability to produce a great amount of power in a very short time — and this must be executed with an accomplished technique. To develop this kind of ability it is my opinion that training must include a considerable amount of throwing, not only with the normal competition implement but also with underweight and overweight implements. To develop more speed strength in the leg muscles I prefer to use jumps, especially drop-jumps, where you aim mainly on the shortest possible contact time, together with an optimal height of the jump.

**JOHNSON:**

The most beneficial is strength training at 95% of maximum, since, as Schmidtbleicher and Tidow aver, 'there is no limiting influence upon power resulting from maximal strength gain". That is, provided it is undertaken with explosive efforts (snatch and clean) and full recovery is allowed between efforts.

**SEDYKH:**

Of course, one of the major exercises for developing speed in the throws is throwing itself, especially throwing lighter weights. All possible forms of jumps, sprints and weight exercises undoubtedly exert a good influence on developing speed qualities, but, in my view, weight training exercises (barbells) should be carried out rapidly, and all auxiliary work for developing speed should be performed in a way that approximates to the intensity of the basic throwing movement.

**3 In your opinion, what is the relationship between the various forms of strength and strength training and speed in the throwing events?  
For:**

- a. beginners,**
- b. advanced,**
- c. top level.**

ARBEIT:

My fundamental theoretical position is that strength training is motor learning training. This means that strength, like any other psycho-physical performance, is characterized by three aspects:

- motivational aspect,
- regulation and control aspect,
- energetic aspect.

Motor learning training must always be carried out in a target-oriented way. The fact that the effects of motor learning training depend on the athlete's age can be explained by the fact that young athletes possess a broad range of adaptation possibilities. Young athletes can improve their strength, and therefore their performance, through speed and jumping exercises. Athletes should make use of this possibility as long as possible.

In older athletes or athletes of a higher training age, this transformation effect no longer exists. For these athletes it is essential that they increase their physical potential by doing strength training. This extended physical potential must then be transformed into a high level of athletic performance. This transformation is achieved particularly by means of special strength training and the use of competition implements of different weight.

This means that strength training and special training must have a very similar dynamic structure. This is the only way to train the performance-determining factors of the throwing events.

BORGSTROM:

In all the throwing events, beginners will benefit mainly from technique training, using throwing exercises which develop both technique and speed of movement.

Advanced throwers need a simultaneous build up of maximum strength and specific throwing strength / speed.

The development of speed with top level throwers is a very individual matter. You always try to bring the technique up to a very accomplished level. Parallel with this, you will get the development of specialized speed strength.

JOHNSON:

Firstly, I assume that the term beginners includes adult beginners as well as young athletes.

a) In my opinion, all beginners need to progress through a broadly based general strength development programme, involving the use of bodyweight exercises and stacked weights and ultimately leading to competence in handling a barbell, at their own level.

I believe that athletes should be introduced to light bounding and other forms of plyometric work early in their careers, especially when young. I find that those throwers who come to bounding late in their development are seldom free from bounding induced injuries.

Sprinting over short distances, from both rolling and standing starts, is also important.

b) For the next tier (whether it is called advanced or top) I see a gradual increase in tonnage as being important in setting the appropriate strength base, coupled with an improvement in the ability to lift well at maximum individual loads.

For this category I consider a parallel advancement of short sprints and plyometric work as being important, remembering that, to be plyometric, an activity must involve yielding, or forced pre-stretch, before the expression of force.

In my opinion, medicine ball throwing is not plyometric, unless the ball is caught and thrown, having first been thrown hard at the performer.

c) I believe that top level athletes should concentrate almost entirely upon the type of strength training I recommend in question 2.

SEDYKH:

Throws training includes as large a number as possible of varied exercises. This mainly entails throwing the basic implement (discus, javelin, shot), a variety of jumps, runs, weights, and classical barbell exercises.

a) For beginners, any suggested work may bring a positive result. Therefore, I believe that young throwers should follow a most varied programme of exercise, especially with a view to raising the overall level of training of the muscular

system. But I would still give priority to throws and exercises for developing speed and co-ordination.

b) Next, we need to emphasize the development of special strength. Special strength training forms the basis for the development of correct technique. This sort of training takes more time and is much more complex than training to develop maximum strength.

c) Top athletes need to progress to a more narrow specialization in the use of the various training means. Naturally, this will include special work with different weights and auxiliary exercises with and without weights, but not in such a wide variety as for beginners and less experienced athletes.

#### **4 What tests would you recommend for the monitoring of speed development in the throws?**

ARBEIT:

In special sprint training there are no tests. The athlete is given a velocity curve which forces him to run faster every week.

However, maximal pedaling rate is tested both on an unloaded bicycle ergometer and additionally at three load stages: 150W, 300W, 400W for men, and 100W, 200W and 300W for women. In addition, the athletes' jumping performance is tested (three hops, five hops, Abalakov test) and they also perform overhead shot throwing tests.

BORGSTROM:

I recommend the use of jumping and throwing tests. Leg work is, in all throwing events, of great importance - that is why I place a lot of importance on tests of jump strength / speed, especially drop jumps, which provide a criterion of contact time / jump height and drop height.

For the throwing tests, I prefer execution with a technique which is very close to the competition technique. This means that you use both normal competition weight and also (slightly) underweight and overweight equipment. By measuring the  $v_o$  (velocity of release) it is possible to estimate the power that is developed during the throw. This also gives you a hint of what "weight training" should be most efficient for the individual thrower.

JOHNSON:

Maximum snatch, clean and jerk, squat, bench press and bent arm pullover have some relevance, depending upon the event.

Also useful are:

- 30 meters sprint from a standing start (but not hand timed).
- Standing long jump or vertical jump, although I prefer the former because it is easier to administer and can be used anywhere, if it is done ground to ground.
- Overhead shot throw, made from the ground and not the stop-board, so that it can be carried out anywhere. I have some reservations about its validity as a reliable test, because of the way in which the skill factor influences the outcome, but I am aware of no other commonly used, simple test.

I am not comfortable with the often used 3 bunny hops or standing triple jump, because of the intrusion of the skill factor.

I believe that the Bosco Ergo jump mat offers more objective measurement opportunities, but not everyone has the means to acquire one.

The most relevant test remains the competitive performance itself.

SEDYKH:

It is impossible to describe one single test which will provide full information of a throwers speed qualities. Most important is the purely visual perception of the coach while the athlete performs the basic movement. Of only secondary importance are jumping and sprinting tests, since, unfortunately, these contribute only about 20-25% of the real assessment of the speed qualities of any athlete.

### **5 Do you believe that throwing with lighter weights than regulation implements is an effective way of developing speed for the throws?**

ARBEIT:

Light implements serve two functions:

- technique training at the beginning of the training year, when the athletes' physical performance prerequisites are still limited;
- the achievement of higher velocities than are possible with the competition implement.

It is uncertain whether the velocities realized when using the lighter throwing implements can be automatically transferred to the competition implement.

However, there is a positive psychological effect because the athlete throws the light throwing implement significantly further than the competition implement.

BORGSTOM:

I favor a combination of underweight, competition and overweight implements. The ratio is individual from thrower to thrower and, I suppose, also differs from event to event. The key point is to find this individual ratio! It is often said that the purpose of underweight throwing is to develop special speed, while overweight throwing aims to develop special strength, but I think that this is a much more complex matter and that it is extremely important to have variations, regardless of whether the aim is special speed or special strength. In any case, is there really a great difference between special speed and special strength?

JOHNSON:

In my opinion, the use of lighter implements in training influences skill and speed and thus develops the ability to use speed more effectively. The development of power (force expressed at speed), which most of these questions have addressed, I look upon as a physiological phenomenon rather than a technical one.

SEDYKH:

I regard one of the main methods for developing speed to be the throwing of lighter weights. Naturally, this should be combined with throwing the regulation implements (javelin, discus, shot), but, at this moment, this is the most effective means of developing speed, for athletes of all levels.