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Pole vault

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Roman Botcharnikov has many years of experience in pole vault coaching in the USSR, Australia and in the US. He is personal coach of Lawrence Johnson (USA, World Indoor Champion 1997, P.b. of 5.98m).

Leszec Klima, a former Polish vaulter, is Germany's national pole vault coach for the men. He also coaches women in his role as club coach at the LG Bayer Leverkusen. Personal coach of M. Stolle and, until end of 1996, of T. Lobinger.

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Dave Nielson is head track coach at Idaho State University, USA, and personal coach of Stacy Dragila (World Indoor Champion 1997 and US record holder with 4.45m).

Dick Railsback was twice the USA National Pole Vault Champion. He was the field events coach for the University of Nebraska from 1978 to 1983 and is the chairman of the USATF National Vertical Jumps Development Committee (pole vault and high jump).

Julian Shuravetsky is a graduate of Victoria University (Australia) with a B.Sc degree in Sports Science. He is the pole vault coach at the Victoria Institute of Sport. He spent 8 months in Italy (1995-96) studying under coach Vitaly Petrov.

1. In your view, what are the factors determining performance in the pole vault? Why has it proved so difficult for men to clear 6m?

N.b. – the only members of the 6m club have been Sergey Bubka (40 clearances) Rodion Gataullin (7 clearances) and Okkert Brits (2 clearances).

BAILLY:

The known run-up speeds of the best vaulters show that they use a very fast approach but we do not know what percentage of their maximum speed is used, or, particularly, how much speed is transferred to the pole. The speed of the approach, in fact, must be optimal, since the vaulter has to present, plant and raise the pole and thus be in a position to anticipate these different automatic movements at the end of the run-up.

- The grip

The evolution of the rather rangy physique of the current world best vaulters tends to confirm the mechanical principle that the angle between the pole and the ground at take-off is more often open, when a tall vaulter is involved (with the same grip). The more the centre of mass is raised at take-off, the more vertical becomes the direction of the take-off.

- Pole stiffness

The grip is now stabilised, and it is in the area of the ratio between the vaulter's weight to pole stiffness that progress is currently being made. Hence the emphasis on training for power and an early pole plant, to benefit from the pole rebound.

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• Psychological aspects

The vaulter's determination in the last six strides of the run-up, together with his/her ability to remain receptive and clearheaded, will allow an optimal transition from run-up to take-off.

The ability to transmit energy to a pole differs from one individual to another, and is difficult to measure. I define it as a psychological strength, which is specific to the event and which shows that the morphological parameters are necessary, but are not of themselves enough to guarantee a great performance.

Although the number of vaults at 5.70 to 5.80 metres has increased, the 6 metres barrier still remains rather impassable, for to have more than one metre 'difference' or 'ratio' (between the height of the grip and the height cleared) on a pole of maximum stiffness (for a talented vaulter) leaves no room for error. It is the symbiosis of the vaulter and pole at the moment of the recovery of the energy acquired on the ground which determines the success of the vault. It is an idea which transcends sport and approaches art. Vaulters who clear 6 metres are the artists of the pole vault!

BOTCHARNIKOV:

Over the next 3 years, a number of competitors in the pole vault will clear 6m, and there will be a significant improvement over the next 5 years, due to the inevitable better understanding and acceptance by a number of coaches and athletes of a more progressive view of the event.

The conception of a model for the pole vault accepted by most coaches and athletes is outdated. Because of that, most of the leading pole vaulters have less athletic ability than athletes in other events. For a long time "technique" rather than athleticism has dominated the event. In my opinion, this "old" approach leads to a disinclination, after a certain level is reached, to increase the physical abilities of the athlete.

In the past, only Bubka utilised a different approach to the pole vault, and other vaulters, mainly Russian, copied some of the characteristics of this "new" approach. The new approach could be described as simplifying the model into basic "active" parts and correlating the result (performance) with the physical input by the athlete. In short, "no nonsense, the best athlete should win". I do not know of any occasion when Bubka has expressed his views about the pole vault, but his coach has labelled his conception of the event as the "Continuous Chain" method, which can be understood to fit in with the views I have outlined above. It is beyond my understanding why, for so long, nobody understood, followed and continued further along the path discovered by Bubka, but this is soon going to change.

KLIMA:

A primary consideration for the achievement of top performances is the luck to be at the right time in an environment that makes such performances possible. Such an environment is characterized by:

- 1) parents who are interested in sport, who are helpful and who are willing to make sacrifices;
- 2) social circumstances which support the athlete's career and acknowledge his or her achievements;
- 3) a competent club, able to provide everything necessary; good facilities for training and an enthusiastic, committed and knowledgeable coach;
- 4) optimal medical care, because injuries are unavoidable in top level sport.

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If all these factors came together more often in such an ideal way, we would have many more champions – but top performances are possible only for those athletes who possess a all-round talent, the components of which are:

- 1) motor abilities such as speed, strength and co-ordination (Bubka has all of these and, thus, is able to perform at such a high level);
- 2) willingness to experiment, the courage to learn new exercises, an above average imagination and the mental capacity to do all things correctly at the right time;
- 3) the single-minded determination to eliminate all weaknesses and to become the best, to mobilize reserves at the decisive moment and
- 4) to be a bit smarter than the others and to preserve some secrets, which even the coach does not know.

Regarding the difficulty of clearing 6 metres, there are now four athletes, including Trandekov, who have cleared this height and all four are clearly ahead of the rest of the field. Bubka is absolutely the best because, apart from his mental strength, he has all the other required motor abilities. Brits is a bit "crazy"; with him it is more a problem of the head. He is a dare-devil, who has the immense power to be able to vault with very stiff poles. Trandekov possesses an exceptionally good technique, especially in regard to his take-off. The performance of Gataulin is undoubtedly the result of competition with Bubka, when there were two such good vaulters in the USSR. Looking at today's young athletes, one gets the impression that the 6 metres mark will soon lose its status as a magic threshold, because there are now at least four athletes who will soon clear it.

MARTÍNEZ LUCÍA:

The training of a pole vaulter is concerned basically with three abilities; 1) Psychological, 2) Technical and 3) Physical.

In the psychological field we look for the following traits in athletes, to help to direct their preparation towards the advanced level:

- great determination shown in the approach to the box,
- great self motivation to master the event,
- the ability to assimilate the correct technique of the complex pole vault action.

This last psychological aspect brings us face to face with the one technical factor that is essential for the achievement of top performances. Many years of hard work are needed to reach a high technical level and it must be recognised that a high technical level is possible only with a similarly high level of physical condition, and specifically with a high approach speed in the last few metres, together with excellent control.

There is such great difficulty in clearing 6.00 metres (Igor Trandekov has also now cleared 6.01m), because the acquisition of the technical/physical parameters is possible only through a long period of hard work. There are no short cuts.

To cite a few parameters, the vaulter will need to use a hand grip of between 5.10 and 5.17m and this will be possible only with great speed and excellent technique. A velocity of between 9.6 and 9.9m/sec must be reached in the last few metres and only a few can do this. Many years of intensive work are needed to reach this sort of standard.

Among the four athletes who have cleared 6.0 metres, only Brits has succeeded in doing so in less than 10 years training:

- Bubka (4.12.63) started in 1975 and up to 1985 he had not cleared 6.00m,
- Trandekov (17.8.66) vaulted 5.30m in 1984, at the age of eighteen, and then, in 1996 cleared 6.00m for the first time,

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- Gataullin (23.11.65) vaulted 3.10m in 1978 and cleared over 6.00m for the first time in 1989,
- Brits (22.8.73) vaulted 5.46m in 1992 and 6.00m in 1995 in Sestriere.

McGINNIS:

Mechanically, height achieved in the pole vault is determined by three things: the vaulter's velocity at take-off, the vaulter's height at take-off and the work done during the vault itself. Take-off velocity is the most important of these three parameters. Take-off velocity is created by the vaulter's speed at the finish of the approach run and his jumping action at take-off.

The next most important determinant of success in pole vaulting is the ability of the vaulter to do positive work throughout the pole support phase (during the vault itself). Many vaulters have the approach run speed necessary to vault 6 metres, but few of these vaulters are able to handle this speed while executing a good jumping take-off. Even fewer of these (maybe only three) are able to generate energy continuously (do positive work) while they are on the pole. Most vaulters are passive immediately following take-off. They hang from the pole and transfer energy to it but do not create any more energy by doing positive work. The time that the vaulter can do positive work is thus limited by these actions.

A 6 metre vault is a result of a fast approach run and a jumping take-off, followed by actions on the pole which maximize the positive work done and minimize the passive. A number of vaulters can do each of these three things, but only three vaulters have been able to do all of these things together in the same vault.

NIELSON:

Speed and suitable opportunity are the key factors. The stable of men with the necessary physical abilities to jump 6.00m is very small. Athletes with the speed necessary to vault this high are in high demand in many sports. Sports or activities that receive more attention or offer greater financial reward will capture many of these potential elite vaulters.

RAILSBACK:

Without a doubt, the most important factor determining performance in the pole vault is speed. Over the years, there have been many *great, big, fast vaulters*, and there have been many *great, small, fast vaulters*. *There has never been a good slow vaulter!*

Other physical factors are height, jumping ability and agility. Taller vaulters have the advantage of being able to hold higher on the pole and good jumpers can convert the horizontal speed attained through the approach into a proper take off angle (16-18°). The approach, pole plant and take-off determine 90%+ of the entire vault. Many vaulters have attained great marks (5.70+) with strong runs, plants and take-offs but with only fairly mediocre during the rest of the vault. Without the great approach, plant and take-off, good mechanics on the pole are impossible.

These factors of great approach, planting technique and take-off separate Bubka, Gataulin and Brits from the others. They have utilised these strengths to develop very advanced techniques once off the ground and on the pole.

Of course, there are many fast vaulters out in the world but if, and usually when, their planting technique breaks down, the potential for very high vaults (5.95+) is lost.

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SHURAVETSKY:

In order of importance:

- correct technique
- balanced and relaxed movement
- speed
- power
- agility
- confidence.

Very few men have been able to clear 6 metres; yet there is enough talent in the pole vault world for many more athletes to vault in excess of this height, but they are limited by their poor technical understanding of the event. Sergey Bubka, having cleared 6 metres so often, demonstrates an extremely advanced level of technical understanding. These performances are not attributable merely to his physical talent – as other athletes are equally talented – but also to the fluidity, balance and the apparent ease of his movements, which belies his technical proficiency.

2. Women's pole vault is now officially recognised by the IAAF. Already this year women have competed in the World Indoor Championships while next year the pole vault will be part of the European Championships' programme. What is your opinion of the current technical level of performances achieved by women when compared with that of male athletes?

BAILLY:

Any comparison with the men's event would be prejudicial to this new event for women. Even though they do not need to rewrite the history of the pole vault, they must develop their own specific culture, drawing on their own experience. Of course, they can use the example of male vaulters but, as in other events, such as the triple jump, they will need time to assimilate the technique and the specific training.

Progressive training orientation

At the moment, we see women with a gymnastic background (George, Bartová, Poissonier), who succeed because they have good spatial awareness and handle the pole well. They successfully embody the women's pole vault culture – but where will the event be in a few years' time?

In a male 6 metres vaulter, five sixths of the performance is due to the grip height and one sixth to the ratio between the height of the grip and the height cleared. Grip height evolves very little, and it is, therefore, in the stiffness of the pole that the men can make progress, and upon which the evolution of the event will depend. The vaulter's profile will change from the acrobatic to the more specifically athletic.

In fact, the top women vaulters show very modest differences between grip height and the height cleared. Possible reasons for this are:

- either they try to take a high grip on a supple pole and there is little rebound
- or they modify their grip, but even though they demonstrate a good technique, and in spite of their acrobatic ability, they still find difficulty in achieving a ratio of more than 50cm.

Therefore the real sources of energy must be found on the ground.

- The approach speeds of the male vaulters show that the higher the vault, the more important the approach speed.
- The evolution of physiques, now slimmer than in the past, show that it is more important to develop power than strength.
- Finally, there is the ability to transmit energy to the pole, which is both physical and mental.

Here is the profile of the woman vaulter of the future: a jumps type, with some exceptions, as for the men (Collet, Dial)

- tall, facilitating a high pole grip
- fast, permitting the use of a stiff pole

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- good relaxation, aiding the ability to drive at take-off
- a good mental approach: determination, confidence, responsiveness during the run-up and ability to adapt.

This, in fact, is the profile already to be seen in female jumpers, especially long jumpers such as Drechsler.

The development of the women's pole vault

Bercy in 1997 demonstrated to the sceptics that the women's pole vault truly belonged in the competition programme. It is a very visual (and 'tele-visual') event, in which the performances and the height of the competitors (over 1.70 metres for the top ten) have progressed since Stockholm 1996.

The introduction of the decathlon for women would be very favourable, from the point of view of talent spotting and an early start in the event for young athletes.

Inclusion in the Olympic Games would establish the event permanently.

In the other jumps, the women's performances are more or less the same as those of boys of the age of 15 to 16. This should mean that women will clear 5 metres or more within the next five years.

BOTCHARNIKOV:

The participation of women is very positive for the event. In this early stage, the technical level of women's vaulting is still developing. One female athlete, Stacy Dragila, in my opinion, has a better concept of the event than most male vaulters. Her technical skills will improve as time goes on, and she will probably lead the women's event for a couple of years.

KLIMA:

Regarding women vaulters, it is notable that Emma George is able to vault 70cm higher than her grip height of 4 metres. It is clear that she will soon be able to clear 4.80m. A woman who has had such a good gymnastics preparation as Emma George (and, indeed, as the five athletes ranked below her) but who can also run 30 metres for a flying start in 3.20sec and reach at least 6.20m in the long jump, will presumably be capable of clearing 5 metres.

MARTÍNEZ LUCÍA:

To reach a high level of performance, women vaulters need to unite an excellent technical execution with the physical and gymnastic potential needed for them to reach this technical excellence.

The physical differences between men and women must be recognised, especially in regard to the feet, back and hands, and special attention must be paid to this in the training of women.

The technique of the women vaulters currently lags far behind that of the men; only the representatives of the Russian school of vaulting show an adequate standard of technique. In the last World Indoor Championships in Paris, the approach, plant and penetration of Abramova were near technical perfection, although the result was not the best.

In general, success in the women's pole vault is based on physical condition rather than on technical expertise. Much more attention needs to be paid to technical aspects of the vault.

McGINNIS:

The performances achieved by women in the pole vault are impressive, considering the short time that they have practised the event. However,

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their technical level of performance is still well below that of men. I would consider a 5.10m vault by a woman an equivalent performance to the men's world record. The best American women have improved their approach runs so that they now have the velocity needed to vault over 5m. Their vault performances are limited by their take-off mechanics and their technique on the pole. The next technical improvements in women's pole vaulting will be in their take-off mechanics.

NIELSON:

Comparison has been made between elite women and good U.S. high school boys. There is an unfair strength and speed difference in many cases. Skills that some of the elite women demonstrate are more comparable to good collegiate male vaulters. Gymnastic movement seems to be at a good level. Speed and its conversion at plant/take-off appear to be the prime area for development.

RAILSBACK:

Currently the women competing in the pole vault are exhibiting very good technique at the higher levels of competition. I believe this is because they are learning from good coaches from the very start. They are identified as potential vaulters, often have a very strong gymnastics background (almost non-existent for boys in the U.S.) and are very eager to learn correctly from day one. Boys in the U.S.A. have often started vaulting in the backyard, over bushes, etc. for the fun and excitement of the event. Unfortunately, they have practised poor technique. *Practice does not make perfect – practice makes permanent!* Once a vaulter has jumped for a year or so, very little can be done to break bad habits.

The women in the world of vaulting are going to jump very high! Their only limitations are speed and physical height, compared to men. Upper body strength is not as important today as it was years ago, because proper mechanics has taken its place. When I vaulted, we all had to be very strong because we all had very poor mechanics. We had great speed, big poles, and high grips – but very poor technique. The proper mechanics through the plant and take-off allow the vaulters of today (men and women) to utilize their maximum speed at take-off and therefore achieve the great heights of today.

SHURAVETSKY:

Women have not yet reached the technical level shown by the men. They have been training for a relatively short period of time compared to male vaulters and need several more years to develop technically. It could be a very long time before women begin to approach the technical proficiency shown by some of the men vaulters. Generally speaking, most women vaulters are following inefficient technical models and concepts.

Women generally have less strength, speed and weight than men and, therefore, are unable to compensate as effectively for errors in technique. It is also unfortunate that, for these same reasons, women are more subject to injuries, especially of the lower back. The high incidence of lumbar spinal injuries is due to the fact that, unless planted correctly, the pole can provide an enormous amount of resistance at take-off. Unless there is enough strength and power to stabilise a fully rigid body position, so as to compensate for this pole resistance, the lower back receives most of the force.

Why not simply develop a technique which limits or eliminates these stresses?

3. In training methodology the modern tendency when planning the evolution of long term training for beginner/young athletes is: 1) use a multilateral training programme as an introduction (from 10 to 14 years); 2) gradually shift to events group training (from 15 to 17 years); 3) finally concentrate on specific event training. (after 18 years). Do you think that this system works well with the pole vault or not?

BAILLY:

In my own training group, 50% started in special athletic schools (10-12 years of age), 30% started with the pole vault at the age of 12 to 14, and 20% started with combined events and then went on to pole vault.

The training plan I recommend is as follows:

1) For the young beginner (10-14 years) – 3 sessions per week:

- general athletics training – runs, jumps throws
- basic gymnastics training (spatial awareness, posture control, acrobatics)
- regular specific pole vault sessions

Actually I use mixed sessions, as I am confined to two sessions per week.

2) For the more experienced athlete (14 to 17) – 4 sessions per week:

- training with a combined events group
- sessions with other groups (sprints, hurdles, long jump)
- group strength training and gymnastics sessions
- specific pole vaulting sessions (two per week)

3) For the specialist (17 and above):

- 2 vaulting sessions per week
- 1 session of gymnastics
- 2 sessions of strength training
- 2-3 sessions of different types of running – aerobic, sprints/hurdles, speed endurance

This should be adapted to the availability of the athlete and the period of the year.

Note: some vaulters have done only the pole vault. It is a formative and many-sided event, which is self-sufficient, such is the diversity of its components. It is up to the coach to decide on the needs of each type (inc. somatotype) of athlete, for there are still several unknown factors in the ability that some vaulters have to transmit energy to the pole, in the feeling for the jump, or even in the way they perceive and clear the bar. Finally there is the mental preparation. It is often overlooked, but it is vital for those vaulters who are psychologically weak. The help of people other than the coach (even just because of their charisma) can be useful in this area.

BOTCHARNIKOV:

I do not think that this is a modern tendency. I think it is the best way to prepare athletes for most events in Track and Field, including the pole vault. Considering the lack of physical maturity and development, it is almost useless to demand complete focus on one event from 10-14 year-old athletes. A 16-year-old athlete could, in two years, be as good as or even better than an athlete who started at the age of 10. Concentration on one event should begin at the time when development of other events does not contribute to the purpose of the main event. This could occur at 18 years of age or even later.

KLIMA:

During the first stage, one technique and one gymnastics training session a week are sufficient.

During the second stage, there should be two technique and two gymnastics sessions and, in addition, one session of "playful" gymnastic pole vault exercises per week. At the age of nineteen, an athlete should really be able to clear 5 metres. If he does not, then he should consider whether it is worthwhile to continue specific training.

Bubka started training, or "playing" with the pole vault at the age of five. Tim Lobinger also started at the age of five and took part in his

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Do you think that this system works well with the pole vault or not?

first competition at the age of seven. This implies that, if there is somebody to teach the child the basic movements of vaulting in a "play-like" way, there is no limit to the age at which a child can start to learn. It is just a matter of motivating the child to keep on vaulting.

Once the proper movements have been learned, they become so automatic that the athlete never "runs through" but always plants the pole correctly. The pole vaulter is a very versatile athlete and the abilities developed in training for the vault are also beneficial for other events.

MARTÍNEZ LUCÍA:

The pole vault is a very complex activity. Many years of hard training are required to master the technique and achieve high level results.

McGINNIS:

The pole vault is a difficult event to master technically and thus takes many years to learn. This leads one to conclude that the event should be introduced at an early age. On the other hand, the variety of physical abilities required by the event indicates that the future pole vaulter should participate in many different sports while young. So, the ideal long term training programme for future pole vaulters is similar to the one proposed:

- 1) participate in many informal sports activities (soccer, basketball, tumbling, gymnastics, baseball, swimming, etc.) and introduce vaulting with a pole into a sand pit (from 6-10 yrs.);
- 2) use a multilateral programme, but introduce pole vaulting formally and emphasize pole vault specific aspects of other activities (from 10-14 yrs.);
- 3) gradually shift emphasis to pole vault specific training but continue secondary activities during off season (from 15-17 yrs.);
- 4) concentrate exclusively on pole vault specific training (after 18 yrs.).

NIELSON:

Exposure to the pole vault at an early age can be a very positive experience but development for the long term will be stunted by an early "tunnel focus" on the vault. Any vaulter should be coached first as an athlete. He/she must be fit enough and fresh enough to achieve the highest level. Fitness comes from an aggressive multi-lateral training regime. The presence of other forms of athletic stimuli are required to keep the athlete fresh and focused, at the appropriate time, on the task of vaulting. The timing of the type of training used should be considered in terms of the individual's training and physiological age, rather than just chronological age.

RAILSBACK:

A vaulter, by the very nature of the event and training is (or at least should be) a very good athlete. This is the athlete who, in high school, should not only be winning the pole vault, but scoring points for the team in the sprints, hurdles, relays, long jump etc. Training and competing in other track and field events help the vaulter to be well rounded. More specific vault training, competition, and mental preparation should begin no later than the age of 15. Once the athlete has learned correct technique regarding the approach, plant and take-off, natural strength gain and sprinting ability will allow for higher jumps.

SHURAVETSKY:

This system is not optimally efficient for the pole vault as it remains non-specific for far too long a period. A more ideal plan might be

- 1) multilateral training programme (10-12),

- 2) event group training (13-15),
- 3) specific event training (15+).

Specific event training needs to be carried out at an earlier age for two reasons. Firstly, the pole vault is an extremely technical event, arguably the most technical in track and field and, secondly, it requires the development of certain skills and abilities that are not developed, nor utilised, in training for any other event.

4. What do you think about the fact that some pole vaulters use their hands to keep the bar on the cross-bar supports during a clearance? How about a clearer rule that prohibits athletes from touching the cross-bar with the palms of their hands?

BAILLY:

Perhaps one must be a vaulter to appreciate the strength of the desire to keep the bar on its supports. It is more by a reflex action than by specific training that some vaulters manage to stop the bar vibrating or replace it on the supports. This is not forbidden by the rules.

I do not think that the international rankings are affected by certain vaulters trying to keep the bar in place during a vault; this is a part of the game and all vaulters do it spontaneously, some time or another. Who would dare to reproach Thierry Vigneron for being in the habit of doing it, with his background in the event? I think it is an extra motor skill, specific to the pole vault.

I do not consider it at all necessary to modify the rules by introducing an element of subjectivity (did the vaulter do it on purpose or not?), which would de-nature our event (it is not Olympic gymnastics). As for the idea of modifying the supports, who knows?

BOTCHARNIKOV:

Absolutely no rules against "handling" the bar. The present rules do not require any judgement regarding a failure other than that the bar must remain on the supports after the jump. Touching the bar raises the excitement of the spectators. Attempts to learn the skill of "putting the bar back" have been made for as long as the event has existed, and no-one has really made significant improvement in this area. NCAA employs the "do not touch" rule and this has caused a lot of unnecessary controversy.

KLIMA:

Keeping the bar on the pegs with the hands is a matter of luck rather than skill – and, even if it looks as though the vaulter knows how to do it, in most cases the bar still falls off the pegs. Anyway, in my opinion, pole vaulting is an acrobatic event. If an athlete masters the art of keeping the bar on the pegs with his hands, or even of putting it back on the pegs, during a very difficult movement process, one should acknowledge his expertise and call the vault valid.

MARTÍNEZ LUCÍA:

The possibility of dislodging the bar with the hand is very slight. I do not think it would be useful to lay down rules to apply to it, since the great majority of the cases would rely on the opinion of the judges.

The vaulter should think more of his technique and physical condition rather than holding down the bar. This is usually an instinctive action, when the timing of the vault is incorrect.

MCGINNIS:

Rules would be difficult to enforce uniformly since violations must be viewed clearly by the officials. Rather than proposing a rule change, the problem could be addressed with a change in equipment. The design of the pole vault uprights could be changed by modifying the supports for

4. *What do you think about the fact that some pole vaulters use their hands to keep the bar on the cross-bar supports during a clearance? How about a clearer rule that prohibits athletes from touching the cross-bar with the palms of their hands?*

the crossbar. Rather than having the uprights extending well above the peg that the bar rests on, limit the distance that the upright can extend above the peg to one half the diameter of the crossbar end or about 15mm. Alternatively, the crossbar supports could be similar to those of the high jump, platforms rather than pegs. Either of these design changes would effectively eliminate attempts to steady the crossbar, since such attempts would be more likely to dislodge the crossbar.

These changes would also increase the safety of the event. A vaulter who has not penetrated far enough will often still attempt to get over the bar. Sometimes this results in the vaulter hooking his/her legs or feet over the crossbar. If this occurs at the peak of the vaulter's trajectory, the crossbar may not be dislodged towards the pit but may be pulled against the pegs and uprights as the vaulter begins to fall. This hangs the vaulter up momentarily. This prevents the vaulter from rotating and, as a result, he/she falls head first. Since this typically happens in vaults where the vaulter has not achieved enough penetration towards the pit, the vaulter will fall head first towards the box. A shorter projection of the upright (or none at all) above the peg or crossbar support will prevent this type of situation from occurring since the crossbar will dislodge in either direction, thus allowing the vaulter to continue to rotate. The vaulter will not fall head first as a result.

NIELSON:

While using the hand(s) to steady or replace the cross bar in place is an admirable skill, I think that it is not in the spirit of the event. A rule stating that the vault would be counted as a failure, if the athlete touches the bar with the palm of his/her hand is in order. However, I do not feel strongly about the need to make this a rule. I wonder what the feeling is from the spectators' point of view?

RAILSBACK:

There have been more failed attempts when vaulters have tried to "save the bar" than if they had kept their hands off the bar. The IAAF should ban any attempt to try consciously to steady or place the bar on the pegs. The NCAA (National Collegiate Athletic Association) in the U.S.A. has made this ruling. No questions asked – if the vaulter tries to steady the bar, it is a failure. International officials need to have the "intestinal fortitude" to make this call – controversial or not.

If vaulters use proper technique, especially on the "bottom of the vault", there would be a lot less need to try to steady the bar. I certainly hope no coach or athlete would be trying to develop this technique. Better time can be spent on proper mechanics.

SHURAVETSKY:

To hold the cross-bar with the hand during the clearance phase signifies that the rhythm of the vault is incorrect and the vaulter is losing speed prematurely during this phase. There is no need for a rule to prohibit this. I say "good luck" to those who choose to vault inefficiently and then attempt to compensate for their errors.

5. *What are the necessary physical abilities and skills and psychological prerequisites of potential young pole vaulters you are looking for?*

BAILLY:

'Athletes do not take up the pole vault by chance'. This statement implies a significant act of will on the part of the future vaulter. If the vaulter is the initiator, the relationship with the coach will be a good one. If it is the coach who spots the potential vaulter and asks him/her to try the event, then it is not so easy for the coach!

5. *What are the necessary physical abilities and skills and psychological prerequisites of potential young pole vaulters you are looking for?*

These are the aptitudes I would look for:

- a) Psychological
 - desire to succeed
 - determination and courage
 - capacity to deal with the stress of competition
- b) Physical
 - a fluent and powerful running action
 - acrobatic aptitude (spatial awareness)
- c) Somatotype

I have no selection criteria, although I realise the advantage of height, all other things being equal. A short vaulter can have more success early on, but this can be reversed later.

The 'tangible' parameters, such as speed, strength, relaxation, must be accompanied by mental qualities, such as risk-taking, determination, perception and a feeling for jumping.

BOTCHARNIKOV:

I would look for the same abilities in a young vaulter as one would find in a sprinter or a long jumper, as compared to a thrower or a long distance runner.

KLIMA:

- a) I would first of all look at the parents (body height, fitness; it is advantageous if they have had some practical experience in sport);
- b) Co-ordination (athletes who come from gymnastics are best);
- c) Learning ability (if progress is too slow after ten training sessions, I try to arouse interest in other disciplines);
- d) Speed: natural running style, a smooth, relaxed way of accelerating (the coach can judge this himself);
- e) Jumping power (in my home town there was a boy who could long jump about 7 metres in gym shoes. The coach took action at once and later the boy vaulted 5.60m).

MARTÍNEZ LUCÍA:

The identification and selection of talent for this event is very difficult. The potential vaulter should possess a good psychosomatic balance.

Determination is the basic factor, along with the ability to learn technically correct movements, speed and a good physique. I believe that these are the most important parameters to look for in the future champion.

MCGINNIS:

Physically potential young vaulters should be tall and have good running speed and jumping ability. They should also be able to handle their body weight easily with their arms as indicated by their rope climbing ability and pull ups. Psychologically, the potential vaulter should be tenacious but patient since the event takes so much time to master. A curious and inquiring mind is desirable. The vaulter should be willing to experiment and try new things. Finally, the most important quality a potential vaulter should have is confidence in his/her own physical ability.

NIELSON:

I have two answers to this question. If it implies developing someone to be competitive at world level, my answer is to look for athletes whose standing height is (or apparently will be) in excess of 1.80m, lean, with very good leg speed (or potential for this), single leg jumping ability,

5. *What are the necessary physical abilities and skills and psychological prerequisites of potential young pole vaulters you are looking for?*

raw gymnastic/kinaesthetic sense, competitive drive and the ability to focus on acyclic athletic tasks. If the answer is in regard to programme development and promotion of the sport, the answer is very different. Any young athlete with the willingness to learn and safely take direction meets this criteria. The adage "the cream rises to the top" is appropriate. Those who may not be good enough to make it to the "top" have value to the sport as ambassadors. Nearly anyone who has vaulted, even for a short period of time, has a passion for the activity. Usually this is an asset.

RAILSBACK:

Speed, physical height, good jumping ability and a courageous mental state are the attributes I would look for. I would not discourage an athlete who is a bit short, as we have all seen great jumps from small vaulters (Issakson, Vigneron, Buckingham, Dial, ad infinitum). But good athletic ability combined with speed is a must. Not every young athlete can be the starting quarterback on the football team, star on the soccer team, etc. Not every young athlete can or should be a pole vaulter. Willingness to take instruction and hours of hard, sometimes repetitious, work are involved in learning to vault correctly.

It is not only important to identify good athletes. It is equally important to put those few potentially good vaulters in the hands of good coaches. It is imperative, from a very early stage, to learn proper technique. Physical development will take care of the rest. Too many young vaulters achieve good marks in spite of what they do, not because of what they do. Proper technique, learned early in the development of the vaulter, will ultimately ensure success.

SHURAVETSKY:

The three types of ability I would look for are:

- 1) Physical suitability
 - a) height – preferably of tall stature
 - b) body type – preferably ecto-mesomorph or ectomorph. In a developing athlete a mesomorphic physique is disadvantageous in the long term.
- 2) Running potential – this is based on relaxed movement, balance and spring. Pure speed, at this stage, is less important than these qualities.
- 3) Psychological qualities – attentive, relaxed and confident but not too confident! It is also important to have an active imagination and an open mind to learning.

6. *Which special exercises and equipment do you use for specific technique training?*

BAILLY:

For the young beginner (male or female) I use particular educational drill – the 'held-plant'. As soon as the beginner can handle a stiff pole correctly, sometimes even from the first lesson, I use this drill.

- 1) Bend the pole in the box from a standing position
- 2) ditto from a walking position
- 3) ditto from a 4 strides jog
- 4) ditto but with a take-off. The holder places the left hand on the vaulter's left thigh, to check straightness and prevent a dangerous rebound of the take-off leg back to the ground, and the right hand at the top of the back, to balance the pole/vaulter system and to direct the vault.
- 5) when this drill is mastered, repeat it from 6 strides, accompanying the vaulter onto the landing mat
- 6) ditto, with the vaulter landing on his/her back at the edge of the landing mat

6. Which special exercises and equipment do you use for specific technique training?

7) ditto, with a half turn and landing on the stomach.

Then, when the total action has been built up, an elastic 'bar' can be placed at a height of 1.50m.

I mark the point of take-off with a brightly coloured rubber mat, in order to give confidence to the beginner. I also use this drill with experienced vaulters, to correct their take-off, if it is too near, or if they attack the box with a bent lower arm.

Since repetition drills can be boring, although very necessary, I enliven the training with the following test.

From a 6 stride approach,, and with the highest possible grip on the pole, the athlete takes off and lands on his/her back, without letting go of the pole and with the pole and keeping the pole perfectly in line with the run-up.

I believe strongly in miming, in drills which teach an understanding of the perfectly executed movements at slow speed, before moving on to faster speeds, and in the mental rehearsal of the event.

Extra Equipment

- portable box (for a 6 to 12 stride run-up)
- raised track (full run-up, 20cm high, box below)
- sloping track (6-8 stride run-up, from 1.20m to 60cm)
- elastic pulling apparatus for speed work
- electronic timing, to measure speed, with and without the pole, on the runway or on the track; for example, 20 metres from the take-off, to compare the times of the first and last 10 metres.
- video.

BOTCHARNIKOV:

We do not use special equipment for technique training. If one has imagination, one can utilise any of the normal equipment found in the gymnasium or athletic stadium.

KLIMA:

The most important pieces of gymnastic apparatus are the ropes, horizontal bars and the rings. Other gymnastic equipment can be used to provide variety but most essential is continuous practice of the basic exercises on the above items.

MARTÍNEZ LUCÍA:

Performance in the pole vault relies on a multitude of small details. There is no special exercise or sophisticated apparatus that will lift the vaulter to greater heights. Correct planning of the training and a technical process with correct methodological criteria will lead to top performances – if we work with talented athletes.

McGINNIS:

Most of our specific technique training involves vaulting itself – ten to fifteen vaults per session, if full runs are used, and twenty or more, if shorter runs with lower grips on smaller poles are used. We practise take-off technique by jumping into a sand pit, while simulating the plant action with a "stubby" pole (about 1m long); by jumping off a gymnastics beat board and landing on gymnastics mats; by jumping up and gripping a high bar from a mark further and further from the bar; or by jumping and gripping a rope higher and higher up. We practise the follow through and swing with rock-back exercises on the high bar. Starting from a hanging position, the vaulter swings slightly from his hands and then attempts to rotate at his shoulders and invert himself so that his hips end up against the bar directly above his shoulders. We

6. Which special exercises and equipment do you use for specific technique training? 6. Which special exercises and equipment do you use for specific technique training?

practise the follow through, swing, extension, and clearance actions with rope vaulting. Extension and clearance are practised by swinging on a high bar and then shooting the hips and feet upward and forward, while turning over an elastic band set up in front of the high bar. The vaulter lands on his back on a high jump pit. We practise bar clearance technique on the trampoline, by dropping onto the back and bouncing upwards and backwards over an elastic band. We also practise bar clearance by rolling backwards on a mat into a handstand and over an elastic band.

NIELSON:

Most of the drills and exercises we use are traditional or borrowed from other coaches. One general type of gymnastic activity that simulates the vault swing is the "tap" swing; Some examples of our use of this tap swing are high bar drills, such as giant swings and swings with a half turn (blind changes). This has helped stimulate active inversions on the pole and a feeling of confidence.

RAILSBACK:

Speed and jump training are the most important factors, along with learning proper planting mechanics. The vaulter must learn to be a sprinter with a pole. Timing the last 6 steps of the approach to the take-off point is a very good tool. I like the vaulter to try to attain maximum speed at take-off - *maximum*, crazy, up against the wall, all out speed at take-off. Notice I did not use the term "maximum controlled speed". I have found that, if you tell athletes to control their speed, they will do it very well.

I want to control their speed by limiting the length of the approach. Early season, using only 12 strides, I want the athlete to attain the maximum speed at take-off that can be achieved in that distance. Going back to 14, 16, 18 and maybe 20 strides (for the elite athlete), we still strive for maximum speed that can be generated in that approach. Why run 18 strides and be slowing down at take-off? Jumping mechanics are much easier when accelerating than decelerating.

The major fault I observe in younger vaulters is that they run too far. Athletes with great speed need longer approaches. Young vaulters do not possess great speed by the nature of their age. As I tell coaches, Carl Lewis needs 50 metres in his long jump approach; Tommy Turtle is going top speed in one stride. There are too many young Tommy Turtles trying to use Carl Lewis's approach concept.

Besides speed training, the vaulter must practise proper pole planting and take-off techniques. The practice of holding at a moderate height, planting early and high and using good jump mechanics into a long jump pit is very good. (Plant the pole into the sand!)

The coach/vaulter should strive to have the toes of the take-off foot in a plumb line with the top of the top hand on the pole. Only then can the vaulter use proper jumping mechanics. The vaulter should be rising up over the ball of the foot, with the top arm fully extended as the pole touches the back of the box.

The concept of pole speed is also very important. Moving the pole from the take-off position to vertical as quickly and smoothly as possible is a must. Many improper mechanics can negate pole speed, such as: holding too high, slowing down through the take-off, a low, late plant, being "under" at the take-off, pulling with the top arm, trying to get upside down too soon, any of these can slow down the pole.

Now, how many times do we see young vaulters hold too high, slow down at take-off, get "under", pull with the top arm, try to get upside down fast ... all in the same vault.

6. Which special exercises and equipment do you use for specific technique training?

Think of pole speed like the movement of a metronome. With the weight high on the lever, the rhythm is slow. With the weight away from the top, the tempo is faster. The weight is the centre of mass of the vaulter. Even though today's elite vaulters hold very high, their technique through the plant, take-off and follow through or penetration phases keeps their centre of mass away from the top hand. This allows the pole to move forward and upwards rapidly to the vertical position. This is sometimes hard to see with the bending of the pole. The coach can, in video studies, draw a straight line from the bottom of the pole to the top hand. Watch this straight line movement. With proper mechanics, the pole will move quickly and smoothly to a vertical position.

I must address one issue that has come up over the past few years. That is the concept of a "free take-off" or actually leaving the ground before the pole hits the back of the box. In all the video studies I have made, and from talking with leading biomechanists I have found *no evidence* that this is done in proper, elite vaulting. This is not pole vaulting – it is voodoo vaulting. It is very dangerous for any athlete or coach to try this manoeuvre. It is one thing to hold low, run slow, and practise early jumps. It is a totally different thing even to suggest the concept of a so called "free take-off". There is not one world elite vaulter who does this, and it is gross negligence for any one to suggest that this is the way to higher vaults.

SHURAVETSKY:

There are no special exercises, other than those used by most coaches. Most proficient coaches and athletes can read a diagram or watch a video and attempt to analyse and copy what they see. The answer is not in analysing the action in isolation but rather the intention that exists behind the movement that powers that action. Analysis of static positions does not tell the whole story. What is needed is an understanding of the objective behind the movement. Not just the 'how' but also the 'why'. The ideal technique is developed from following a set of rules and principles of movement which result in the action you see; the action is not developed for its own sake.

