

THE IAAF - TOP-COMPETITION BIOMECHANIC RESEARCH PROGRAMME AND ITS PRACTICAL COACHING APPLICATIONS

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“ *The Author here illustrates the significance of the Biomechanic Research Programme, its aims and its future developments. He also explains how coaches and athletes can use the information gathered during the major competitions to their best advantage.* ”

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After experience with earlier research programmes we have come to the conclusion that a project as complex as the IAAF-Top Competition Biomechanic Research Programme requires the combined expertise and technical equipment of research centres from several countries. Taking into account the present scope of biomechanics, and more generally of bionics, it is the only way the real possibilities and potential of modern methods of research and technical equipment may be realised.

There is no doubt that such a combined team of experts, along with coaches, teachers and athletes form an excellent background for mutual influence on ideas and methods and for shifting forward the development of athletics.

The principal ideas and goals of the project were summarized by Helmar Hommel in his article published in "New Studies in Athletics 2". We should like to underline that there is a

whole complex of questions and problems raised by taking a biomechanic point of view. Problems such as technical performance, among others, must be solved in order to make an immediate contribution to coaching knowledge. After the completion of research over the next three years the results of this programme should be elaborated on two levels:

1. For coaches of juniors, where the correct and proper training of technique is of primary importance in the development of individual athletes, as well as for coaches in countries less developed in athletics.

2. For coaches with the highest degree of education in sport, who train elite athletes.

The IAAF - Top-Competition Biomechanic Research Programme will include research done during the most important IAAF events - The World Championships of Athletics, The World Junior Athletics Championships, etc. and hopefully the Olympic Games - complemented by research done by the participating laboratories during international and important local events which take place in their countries. It goes without saying that this research is accompanied by thorough study and analysis of literature as well as film and video material.

Following initial research activities at the European Athletics Championships in Prague 1978 and Athens 1982 as well as the World Championships in Athletics in Helsinki 1983, a seven hour serial titled "Champions Style I, II, and III" was produced. Available on cassettes for daily use by coaches and teachers it concentrates on individual events or complexes of events

such as jumps, throws etc., using animation and special effects to explain important material. The next major step of this international project took place at the World Junior Athletics Championships in Athens held in July this year. The results of this research were "Fast Information" reports (66 pages) available after each day's competition as well as a 2 hour 27 minute video cassette and a final "Research Report" (247 pages) both of which were completed within 96 hours of the Closing Ceremony.

These materials form the basis for the future research projects to be included in the IAAF programme.

The expected output of the planned research will be presented without unnecessary use of formulas and equations or complicated descriptions of methods and measurements. Instead, simple formulations and one meaning descriptions of the action, along with recommendations for new training techniques, will be used. Further information on the relationship between applied biomechanics in sport and its consumers, i.e., coaches, teachers and athletes, is available in an article by Juris Terauds published in "New Studies in Athletics 3".

How to utilize the Reports from the World Junior Athletics Championships

The reports from the World Junior Athletics Championships are probably the first attempt, in an international context to inform coaches and athletes directly after a competition, on biomechanical observations made by experts. "Fast Information" reports were at the disposal of participants between 2 and 36 hours after each event

while the "Research Report" was completed and bound 96 hours after the Closing Ceremony.

The acceleration of the exchange of information between researcher and athlete/coach taking place only a few hours after the competition brings with it a danger of mistakes, inaccuracies and sometimes a formal character of information without practical or valuable content. Most of these deficiencies are due to the complexity of methods used and the volume of work involved. It must also be noted that the value of information about individual events is not and cannot be proportional or exhaustive.

We are, however, firmly convinced of the importance, correctness and right perspective of this endeavour. To eliminate some of the problems we have concentrated our efforts on creating a stock of software in order to computerize our work and eliminate, to the highest possible extent, the human factors – one of the sources of inaccuracies.

Another problem, no less important, is finding a common language between experts in the field, and coaches. We shall try, therefore, to describe briefly some general and detailed aspects to give coaches guidance when working with our published material.

General Aspects

1. Biomechanical study of juniors and seniors can gradually build up a more exact picture of the technical development in a given event.

2. The parameters of geometry and kinematics of the movement in a given technical event permit a more precise formulation of partial goals, in an ef-

fort to equal or surpass the athlete's present technical performance.

3. It is possible with more precision to confirm, to correct or to reject the technical performance by each individual athlete when the coach makes a detailed analysis of his/her technique.

4. It is possible to influence partly the composition of the training process aiming at the planned development of the athlete and at suppressing technical inefficiencies. It means also that it is possible to select training practices and pursue a methodical sequence towards perfection of technique with the aim to stabilize the optimal structure of movement.

5. Last, but not least, the expected results of biomechanical research are confronted and compared with pedagogic observations and long term practical experience of coaches.

Detailed Aspects

1. In the sprints and hurdles, the correct distribution of effort by each athlete during the competition can be evaluated by studying the intermediate times. Where important deviations from the model intermediate times are observed we can assess what type of competitor the athlete is and what his strengths and weaknesses are, such as acceleration, speed endurance, etc., so that a coach can plan a training programme accordingly. The model intermediate times for all sprints and hurdles have been worked out from measurements taken during the principal international competitions in the years 1978-85 and a study of analyses published in technical literature.

2. In the relays, the quality of performance of each individual change of

the baton can be evaluated, once we have the knowledge of the time required for the baton exchange inside the exchange zone.

3. In the running events the physiological aspects are most important and the basic parameters presented in our reports have only an orientational value. In the walking events we concentrated our interest on the problem of permanent contact with the ground. We proved that for juniors permanent contact in competitions does not exist. The same phenomenon was ascertained in senior competition. The attention of coaches should be concentrated on the stretched leg at the knee joint during the period of contact with the ground. At the conclusion of our study, we formulated a recommendation for the IAAF Walking Committee.

4. In the jumping events the correctness of the pretake-off adaptation can be ascertained by analyses of the geometric and kinematic parameters of the last 2-3 strides before take-off. Similar methods can be used for the performance of the take-off and technique of the jump itself. In the long jump, as well as the triple jump and pole vault, run up speed is the parameter which most influences achievements. When measuring we take particular interest in this aspect of the performance. Information such as this should influence the attitude of coaches during training, and lead them towards or away from the practicing of technique when the athlete's speed is not at its best.

5. The analysis of geometry of movements and kinematic data collected in competitions prove that there are considerable deficiencies in the

performances of individual athletes. Deeper study of these facts is one of the roads leading to the athlete's progress and helps to influence training methods for technique.

6. The amount of information from qualification rounds will be reduced. The importance of information from the qualification rounds is often exaggerated by coaches. It cannot be expected that, in the period between the qualification rounds and the Final, the technique of the performer can be influenced. It is more possible, however, to influence the actual state of movement ability of the athlete. Only in the technical events and relays can the attention of the athlete be drawn to apparent technical faults which are not a permanent part to the dynamic stereotype of the athlete. Such advice can have a positive influence in the final if it takes place shortly before.

We need to differentiate our approach to the presentation of information immediately after the conclusion of the competition. We also desire to make an immediate, if necessarily gradual, contribution to coaching knowledge. This has led us to the decision to distribute the results of our research in different stages of the programme.

The main aims of our project are:

Software

1. To create software and exploit sophisticated equipment to improve the content of the "Fast Information" reports supplied to coaches and athletes within 24 hours of the competition. Data will be supplemented by commentary enabling simple interpretation of its content.

2. To improve the software equipment and methods of using computer

techniques for space analysis of the athlete's movements as seen by two or more synchronized high speed cameras.

3. To accumulate sufficient quantities of software, enabling critical evaluation of analysed performances. Biomechanic analyses gained by space and high-speed cinematography requires different approaches for each event. Peculiarities of the individual athletes and his/her performance must be respected through a casual approach.

Film Video Kinograms

An international databank is expected to be created to include:

1. Film materials from high speed cameras. The shooting will be methodically directed so as to enable biomechanical space analysis to be carried out at any laboratory having film analysers.

2. Video material available for study by experts, coaches and teachers to be used for ideomotoric training and other pedagogic uses.

3. Kinograms of the best junior and senior athletes as the best intuitive means of information supplemented by results of biomechanical studies or at least by a coaching description.

The databank will be regularly supplemented every half year beginning December 1987.

Publications

The series "Biomechanical Aspects of Athletics".

To produce and publish at the end of the Olympic cycle 1985-88 (i.e. from October 1988 to April 1989) a series of publications and video cassettes covering all the relevant information concerning the Olympic cycle and major events between 1978 and 1985. New editions (supplemented with new information) after each Olympic cycle are strongly recommended. The sections of this series should include:

1. Sprints and Relays
2. Running and Walking
3. Hurdling
4. Long and Triple Jump
5. High Jump
6. Pole Vault
7. Shot Put
8. Discus Throw
9. Javelin Throw
10. Hammer Throw.

Each part should be fully illustrated by kinograms, colour diagrams, charts etc. and supplemented with a video cassette summarising dynamic information related to the text.

The video cassette should include a programme (30-40 minutes) detailing the methodology of teaching athletic events. The programme should be designed for the developing countries and should respect the special features of age categories and the knowledge of the teachers and coaches.

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