**NSA ROUND TABLE**

**DISCUS**

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1. **What importance do you attach to the development of special throwing strength for the discus event?**

Abdelmalek:

Special throwing strength is a vital component in the training of throwers, so much so that all other types of strength training should converge towards the optimization of specific strength. Numerous studies show that specificity is essential in the development of strength. The gain in strength is due partly to inter-muscular co-ordination, which is specific to the movements required for the event.

The development of this kind of strength should be combined with exercises which mirror the specific technique of the event. These can be divided into three categories:
1. What importance do you attach to the development of special throwing strength for the discus event?

a) Throws from different positions and with implements of different weights.

b) Strengthening exercises for the muscle groups specifically concerned with the discus throw:
   - a varied range of exercises
   - varied weights used in all phases of the throw and for all implicated joints and muscles.

c) Different forms of weight training with barbells.

ANDERSON:

I implement Special Throwing/Strength for the discus in the autumn: October, November and December. This is the strength phase of our year long plan. The women use a 1.3kg discus while performing a power throw. The men have utilized a 3kg ball for the same exercise. The athletes perform 50% of power throws with heavier implement in October, 25% in November and 25% in December.

BÖTTCHER:

In my opinion the main means of improving performance in the discus throw is the use of special strength exercises, as a link between maximum strength and performance with the different implements. Special strength exercises should be used for the methodical development of the main muscle groups directly involved in the event.

GAMBETTA:

The rotary actions of the discus, as well as the balance necessary to come out of the back of the circle and achieve a sound consistent power position, demand a high level of special strength. Strength must be developed in the transverse plane in order to be applied to the rotational aspects of the throw. Due to the importance of the periods of single support, unilateral leg strength assumes a high level of importance.

JONES:

There appears to be two schools of thought regarding strength work. The first school believes that an athlete becomes strong by training generally on conventional weights, whilst the second school advocates event specific exercises, such as mirroring the event's movements correctly, in order to create strength that is very specific. Perhaps the answer is somewhere between the two, with the discus thrower performing exercises such as back squat, power clean and bench press, in order to build general strength, and also performing special strength exercises such as weight throwing and heavy implement throwing. I think the division of strength training between the two types of strength will change as the athlete becomes older, with the elite performer devoting much more of his time to special strength exercises.
1. What importance do you attach to the development of special throwing strength for the discus event?

PAISH:
Strength is very important. However, it has to be 'specific', otherwise all of the world's strong men would be discus throwers. The development of strength is about the most important aspect of training that the throws' coach has to consider. The emphasis must also be on development, since strength is not a quality which can be developed overnight, and certainly not with younger people, since it is hormone related.

TANCREDD:
In my view, the development of special/throwing strength for the discus event is of the utmost importance. Not only does it imitate the general movement pattern of the throw, which includes balance, co-ordination and timing, but it can also enhance technique. It also creates training variety and interest for the discus thrower. Most useful exercises for this development include dumb-bells, medicine ball exercises (putting, throwing, turning throws), exercises with different weighted shots, jumps and technique-related exercises. It is also worthwhile, in my view, to include this type of training for young discus throwers.

TAYLOR:
I place great emphasis on the development of special/throwing strength, which can be developed in an athlete only after the establishment of a sound basic technique that will enable the athlete to throw a long way. The true test of a sound technique is the ability of the athlete to maintain it, while performing under pressure.

Special strength training should be introduced only after the athlete has finished growing and has been able to establish a level of basic strength through weight training. It forms the vital link in developing the athletes' ability to transfer strength gained through conventional strength training methods into the throwing action and thus increase the power to enable them to throw greater distances.

WIRTH:
The discus, like other throwing events, requires a great deal of strength and power. These components must be developed in a planned progression, from general strength activities for the beginners to more event specific exercises for the advanced athletes. I believe that beginners and developing athletes need to limit their use of special exercises, in order to develop a good general strength base. From a solid base the athlete can develop into an elite performer, when event specific throwing exercises can be properly utilized. For elite athletes the inclusion of these exercises into their programme is crucial.
2. What means and methods do you use, in strength training, for the development of the basic abilities and how do you refine these basic abilities during the competition period?

ABDELMALEK:
There are many different types of strength, each requiring different means and methods for its development. Space is too limited for a full answer to this question. However, as a brief résumé, I would like to mention a few basic principles.

The course of the training towards the competition period should be very gradual and progressive. It should proceed from a foundation of varied and many-sided general work, using all possible means, such as body weight, medicine balls, jumps and barbell, towards work and means which become more and more specific - all this, with scrupulous attention paid to the principle of intensity/volume and their effective combination according to the relevant period.

Regarding the competition period, the sole objective should be to maintain good form and always arrive at the competition fresh.

ANDERSON:
We utilize the core lifts of power clean and power snatch, squats, bench and inclines. Specifically, in the weight-room, the exercise ‘dumbbell fly’ is used. The athletes have a very slight bend at the elbow while performing this exercise. During the competition period the basic abilities are refined as the athletes throw with lower volumes and higher intensities.

BÖTTCHER:
The essential prerequisite for an intensive use of special strength exercises is the creation of a foundation of general strength. Here, the main focus is on the development of the abdominal, oblique abdominal and back muscles and on the stabilisation of the muscles of the shoulder girdle.

Maximum strength, as a function of any new level of speed-strength performance, is a fundamental part of the all-year-round training of throwers.

General strength exercises (abdominal and back muscles) are carried out all year round. Their main purpose is for the prevention of injury.

The competition period should provide no exception. However, the intensity of the maximum strength exercises should be increased considerably and continuous efforts should be made to reach new personal best performances (e.g. in the snatch).

JONES:
To develop basic strength, I would follow the conventional lifting regime of commencing winter work with high repetitions, which gradually reduce in quantity as summer approaches:

Oct/Nov: Conditioning – high repetitions (8-15) simple sets –
2. What means and methods do you use, in strength training, for the development of the basic abilities and how do you refine these basic abilities during the competition period?

many exercises – circuits to be included. Aim – ‘getting fit to train’.

Dec/Jan/Feb: Basic strength – medium repetitions (6-7) simple sets – basic exercises. Aim – to increase the cross sectional size of the muscles involved.

Mar/Apr/May: Peak strength – pyramid system of repetitions (5-1) – power exercises. Aim to increase strength by muscle recruitment methods.

Competitive Season: A mixture of low volume conventional weights, moved dynamically, and other sessions, in which exercises are combined, so that a set of plyometric exercises immediately follows a set of conventional weight exercises; eg.

Squat: 3x5 reps (fast)
Hurdle jumps: 3x5 hurdles at 90cm.

McGILL:

This question would elicit many different answers from coaches. Let me relate a story about Glenn Passey, a terrific discus thrower, who was smaller in stature than most. Glenn threw nearly 60 metres in the mid-60’s, at a bodyweight of 185 lbs (84kg). I asked him what he did for general training and he replied that he baled hay during the summer before school started. He did not like to lift weights! Anyone who has ever baled hay with a pitchfork knows how hard that work is. My next question was, ‘How did you train specific strength, since it is obvious you got in shape from hay baling?’ His answer was amazing. His father asked him to clear fields of rocks, so Glenn would walk the fields and throw the stones off the field, using a discus motion! The moral of this story provides this answer to the question; use what facilities and equipment you have, to provide general strength training. Generally, throwers will benefit from throwing heavier implements earlier on, and perhaps some lighter ones close to the competition period. Work from heavier, slower, less specific movements to lighter, faster, more specific ones.

PAISH:

There are three quite distinct areas of strength which the thrower has to address. They are: a) Gross strength, b) Specific strength related to elastic strength and power and c) strength endurance.

a) Gross strength: This can be developed only by systematic weight training, making full use of the variations in the ‘systems’ and the extent and intensity of loading. The foundation has to be set in the winter, with less emphasis placed on strength as the season approaches. However, the mature athlete must keep the gross strength component stimulated all the year round, since it
2. What means and methods do you use, in strength training, for the development of the basic abilities and how do you refine these basic abilities during the competition period?

is this quality which regresses the most quickly but responds more quickly to stimulation.

b) Specific strength: Again this has to be examined carefully, since there are several systems which have to be stimulated. Since it is impossible to throw a long way while suspended in the air, one must pay the same attention to the legs as to the other body parts.

- Specific strength using weight training exercises which have a nervous pathway similar to that of the event itself: exercises like bench ‘flies’, trunk twists with weights etc.
- Simulation movements using a pulley, resistance pulleys, elastics and weighted balls.
- Muscle group isolation skill drills, using weighted balls etc. i.e. drills to isolate back leg, front leg etc. while performing a throwing movement.
- Plyometric activities using both the upper body, trunk and legs. This will involve bounding, rebounding and medicine ball work.

c) Strength endurance through body circuit training and high repetition weights. I rate this aspect of the work as the most important in the all-round development of a thrower.

TANCREDA:

Muscular power can be improved by means of progressive and appropriate weight training, first of all developing strength endurance and then maximum explosive strength. To improve explosive leg strength, I would use multiple jumps for distance and height, depth jumps and plyometrics. For upper body strength, I would use multi-throws, with lighter and heavier objects. It is important to bear in mind that strength should be developed over a very long, carefully planned period. With the young thrower, competent lifting technique should be taught from an early stage.

As far as trained muscles and well-developed strength capacities are concerned, I can assure everyone that both disappear more quickly than the time required for their development.

When the competitive season begins, I am more interested in the maintenance of the developed strength. The philosophy here will depend upon the level of the athlete and the importance of the forthcoming competitions. The basic maintenance programme is one characterized by low volume, high intensity and high load. Sets of from 2-5 repetitions, athletic lifts, selected exercises or high-repetition, low-resistance type exercises in critical areas, with an emphasis on flexibility, are a feature of the maintenance programme.

Finally, I might add that technique-related exercises, although not with the same intensity, would also be employed during the competition period.
2. What means and methods do you use, in strength training, for the development of the basic abilities and how do you refine these basic abilities during the competition period?

TAYLOR:
I have found that the following principles need to be followed:

1. Athletes need to learn the basic techniques of general weight lifting exercises, so that they can develop a correct technique, while gradually increasing their strength levels. In some cases, this should take from 6 to 12 months.

2. Once a basic lifting technique and strength level have been established, a general increase in strength level can be pursued.

3. I use mainly free weights, with some machines as assistance exercises. It is important that athletes learn the Olympic lifts to develop over-all strength.

An important consideration, in the development of strength, is that, once strength training has been introduced into the athletes' programmes, they have to be able to cope with the extra training loads and sessions. This can add 2-3 extra sessions per week to their training.

I believe that strength training should be a long term consideration and that it should keep pace with the athlete's development.

During the competition period, I always try to maintain strength levels, while increasing the athlete's ability to move faster and transfer this strength into the movements of the event.

WIRTH:
Strength training has many aspects, such as the general strength training of body building, the explosive power development involved in Olympic weight lifting, the use of various jumps (depth, reaction, etc.), medicine balls and sprinting activities. These activities, used in combination, help develop the basic abilities needed for throwing.

The competition period requires the athlete to feel powerful and fast; therefore a reduction in the volume of strength training is advised, with a corresponding increase in speed activities such as jumps, sprints and throws with lighter implements. This period must be monitored carefully, for strength levels must be maintained without unduly fatiguing the athlete. The prime objective is to have the athlete ready to throw.

3. What do you think is the most favourable age for learning the technique of discus throwing?

ABDELMALEK:
While discussions still continue as to the most favourable age for the learning and development of this or that technical aptitude, more and more use is being made of the research findings of physiologists and psychologists. In fact, they tell us that the essential base for the development of neuromuscular co-ordination is established towards the end of the age of 12. At this age, the child will have reached almost 90% of the basic ability
3. What do you think is the most favourable age for learning the technique of discus throwing?

acquired during his or her lifetime. The most favourable age, therefore, for acquiring patterns of movement comes before the advent of puberty. Psychologists also maintain that the greater the number of different patterns of movement assimilated during this period, the easier it will be to master a good, stable motor ability and technique later in life.

If, at the age of 12, one can make a start on general co-ordination, from the age of 13 to 16 more emphasis can be placed on the specific co-ordination and development of the technique already introduced.

ANDERSON:

Any age is favourable as long as they have the desire to do the required training to acquire flexibility, speed and strength relative to their body size and type.

BÖTTCHER:

I think that the best age for learning the technique of the discus throw is 13 years. The whole method should be used right from the start. This means that the main focus should be on the turn.

JONES:

If we accept that the ‘Golden Age of Skill learning’ is the 8-13 years old period, then an introduction to throwing would be beneficial during this period. This perhaps should be of a general nature within a multi-event approach to the sport. Conversion to discus is best taught in the 13-15 age range but only if competently coached. Good coaches are essential, since faults can easily be ingrained at this tender age and be a companion for life!

McGILL:

I want to be radical in this area. The revelation of Igor Nikulin’s development from the age 8 to 20 in the hammer changed my feelings on this. There is nothing wrong with children throwing a light discus, or some sort of ball, with discus technique. In fact, if the discus is to get going again in the US, as it was in the Wilkins/Powell era, we need to rethink this question.

Youth soccer is very well organized for kids as young as 6 and I believe the creative youth track and field coach must counteract this ‘invasion’ from soccer with drills to teach 6-8 year olds the basic discus movements. There is nothing wrong with having fun spinning around with a safe implement! Track has been too afraid of starting kids too young. There is too much of this Movement Science being applied, which creates a fear among coaches. We are not suggesting 100 throws/workouts!! If we do not expand the concept of youth track and field, we will fail to interest the next generation in field events. I react strongly to this ‘most favourable age’ concept, as it will give people the idea
3. What do you think is the most favourable age for learning the technique of discus throwing?

We cannot introduce the discus to anyone under 14. Having seen youth javelin in Finland, I can tell all coaches: you've seen how well Finland has done in the javelin and they start young. Do this in the discus, and in future years, you'll see a payoff.

PAISH:

If you are making reference to the discus event, as an adult would know it, then I suggest about 12 years old. However, if you are considering the basic rotational skills involved in using a hinged moment principle, then I have done a lot of this work with 8 year olds. The younger the better, as I know that they can pick up the rotational component starting from the feet. However, it should not be with a discus in the hand. A rubber quoit is excellent.

TANCREED:

I think it safe and worthwhile to introduce/learn the technique of discus throwing at 13 years of age. Certainly the foundation for throwing can be introduced earlier, using, for example, rubber quoits but the actual technique should be brought in at around 13 years of age. It is an event which requires a long period of time to develop the necessary skills and, at the same time, maintain good joint mobility and suppleness.

TAYLOR:

12 to 14 years of age is quite suitable for both boys and girls. I am always quite fascinated by the phenomenon whereby 14 to 15-year-old boys, with only natural levels of strength, are able to develop an excellent technique and throw distances in excess of 60 metres with the 1kg discus.

Young athletes are able to develop a sound basic discus technique at an early age, as young as 10-12. Although girls mature earlier than boys, their early lack of natural strength does not allow them to throw similar distances as those achieved by boys of the same age. I also think that basically the same technique can be taught, at the beginning, to both girls and boys.

However, I believe that the discus event can be successfully introduced to athletes of an older age, as some individuals, especially very tall ones, do not finish growing until they are 17-18 years old.

WIRTH:

I base my answer to this question solely on my own personal experiences. Having taught students in my physical education classes, I have found the most successful years, in terms of learning the technique, to be 12-13 years of age. The eagerness of the students to learn a rotary activity is quite remarkable, as is their ability to grasp the basics of the technique. I have also found that
students who have an earlier exposure to spatial awareness activities such as gymnastics and figure skating, especially with jumps and turns, seem to have a marked edge in the early development of technique.

4. What are the fundamental differences between the training methods you would use for beginners and those you would use for advanced athletes?

ABDELMALEK:

With young people, the main concern should be to ensure a good technique while carrying out exercises for the development of strength. The most important considerations, at this stage, are safety measures and the exigencies of biological growth. Thus, all types of weight training should be avoided for young people between the age of 12 to 16. It is true that strength is needed to optimize performance but it is wiser to rely solely on the development of the technical movements. The aim, in all the throws, is to give speed to the implement and this is common to both beginner and élite. Moreover, this is an ability that one can work at from a young age; only the means and methods differ. The training of young people should be many-sided and directed towards different events in an enjoyable, play-like form, with exercises using the body weight for strengthening, sprints, hurdles, jumps and co-ordination activities. This principle of diversity for the effective development of the essential inter and intramuscular co-ordination will prove indispensable for the development of speed. For the advanced athletes, training becomes more and more specific, rigorous and more progressive in regard to the training loads and methods.

ANDERSON:

Beginners aspiring to throw the discus need to maintain a general training routine for a year. Cycling of the various means of training: running, jumping, sprinting, lifting and throwing would progress slowly, changing the volumes and intensity throughout the year. Supplemental training such as swimming for bilateral co-ordination, basketball and volleyball for general training of aerobic, anaerobic capacity and elastic strength are maintained throughout the year. As the individual matures, the supplemental training is used during the active rest phase. General preparation, pre-competition, and competition phases become very specific, based on the individual’s capacity to train at various volumes and intensities. More specifically, the general preparation phase for a beginner might last 6 months, while the elite athlete’s general preparation may last 4-8 weeks.

BÖTTLCHER:

There are great differences between the training of beginners and that of top athletes, primarily in regard to the use of special strength exercises and the intensity of maximum strength
4. What are the fundamental differences between the training methods you would use for beginners and those you would use for advanced athletes?

exercises. The use of different weighted implements must be suited to each athlete’s level of physical performance. The basic rhythm and the temporal-dynamic structure must be maintained. It is essential that the fundamental training methods and the sequence of the training means, both in the long-term build-up and in a double periodisation programme, are very carefully planned, right from the training of the beginner up to that of the top-level athlete. However, the emphasis will vary according to the different phases of development.

GAMBETTA:

For the beginner, the emphasis must be on the establishment of a sound technical model and basic conditioning. At the beginning stages, emphasis should be placed on a rich repertoire of movement skills. At advanced level, it should be placed on specific, advanced conditioning and refinement of an advanced technical model.

JONES:

Since beginners have only limited time available, I would tend to keep the technical elements very simple, concentrating upon ‘the basics’. I would also stress the need for all round conditioning at this stage, since it is of paramount importance for future development and injury prevention.

The advanced thrower works on a much more multi-unit approach, since there is much more time available and the needs for improvement depend upon the fine tuning of many aspects of the discipline.

PAISH:

With young athletes I place the emphasis upon skill and enjoyment. I like to encourage young athletes to become compulsive throwers and I would encourage them to throw objects of all shapes and dimensions. The novice must concentrate upon Skill and Speed. As one progresses through the age/ability spectrum, then one balances the equation of Work and Impulse, i.e. force and distance/time. This involves the qualities of strength, flexibility, speed and power.

TANCRED:

For the beginner, emphasis should be placed upon technique improvement, conditioning activities and strength training. Most certainly, from a coach’s point of view, the planning of training tasks, the establishment of technique fundamentals and the description of applied methods must be made on a gradual progression basis within a ‘fun and enjoyment’ atmosphere. The duration and intensity of training should be much less than those for the advanced discus thrower. Furthermore, the throwing volume is also less.
As for the advanced athlete, similar methods of training are also used but the volume and duration are that much greater. At this stage, the back-up of the sports sciences is also included (e.g., mental preparation), including the achievement of optimum performance (peaking) in competition. The advanced athlete must be involved in higher level training to include sound technique, strength, conditioning, co-ordination and speed.

I might add, at this stage, that both groups would be exposed to training which develops all-round physical abilities and helps to make them 'look like athletes'.

**TAYLOR:**

Beginners must progress through the development of a sound basic discus technique. I find that most athletes, when first introduced to the discus throw, are not balanced and not very well co-ordinated. Turning within a circle and then throwing an implement is something new to them. The following is an outline of the methods I use for beginners:

- The development of a basic technique to enable the athlete to complete a standing throw, a half turn and finally a full turn and then progress to a high level.
- Physical development, generally in terms of general conditioning (the development of strength is not the main requirement at the beginner stage).
- Precedence given, in the training programme, to the development of athletic ability.

The training methods used for advanced athletes are very different from those used for the beginner. In a structured training year, the advanced athlete will work through a much greater range of activities, the main difference being in the levels of the training loads and the number of sessions. The following principles apply:

- The development of technique must continue to the highest level.
- Strength training should become a major ongoing part of the programme; a long term plan of strength development needs to be implemented.
- More specific training can be introduced, depending on the age and maturity of the athlete.
- Special strength plyometrics, a periodized training year and a greater number of competitions should be used to advance the development of the athlete.

**WIRTH:**

The training of beginners depends on their age and their previous activity level. I would test the athletes to get an indication of their basic levels of strength, power, and fitness. Following this testing, a training programme would be designed, to assist the
4. What are the fundamental differences between the training methods you would use for beginners and those you would use for advanced athletes?

athletes to improve their general cardio-vascular activities and a weight-lifting programme would be introduced, if the athlete is developed enough to undertake such a programme. Generally, there are two basic programmes. One programme consists of body-building type exercises and the second includes a variety of lifts, leading into Olympic lifting.

The more advanced athletes, who have been training with me for 3-4 years, generally do Olympic type lifting, cleans, snatches, squats, and then a press. I feel that the strength base, once established, can be maintained sufficiently with these lifts. When they are used in conjunction with speed, drills, jumps, medicine ball and event specific exercises, the athlete can develop to a very high level of performance.

5. What importance do you attach to the preliminary movements and entry into the turn in the discus event?

ABDELMALEK:

a) The preliminary movements:
   - Set in motion the system athlete/implement.
   - Create torsion between the upper body and hips.
   - Produce relaxation in the articulo-muscular system of arm and shoulder.
   - Help psychological concentration.

b) The entry into the turn:
   - Sets up a twist of the hips.
   - Shifts the body weight on to the pivoting foot.

ANDERSON:

We emphasize the preliminary movement to ensure that the shift to the left or towards the balance position is consistently achieved. Once the balance position is consistent, the first turn of the spin can be mastered. Relaxed upper body, and synchronized left side (shoulder, hip, and knee) will ensure the proper sequence of the first turn.

BÖTTCHER:

In my view, the start of the turn is the most important phase of the whole discus movement. Most faults in technique, especially in the delivery, have their origin in the introduction to the turn.

The initiation of the turn with a clear shift of the weight to the left leg (righthanded thrower), while keeping the left shoulder back, must be the central aspect of the athlete’s technique training.

JONES:

More time is spent coaching the event at the back of the circle than at the side or front. A minor error in the entry phase of the turn will be magnified by later movements and will dramatically
5. What importance do you attach to the preliminary movements and entry into the turn in the discus event?

affect the distance thrown. The discus thrower must always give time to balance, position and optimum speed at the rear of the circle, since this is so critical to the full movement. One can only supply power from a balanced, rangy power position in the centre of the circle and this position is decided ‘on entry’ at the rear of the circle.

McGILL:
In a previous article, ‘Speed Discus’, I made some points which did not sit well with a few discus throwers I met. The main problem was this question of preliminary movements. After years of studying younger discus throwers, I felt too many were copying the older, much larger throwers like Mac Wilkins, Wolfgang Schmidt, etc. Edmund Piatkowski and Glenn Passey were small throwers, who used a more dynamic start than was seen in the mid 70’s. If the thrower can manage, with balance, a more dynamic start, it is my opinion, that the block will be more powerful at the end. Slow and wide does not necessarily translate into the great acceleration, which is hopefully the goal. If you go out of control, as some do, of course this is an error. I would urge readers to read the original article by Jesus Dapena in Track Technique, ‘New Insights on Discus Throwing’ and the exchange between Dapena and Jan Vrabel in issue No 129. It is clear from Dapena’s study that there is more to be gained by being more dynamic at the start, as long as the rest of the throw is executed with precision.

PAISH:
The entry to the turn is of prime importance. Balance at the back of the circle is essential, if one is going to be controlled, and thus efficient, at any later stage. It takes a lot of confidence, skill and ability to go far enough over the supporting leg for the free leg, which produces the rotational component, to leave the ground naturally.

TANCRED:
This aspect is of crucial importance. If performed badly, such as not being balanced on entry, then the final throwing position will not be powerful. The preliminary movement and entry, to my mind, ‘make’ the good throw. Throwers who disregard this important aspect, do so at their loss or peril!

TAYLOR:
I think that the preliminary movements in the discus throw are very important; they have a great influence on the athletes’ ability to get their bodies into a relaxed, strong entry position. It is essential for the athletes to develop full control of their preliminary movements. In the development stage, most discus throwers try to execute their preliminary movements too quickly and try
5. What importance do you attach to the preliminary movements and entry into the turn in the discus event?

To gain momentum from a fast upper body movement. A too fast preliminary movement creates major technical problems, such as overdoing the turn from the back of the circle and an unbalanced drive towards the centre.

Over the years, the best tip that I have picked up for controlling the preliminary movements is that the athletes should move their bodies only as fast as to allow their eyes to stay focused on the horizon.

WIRTH:

The entry is the most critical aspect of the entire throw. The dynamic balance position which is developed during the entry must be controlled yet powerful and must, above all, enhance the final throwing position. Without a solid entry, the throw will surely be less than optimal.

6. More and more top athletes seem to use special and very individual strength training apparatus. What alternatives do you see for young athletes and for the transition from build-up to top level training?

ABDELMALEK:

What counts in training is not so much the apparatus used but rather the technical action or the motor ability that enables the apparatus to be used without fear of accident.

Once the technique is mastered it becomes possible to regulate the loads with all sorts of apparatus capable of developing strength. Young athletes should be given a meticulous demonstration and explanation of the basic techniques concerned with the use of levers and also shown how to exploit to the maximum the levers called into use in the strengthening work.

It is true that the new types of apparatus open the door to a wide range of exercises and facilitate the employment of different ‘angles of attack’ ...but, for young athletes, progress must be very gradual and well controlled.

ANDERSON:

For the development of strength, young athletes need to utilize their body weight, with exercises such as bounding on flat ground and up stairs. Gymnastics may be used to learn body awareness and develop joint strength, during the transition from build up to top level training. The use of Olympic lifts, medicine balls, bounding and sprints will also assist in the transition.

BÖTTLCHER:

For young top-level athletes, I see the following alternatives in training with special strength training apparatus:

- Back lying on a bench: lateral raise with one or both arms (butterfly);
- Standing throw position: the athlete turns back as far as possible with extended throwing arm and takes a barbell
6. More and more top athletes seem to use special and very individual strength training apparatus. What alternatives do you see for young athletes and for the transition from build-up to top level training?

disc from a box; he then performs the throwing movement as explosively as possible;
- Performing a turn with additional loads and with a significantly reduced turning velocity (barbell or weight vest);
- Double handed throw of medicine or sling balls from a standing position;
- Stabilisation and development of the trunk muscles, in order to improve the ability to create tension and also to assist in avoiding injuries.

GAMBETTA:
I guess it depends upon what you mean by strength training apparatus. Medicine balls and dumb-bells are two that come to mind that are appropriate for either the beginner or advanced athlete. They are ideal for the transition from build-up to top level training. All that has to be done is to adjust the size of the medicine ball or the weight of the dumb-bell to the stage of physical development of the athlete.

JONES:
I am not sure that there is a need to design strength apparatus for the discus. In the sports school in Halle, near Leipzig, there is a machine, which mirrors the path of the discus and a heavy weight is pulled along that path. I see a problem in using weights far above the discus weight, in that it will upset the correct muscular action and develop certain muscles, which will dominate the movement of the discus. We can duplicate the movements of the discus by throwing heavy implements, so why is there a need to design specific equipment?

PAISH:
I believe that one can produce the correct levels of specific strength without having to resort to very sophisticated machinery. The newer machines are merely part of a manufacturer’s efforts to exploit a market. I know that I can produce the levels of specific strength necessary to throw world-class distances, with bar-bells, pulleys, resistance pulleys and weighted balls.

TANCRED:
I think special strength and very individual strength training apparatus is also beneficial for young athletes. Activities such as gymnastics, the use of rubber tubing, medicine balls, weight throws and special weight exercises can be employed, which will help in the transition from build-up to top level training. Bounding, carefully monitored, can also be of benefit, as can also discus throwing movements, using implements such as weighted quoits or light shots. Partner work can also be used to ‘work out’ the arms, shoulders, trunk and legs, preferably in that order. I would also include circuit training with weights.
6. More and more top athletes seem to use special and very individual strength training apparatus. What alternatives do you see for young athletes and for the transition from build-up to top level training?

The strength development of young athletes should be based on the established principles of basic training, aimed at a many-sided technical and physical development. It is also a mistake to assume that the only means for strength development are the bar-bell and dumb-bell. The principles of ‘overload’ can operate in a variety of activities.

TAYLOR:

Because the discus is such a dynamic event, it is important that young throwers learn how to use weight training as a foundation for their future development. The development of strength in young throwers begins with learning how to lift free weights with a dynamic movement. Olympic lifts, such as the snatch and the clean and jerk, form an important learning path for the young athlete. In my experience, most top discus throwers still use fairly conventional weight training methods and only use machines for some specific areas that may need special attention.

I foresee that, in the future, young athletes will still use conventional methods of strength training, both for the development of maximum strength and of most areas of specific strength. Once they are able to undertake a structured strength programme, a long term approach to strength gain must be used.

WIRTH:

I am not sure what is meant by the term individual strength training apparatus. I individualize my training programme based on each athletes’ needs. In so doing, we must utilize the equipment that is available or perhaps make or modify the equipment. This is perhaps what is meant by the question. As for young athletes and their transition to top level training, I believe this takes a number of years of basic training; with some athletes 3-4 years are sufficient and in other cases longer. I believe it must be a gradual transition, changing training variables and measuring the athletes’ response. The results of the changes must be positive, or at least appear to be, in terms of performance or test results.

ABDELMALEK:

For the development of specific throwing strength, which has, as its goal, the optimization of intra and inter-muscular co-ordination, it is necessary to vary the weight of the implements used in training, as follows:

- heavier
- the competition weight
- lighter.

The different weights should be chosen carefully, in order to
7. For the development of special throwing strength, various implements (shots, sticks, rings, disks etc) are used in training. What weights and types of implements would you recommend?

- the technical action
- rhythm-speed
- explosive strength.

Of course, in respect to these objectives, use can be made of two types of implement:

1. The competition implement; discuses of different weights.
2. Varied implements: lighter or heavier (weighted balls, sticks, rods, quoits etc.)

ANDERSON:

I would recommend; balls (Men 3.0kg; Women 1.5kg), sticks of various lengths and disks. Traffic cones or bowling pins (1.5kg) are lighter for the men and yet create a resistance different from that of a discus. For women, they create strength and provide a variable resistance.

BÖTTCHER:

In special throwing training, implements of varied weights are used. It is important that the implements should be carefully selected to match the stage of training and the development of performance.

In the training of top-level athletes, the following implements are used:

- competition implement (1kg): standing throw and turn;
- heavy discus (1.5kg): standing throw and turn;
- heavy discus (1.2kg): standing throw and turn (during the competition period);
- ball throws (2kg): standing throw;
- ball throws (1.5kg): turn;
- imitation throws with sling balls (1kg and 1.5kg) standing throw and turn (centre of mass outside the throwing hand, increase of radius);
- stick throws (2kg, 35cm long) for the development of special throwing strength were cancelled, as there were different opinions concerning the prime movers of the lower extremities – it was considered that the preliminary action of the right side (sequence starting with the movement of the foot, then the knee and then the hip) was missing.

JONES:

One has to be very careful when using over or under weight throwing implements. Using the full technique (full turn and throw), it is perhaps inadvisable to throw with more than 10% above the competition weight, since throwing with any greater weight would necessitate a subtle change in technique, which would impair the over-all competition technique. For men, a discus weighting 2.2kg would be maximum. Heavier weights can be
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used from a standing position, with a limited range of movement. The same problem applies, to a lesser degree, to the use of lighter weights.

I would advocate using a heavy (2.2kg) discus in the winter preparation period, for specific strength gains. It is a mistake to increase the weight of the discus by loading the centre, since it will then leave the hand too early in the delivery. The weight should be built up inside the rim as well as in the centre to give correct balance.

A light discus (1.9kg) is ideal for competition preparation, particularly in the sessions leading to major competition, since the distances thrown will be those which are aimed at in the competition. If an athlete has a best of, say, 58m, it is important for him to feel the rhythm of 60m throwing, instead of being stuck in a 56-58m rhythm.

McGILL:

NSA is an international magazine. The answer to this question is frustrating. I have given clinics outside the US and found that javelin shoes, hammers, light javelins are virtually impossible to find, to mention a few items. In order to answer this for the world readership, I will simply say: use what you have and try to make what you don’t have. In the US and Europe, all sorts of weighted medicine balls and similar items are available. The answer to this question depends on age, sex, training age... so many variables.

Rather than a lengthy chart, let me keep this brief. Use weights heavier than normal to build specific strength; lighter weights for speed. Discus throwers should strive to find an adjustable weight discus. They are a godsend. If none is available, try to modify old damaged discuses. Unless the rim is totally destroyed, any discus can be used. If the plastic side plates are gone, make them of wood! I have seen throwers work out with short, heavy bars but this did not appeal to me. Medicine balls with handles are now around... great! Traffic cones can be very handy; they come in many sizes and can even be cut down to adjust. Tubes or old soccer balls filled with sand and taped... all can be used.

PAISH:

I use a whole variety of weighted implements, many of which I fabricate myself. I have various weighted implements ranging from 600 grams to 4 kilograms. I vary these, according to the specific qualities which I wish to develop at a specific time of the year.

TANCRED:

As long as the weight is not too heavy or clumsy, any type of implement would be advantageous. It depends where you are living and what facilities are available.
7. For the development of special throwing strength, various implements (shots, sticks, rings, disks etc) are used in training. What weights and types of implements would you recommend?

The types of implements I would recommend include: shots, disks, clubs, medicine balls, stone throwing, axe chopping, light dumbbells, sticks, quoits, hoops, sling ball – almost anything I could throw! The ability to improvise is very useful both to the coach and athlete.

**TAYLOR:**

I think that, when using various implements to develop special strength, it is very important to get the weight just right, not too heavy and not too light, especially when performing full throws. For example, for a senior male discus thrower a 3-4kg shot would be appropriate. This shot fits comfortably in the thrower’s hand, making it possible to maintain a good technique.

Heavier kettlebells (weights with handles attached) can be thrown by senior men from a standing position and good form can still be maintained. In using lighter discs, it is important to decrease the weight only by about 250g for the women’s discus and about 500g for the men’s. Sticks, discs, plates and quoits should also be only slightly lighter or heavier.

The main criterion is to use a weight that enables the athlete to maintain technique and, at the same time, allows the development of extra strength or extra speed.

**WIRTH:**

From the moment an athlete begins to train with me, I utilize a variety of implements, including hula hoops, traffic cones, wooden pins, metal bars, weighted balls and competitive shot put. I feel a variety of implements provides the athlete with a wide schema from which to develop the feel of the throw. These implements are lighter than the competition implement for several reasons, which include building the athlete’s confidence and helping to remove the stress of having to perform in practice.

I prefer to have the athlete concentrate on the feel and rhythm of the throw or movement rather than the distance achieved with the implement, especially in the early stages of development.

As the athlete becomes stronger and more accustomed to the throw, the implements would become heavier, forcing the body to adapt to the new level of intensity, thereby increasing the specific strength component. I generally do not use an implement more than twice the weight of the actual discus used in competition and even this weight would only be used for standing throws and tests.

I utilize a 1.25kg and an 80kg for the women and a 2.50kg and a 1.75 or 1.69kg discus for the men. I attempt to keep the number of throws balanced, in a 25% under, 25% over, and 50% competition weight ratio.
8. On an international level there is, apart from the further development of throwing strength, an emphasis on the further development of speed, especially in the delivery. This often leads to the feet leaving the ground just before the delivery. For what athletes would you recommend this sort of delivery and how would you coach it?

ABDELMALEK:
Loss of contact with the ground is common to many top class athletes (more often with men than with women) but, frankly, I would not recommend such a technique to any athlete, for I am convinced that it is contrary to biomechanical principles. Moreover, I do not believe that one has to accept everything that the elite athlete does, as a model for teaching young athletes. In any case, many top athletes, especially throwers, rely a great deal on their muscular mass and strength permitting them to scamp a few scientifically founded techniques.

ANDERSON:
I would recommend this delivery for anyone. I would not coach it as a separate entity. It happens as a result of the forces imparted by the legs, hips and torso through the point of release. I utilize the 'non-reverse' styles as a transitional way to throw. The athletes 'feel' the legs and hips working, which will enable them to duplicate the proper feelings at a slower pace. Once the speed of the legs and hips is optimal while staying on the ground, the athlete is instructed to create a drive from the legs and hips to achieve a more explosive delivery. This will eventually produce a higher release point and the feet will leave the ground. When done properly the front foot will leave the ground first.

BÖTTCHER:
In my opinion there are two aspects to be considered, when seeking to achieve a further improvement in the dynamics of the delivery:
1. For the beginner, the support delivery should be used. The athletes should take care that there is a clear sequence of the movements of the legs, hips, shoulder and arm. This type of delivery is also used by our male and female top-level athletes.
2. Small athletes, or sometimes very explosive athletes, prefer the jump delivery. However, athletes whose technique is not very stable often show faults in their action. Furthermore, there is often a lack of co-ordination of the partial impulses.

JONES:
Most women throw with fixed feet and most men with an active reverse. The reasons for this are simple:
The throwing circle is relatively larger for women and, therefore, their throwing base is wider, making an active reverse difficult to accomplish, unless they have great leg power. Owing to the confines of the circle, the larger men have relatively smaller throwing bases and their enormous explosive leg drive makes it difficult for them to stay in contact with the ground.
Biomechanically, it can be said to be inefficient to leave the ground before release but, since by far the greatest amount of
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force is applied in the early stages of the delivery, relatively little distance is lost. It is interesting to note that Jürgen Schult, set his world record throw of 74.08m using an active reverse but, in 1987, he decided to convert to a fixed feet delivery. The result was that he became very consistent in the 66-69m range and was the world leader during the late nineteen eighties. Schult sacrificed distance for consistency and, perhaps, Riedel has also decided upon this trade-off. In my opinion, male throwers are better suited to the active reverse type of throw. Due to the lightness of the implement, women throwers place greater emphasis upon a delivery with extensive range, a wide base and a long pull. Perhaps this is the best method for women but it really depends upon the individual athlete’s make-up.

I would recommend that all novice throwers use a fixed feet delivery, since this gives a stable, balanced throw. I find that, as the athletes’ power increases, they will naturally develop into either fixed feet or active reverse throwers. I firmly believe that the coach should not chose the method but that the athlete’s own physical capabilities will naturally choose the right way. It is wrong to coach only one technique, since who is to say which thrower has the best technique – Schult or Schmidt, Hellman or Wyludda. They all throw in a different way and they all throw a very long way.

McGILL:

Thanks for the question. This is one of those answers which challenges the beliefs of other coaches. I am ready for battle! Coaches, do you remember the 1983 biomechanics film of the Helsinki World Championships? In that film, Imrich Bugar won with a blocked, on the ground delivery and the analysis showed his discus accelerating right until the moment it left his hand. Do you recall the chart on Optiz? She won, although her discus decelerated the just before left her hand. Granted, not much distance was lost and she did win. There are some who believe this question to be merely academic.

I believe that most coaches do not teach leaving the ground but accept it later, as a result of good technique great leg strength. If a 25 year old male can squat 600lbs. (272kg) – and has a 36” jump reach (91.4cm) – who is to tell this athlete that he is making an error throwing 62 metres with his feet in the air? There is something to be gained by leaving the ground – a higher release height. My reasoning tells me that the slight amount, which appears to be lost by leaving the ground, is cancelled out, in most top throwers, by the simple gain in extra release height. It is tougher to get a good block but we have seen with Wilkins that a great block is possible. I do not agree, however, with one line in John Powell’s video. He characterizes the throw with a simple phrase, ‘Jump and throw’. This is not correct and has misled
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coaches. Much power has been generated by the thrower on the ground, prior to leaving contact; certainly, ‘Jump and throw’ does not give the proper instruction.

In conclusion: the thrower must first learn to throw with a good grounded, blocked position. The sharp coach must determine when the thrower leaves the ground as a result of great leg action or leaves the ground in a premature reverse, which is a major error. One might say there is a fine line between a great throw, and a clunker!!

PAISH:

For one to appreciate this correctly one must be fully conversant with the hinged moment principle, that of stopping one segment of the lever so that the distal segment can speed up. Hence, for the right handed thrower, the left foot must remain in contact with the ground until the shoulders are ‘square’ to the direction of throw.

At this stage the left shoulder must also be prevented from retreating behind the plane of the square position. Otherwise, it would have to get its acceleration at the expense of that of the right shoulder. However, once this position has been achieved, the left leg can no longer contribute to the speed created by the rotational component and it must, therefore, now contribute to the ‘lift’. This will mean that the left leg will leave the ground as a reaction to this lift.

However, the timing is very critical. There is no doubt in my mind that, for heavy male throwers, the front leg must leave the ground once the shoulders are square to the front. Through experience, I have found that the braced front leg technique contributes to injury of the lower back.

As far as coaching this aspect of the throw is concerned, initially I coach a braced front leg, then I ask the athletes to lift, since the shoulders are square. I find that throwing heavier ‘slinging tubes’ encourages the best timing.

TANCREED:

It is true that, at international level, there is now an emphasis on the further development of speed, especially in the delivery. This does indeed often make the feet leave the ground just before the delivery; hence it is sometimes termed ‘premature reverse’.

In contrast to the men, many female throwers stop the action of the hips and legs early, causing only small amounts of momentum to be transferred from the legs to the upper body. Thus, the women’s feet do not leave the ground prior to release and the majority of the power being supplied to the discus comes from the arm. It seems that the men transfer their momentum to the throw more effectively than the women, which may explain, in part, their greater throwing distances.
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The technique of the feet leaving the ground just before the delivery is best suited to the rotational thrower, who is lighter and faster.

The emphasis in coaching this technique is to aim for:
• near-vertical body position at release
• a high release height above shoulder level
• the body lifted into the air well before release.

Finally, the discus thrower should aim to run across the circle and perform the three mentioned actions together.

TAYLOR:
There are two types of thrower for whom I would recommend this type of delivery:
1) Very tall athletes who are unable to complete a strong (blocked) delivery, which could help generate greater leg speed and
2) Shorter, more dynamic throwers, who could utilize the extra height and speed this delivery would generate.

I would coach this type of delivery by encouraging the athlete to develop a more dynamic drive with both legs, initiating the extension of the legs in the delivery much earlier than with a more conventional technique. I would have to watch the athletes’ reaction to the delivery and, perhaps, introduce more specific leg exercises, to help accommodate them to the action.

WIRTH:
My current thinking on the ‘jump’ delivery is that it is best suited to a very powerful athlete, who can generate a lot of force into the delivery. I believe that this type of delivery is a natural extension of the strength and power possessed by some throwers. To coach this type of delivery, I concentrate on the blocking leg and its forceful extension up and slightly into the centre of the circle. This allows a powerful extension of both legs, as well as assisting in the recovery in ‘saving’ the throw, if necessary.