

PROBLEMS OF TECHNIQUE OF ADVANCED DISCUS THROWERS

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This article, originally published in "The Throws – Official Report of the European Athletic Coaches Association Congress, 1987" is an excellent overview of discus technique in the final phase of the throw and is a transcript taken from the author's presentation at the EACA congress, 1987. Re-printed with permission from the European Athletic Coaches Association.

I was very honored to have been asked to present the subject of discus technique to you. I am a great discus technique enthusiast but neither a scientist nor a specialist in biomechanics. I am a coach with a long experience in the field and from this point of view I will approach the subject. Since the early fifties, in other words, over thirty years, I have been trying to collect information and to compare the technique of different throwers and the experience of different coaches with my own ideas and principles of biomechanics.

In 1983 and 1984, I had a unique opportunity to analyze a great number of throws of the best European and world discus throwers: the participants of the 1982 European Championship in Athens and the 1983 World Championships in Helsinki. The analysis was made from film shots simultaneously taken from different angles using two or three high speed cameras, and in Helsinki using synchronized, phase-locked cameras. This analysis confirmed my previous opinion about the weak technique of many top-ranked discus throwers, especially men. Their technique is actually worse than the technique of the best, two or three decades ago. I also think that discus throwers technique is worse when compared with the technique of other throwing events.

Due to lack of time it is not possible to discuss the whole technique from the beginning to the end. Instead I will concentrate on the most important part of the movement, the final phase, that is, the movements that are performed after finishing the turn. This is the phase which plays the decisive role in giving the discus initial flight velocity and thus mainly determines the resulting distance of the throw. This is also the very phase where I see serious blunders by top-ranked throwers, and I had in mind this phase of the throwing action when I spoke about the bad technique of present discus throwers.

There is no doubt about the validity of the mechanical law that the initial velocity depends on the length of the path along which the force is applied, and on the magnitude of this force. Even allowing for different views on some technical questions I am sure we will agree, that best results can only be achieved by good balance and full utilization of the force available. The full utilization of the force

also means complete transfer of the kinetic energy into the discus, in other words, for the acceleration of the discus. The behavior or the movements of the discus thrower just after releasing the discus can tell the coach a lot about how successfully the kinetic energy was transferred into the discus and at what balance conditions it was done.

Let me try to find the causes as to why the techniques of the best discus throwers are so unsatisfactory.

1. Neglecting the technical part of practice in general. Not enough time and effort being given to technical training.
2. A low level of movement coordination ability which is naturally lower with really big boys and often neglected by one-sided, specialized practice or immense strength training.
3. Strength training using not only natural means of improving strength, and perhaps giving too much emphasis to general strength exercises with a technical bias.

All of the above mentioned items may be correct and may play a more or less important role in different individual cases but all of them apply to other throwing events as well. If my previous judgment is correct, that is that the discus technique in comparison with other throwing events is worse, then there must be other reasons, other causes, other explanations. I think that there are. I see them in two areas which may be characterized as follows:

1. The complexity of the final throwing action in discus, and
2. The treachery of the discus technique.

As to the complexity of discus in comparison with other events; hammer is predominantly a rotational movement with a circular path of the hammer and the shot and javelin, predominantly vertical and horizontal movements with a direct path of the implement. However discus is a combination of vertical, horizontal and rotational movements, the path of the discus being a combination of these three components. Their proper timing is an especially difficult task.

The treachery of discus technique is an unusual expression. But I think the word treachery suits well the property of the discus technique in the sense that you cannot rely on it. The unreliability of a mastered final phase technique shows up after an improvement of the turn, or a better wind-up, or sometimes after using an explosive reverse of the legs for a time. The treachery of it grows with incorrect understanding of the problem.

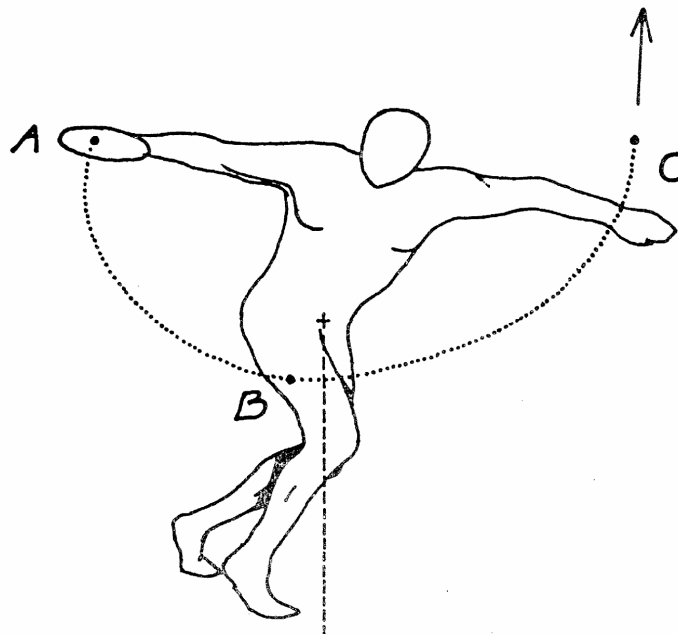
And that is the kernel of my speech and now I will devote most of my time to it.

Balance

I mentioned three items: balance, full utilization of force and transfer of all kinetic energy to the discus. All of these are mutually dependent. The simplest question is balance. The aim is to finish the throw in good balance, i.e. in relatively stable position with a slight tendency to follow the discus. If the throw is not performed in good balance then in almost all cases the body falls to the left. Sometimes one also sees the body falling either in the direction of the throw or away from it. The first is more common in practice with the effect of fouling (stepping out of the circle). The second is more common in competition where the thrower tries not to foul and turns to the left or leans back.

It is not difficult to ensure back-front balance because of the position of both legs, provided, that the body weight is well above the rear leg in the power position.

It is not so easy with the left-right balance. The position of legs is not helpful, and bad timing of upper body movements can have a detrimental effect. But we should be aware of one simple principle: if we want to finish the throw in good balance, and if we want to accelerate the discus along its curved path, (that is in the directions of the movement of the discus at the different positions on its path) then we must apply the force, and a quite substantial part of it, to the right of the direction of the throw. The reaction to the force will act in the opposite direction, that is, to the left of the direction of the throw. To eliminate this reaction and to finish in a good balance we must come to the power position out of balance, with the centre of gravity not over the line connecting the feet but more or less to the right of the throw (See Fig 1, below). It is an off-balance position from an isolated static point of view but is inevitable for maintaining a good dynamic balance throughout the whole throwing action.



The path of the discus in the throwing action

The maximum acceleration of the discus and full utilization of strength require effective application of force, not only along maximum path length, but also in accordance with the direction of the movement of the discus.

Let us characterize the path of the discus during the final throwing action, i.e. from the power position:

- (the left leg landing on the ground) until the release of the discus. If the left leg touches the ground when the discus is in the "A" position (the throwing arm pointing 270° from the direction of the throw) Fig. 1;
- then between the "A" position and the "B" position (the arm pointing 180° from the direction of the throw), the discus moves down and further from the position it will have at release. Then between the positions "B" and "C" (arm approximately at 70°) the discus moves up, the path straightens up, and the discus approaches its trajectory and its release position.

This character of the discus path is typical for a good technique of an advanced discus thrower. In a bad turn technique which is typical for beginners, there is an inferior wind-up and later landing of the left leg and therefore as the left leg lands the discus is approximately in the "B" position.

Application of force

The "B" — "C" portion of the path is common for both beginners and advanced throwers; for those who use bad or good technique. Movements of the body in this portion of the path of the discus are very similar to those in the shot put, i.e. with the prevailing movement of the discus and also with the force application of legs and upper body forward and upward. The application of force in this direction and in this phase accelerates the discus.

But if this application of force, (the application that was learned at the early stage of the discus throwers development) is applied after improving the technique of the turn, after a better wind-up, i.e. from a moment when the discus is in the "A" position, then the discus thrower inevitably encounters problems; he does not feel the discus in his hand; he loses the feeling of pushing himself into the discus.

Why is this so? What happens? In the time when the discus moves down and against the direction of the throw, the discus thrower moves up by stretching his legs and upper body and accelerates the hips and upper body movement forward. Thus not only does he not accelerate the discus, but he also shortens its path in the final phase and most importantly he loses the possibility of using the force of his legs and upper body for accelerating the discus when it moves in the

“B” — “C” portion of its path. This all has serious negative consequences, not only for the discus acceleration but also for the possibility of transferring the kinetic energy of the body to the discus.

When the left leg lands earlier and wind-up is improved, then it is better in my opinion, to avoid applying the leg and upper body force upward and forward until the discus approaches “B” position, than to start this movement too early. This does not make use of the descending path for the discus acceleration but maintains the possibility to use fully the following, more important phase. Some throwers are aware of the necessity of waiting for the right moment. It is a question of proper timing.

But waiting for the right moment without doing anything positive cannot be the best way. So what should the discus thrower, whose left leg touches the ground with the discus in “A” position, do in order to avoid these negative phenomena and make good use of the “A” — “B” path for the discus acceleration.

He has to exert his strength in accordance with the simultaneous motion of the discus, in the crucial “A” position in the direction down and against the throw. It is a very brief lowering of the body, that is bending the legs and upper body with a simultaneous stretching of the head and chest against the direction of the throw. Because of the discus speed, the application of force in these directions must be very short but any effort in this sense should help to eliminate the premature application of force in the direction of the throw. Besides this, along the entire discus path, the discus should be accelerated by rotational work of the legs, hips and upper body. This rotational work, especially of the lower extremities is neglected by many throwers. But it is extremely important for the acceleration of the discus in general, and in “A” — “B” path in particular.

I hope I have explained one dangerous aspect of the treacherous discus technique. The problems start gradually and unnoticed at the beginning, as likewise the improvement of the previous phases proceeds gradually.

Premature reverse

For the coach it is easier to notice the evil in the premature upward movement than in the forward one. You may know the throwers who in the second half of the final action lose firm contact of their left leg with the ground. If they make no reverse in the follow through, they usually shift their left leg back to the left, or when using the reverse they do it prematurely, their left leg leaving the ground too early when the discus has still to travel a relatively long and substantial part of its final phase path. In my coaching career I have quite often seen a good or advanced discus thrower, who used to have a well timed reverse, lose its proper timing and come off the ground too early. Here, I want to stress, it is a similar but not the same case as discussed above, in other words, the case where the timing had to be adjusted according to the improved turn and wind-up.

What causes the change from a well timed and effective reverse to a premature and ineffective one? Besides possible errors in workouts, I think the cause may be in a natural laziness of the body. In other words, the body with many repetitions of throws tries to find a more economic way to work. And there is no doubt that an early lifting of the body, when the discus moves down, is easier than properly timed lifting which has to change the direction of the body movement from down to up and also withstand the resistance force of discus and upper body acceleration. So the body naturally finds a more economical and easier way which, of course, has a detrimental effect upon the acceleration of the discus. The thrower feels good and the leg action appears to be fast and explosive. The danger is greater when easy throws are made with the reverse of legs. So that is another dangerous aspect of the treacherous discus technique. Keep it in mind.

Premature forward movement

I think we have thoroughly discussed the problems of proper timing of vertical movements in the final throw phase.

Now, let us discuss the horizontal component of the movement. Usually it does not cause problems when coming to the proper power position, i.e. with the body weight well over the right leg. Due to inertia from the turn, the body moves in the direction of the throw and the aim of the thrower is to accomplish the right leg action in accordance with the motion of the discus. That is turn and drive. The thrower should feel the stress in his muscles, the resistance to the force applied. It is very important to ensure a long discus path, i.e. the maximum possible radius of the path. If the radius is shortened, i.e. if the discus comes close to the body, or if the body weight moves over the front leg too early then two or three unfavorable consequences may occur.

- One — the thrower pushes hard with his right leg, accelerates the discus but takes a foul, steps out of the ring which is, of course, bad and usually happens in practice or in pre-competition throws.
- Two — in order not to foul he does not drive hard with his right leg, does not accelerate the discus properly, which is bad again.
- Three — he starts driving hard (often too early) but at the very final and important phase in order not to foul, he does not thrust his chest forward, but brakes down the upper body movement, moves back his left shoulder and sometimes also his head to left and thus falls back into the circle and spins. That is wrong again.

Let us summarize. Bad timing of both the vertical and horizontal movements, or more precisely premature movements upward and forward at the time when the

discus is moving down and backward do not allow full use of the strength potential of the body for discus acceleration.

Right shoulder path and position

The path of the right shoulder and the position of it are also important for the transfer of energy to the discus. The path should have the same pattern as the discus path and a shorter radius, of course. At the beginning, the shoulder should move down and against the throw and thus ensure the longest possible path.

The position of the right shoulder or the relation between the shoulder axis and the throwing arm is important too. Premature lifting the right shoulder and dropping the discus down shortens the path of the shoulder and prevents good energy transfer. It is manifested by a broken line — left shoulder — right shoulder — throwing arm with the lifted right shoulder and the dropped discus. So hold the discus relatively high and push the shoulder, during the final throwing action, down and forward.

Spinning after the throw

That is often to be seen in the behavior of the discus thrower just after the release of the discus. The abundance of movements shows that the kinetic energy of the thrower has not been completely transferred to the discus. And the spinning of the discus thrower just after the release is the most evident proof of it.

I know that many great discus throwers — and it holds good for the best ones as well — turn round, or spin after the throw. Nevertheless, I think that the ideal throw should be finished in perfect balance with complete transfer of all kinetic energy to the discus without any rotational movement of the body afterwards. The aim of the thrower should be to strive for such performance.

I know that many coaches will not agree with me at this point, arguing, for example, that what most of the top throwers do, cannot be wrong. But it can be wrong, I think.

I think there is no doubt that the technique of a lot of excellent throwers is far from ideal. And what percentage of the throws of good throwers are perfect? So, there is no wonder that ideal throws are seen very, very rarely.

Let us leave the ideal throw and analyze the rotation of the body of the discus thrower at the end of, and after the throw. There are substantial differences between various kinds of turning or spinning. They differ in number or revolutions, in speed of the movement, and in the time they commence. The bigger the number, the higher the speed and the earlier the rotation starts, the worse. If, just after the release, the thrower makes a reverse of legs and a real follow through, i.e. follows the direction of the throw with his head and chest while

the throwing arm finishes its swing to the opposite hip and after that he turns round slowly, then it is all right. Such a turn could hardly be detrimental to the result.

But unfortunately, there is again a danger or hidden treachery that this innocent, slow single turn after the follow through gradually changes into a fast spinning that is initiated earlier, even during the final phase of the throwing action itself. It is manifested by swinging the left arm back and down, by dropping the left shoulder down and back or turning the head to the left, which is often preceded by prematurely turning the head to the left in the first half of the throwing action. All these phenomena are often accompanied by a premature reverse of legs. One good piece of advice — watching the discus flight will help you to avoid (spinning) after the throw.

This gradual change from a harmless turn to harmful spinning is usually caused by reasons already discussed above: bad timing of forward and upward movements after improved turns and “laziness” of the body, plus neglecting important principles in technique teaching.

Follow through

I have already discussed several points concerning the follow through, mainly faults and their reasons and some hints how to correct them. But I should complete the picture of that phase of the throw by explaining my view on the reverse of the legs.

We know that a vast majority of male discus throwers use the reverse of the legs but even among the best we can find some who do not. With women the situation is different. The number of those who throw without the reverse of the legs is much higher than with men and so it is among the best ones as well.

It is a commonly held opinion that the throw with the reverse is more difficult, more advanced, and more effective but on the other hand more risky or less safe and stable. I think that throwers should strive for a more effective throw with reverse but they should use it only when they are able to perform it well. It is better to throw without a reverse than with a wrong faulty one. The wrong reverse without a well timed lift, with a spinning of the body during and after it, without the thrust of the chest in the direction of the throw can hardly be beneficial.

The easiest way to get rid of the evils of a bad reverse is to go through the throws without reverse. It is much easier to control and improve the wrong components of the movement in easy, light, not full-effort throws without reverse. After mastering them, perform more powerful throws without a reverse and finally with a reverse of the legs. For those who throw with reverse it is recommended to throw some of the throws without a reverse. In my experience this is essential

with easy throws especially. Easy throws with a reverse often lead to spoiling a previously good reverse of the legs.

Rhythm

The main subject of my talk is the final throwing phase which should be performed with maximum velocity. But too much speed in preceding phases is a big error. So it is necessary to mention the importance of the proper rhythm of the whole discus throw. Rhythm, undoubtedly, plays an important part in the success or failure of the throw. The final technique phase, I think, is often negatively influenced by a bad rhythm. High speed both at the beginning of the turn and during the turn itself results in the thrower being unable to perform the final phase correctly. So, slow down the turn and make the best effort to improve the final action and, after perfecting it, try to perform the perfect final phase after a slightly faster turn.

As the technique of the throw plays an important part with advanced throwers it would be good to mention some principles of technical training:

- The aim of improving the present technique should never be abandoned in practice.
- I think that in most cases, technical training should be performed all the year round. The only exception may be the transition period.
- Throws with various intensity should be performed with the aim of keeping the percentage of successful throws as high as possible.
- Use not only the competition weight of the discus but both lighter and heavier ones, too, and also shots 3- 5 kg. For some technical goals, they prove very successful.
- Use film and video analyzing especially in problem areas.
- Find and use suitable drills and technical exercises to improve errors.
- Do not neglect general mobility and movement coordination. They may be worsened by one-sided or narrowly specialized practice over a long period.

Conclusion

There are other interesting subjects related to the main topic but my time is limited. There is also a possibility of speaking about them in the discussion.

Allow me at the end of my speech to repeat briefly the main ideas. Top discus throwers make technical errors. With the improvement of the turn, the timing of

the vertical and horizontal components of the movement must be adjusted in order to make full use of the strength potentials of the thrower. If this is not done the kinetic energy is not fully used for the acceleration of the discus which is often manifested by a wrong follow through.

I hope that the language barrier did not prevent you from understanding me.