The development of combined events scoring tables and implications for the training of decathletes

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by Viktor Trkal

ABSTRACT

Scoring tables for the combined events make it possible to evaluate and compare performances by athletes in different disciplines and score the competition using a system of points. The first documented scoring tables were produced in 1884 and over the next 100 years there were a number of revisions and modifications leading to the official IAAF tables now in use throughout the world. In this article, adapted from a presentation given at the High Level Coaching Seminar 'Combined Events' (Prague, Czech Republic – 27-30 September 2002), the author gives a brief history of the combined events then traces the development of their scoring tables. He explains the basic types of table (linear, progressive and regressive) and discusses the concepts central to scoring table development. He identifies idiosyncrasies and problems in earlier tables (tables produced in 1912 scored each performance to the second decimal point while tables in use between 1962 and 1985 were unpopular because they were progressive for the running events but regressive for the jumping and throwing events). As the leader of the working group assigned to produce the present IAAF tables in the 1980s, he is able to provide first-hand information on the process that was followed and give unique personal insight into the thinking that took place. He concludes with a brief discussion of the practical implications of the design of the present tables for the preparation of decathletes.

AUTHOR

Viktor Trkal was born in Czechoslovakia in 1929. He graduated from Charles University in Prague in 1952, and obtained his PhD in 1958. Since 1955 he has worked with the Institute of Radio Engineering and Electronics at the Czechoslovak Academy of Sciences and was the Director from 1990 – 1994.

He competed in track and field at both junior and senior level until 1958, and is now active as a judge and coach. He has been President of the Czech Athletics Federation and a member of the IAAF Technical Committee.

The Origins of Modern Combined Events Competitions

Combined events have been considered to be the measure of versatility in athletics as far back as the era of the ancient Greeks. Combined event competitions fit in with attempts to achieve harmonic growth, i.e. a universal physical and mental standard of life ('calocagathy'). The pentathlon, composed of the long jump, the discus, the javelin, the 192m sprint and wrestling, was first included in the Olympic Games in approximately 700 BC.

When the ancient Games ended in 390 AD, there was a break in combined event competition that was to last almost 1,500 years. However, the tradition began to resurface again in mid-19th century England and there is evidence of similar developments in Germany at about the same time. The modern combined events probably began in America in about 1880. Early competitions there were held over a single day and became so popular that the organizers of the 1904 Olympic Games in St Louis included a combined events competition as an unofficial discipline in the programme of the Games.

In the same period experiments with the pentathlon and decathlon took place in Germany and Scandinavia. At the 1906 Olympic Intermediate Games in Athens, the Greek organizers tried to revive the classic pentathlon with the following structure: standing long jump, old-fashioned style of discus throw, javelin, 192m sprint, and wrestling. However, by then the trend was irrevocably towards a combined events competition that was purely athletic, with a balance between running, jumping, and throwing disciplines and requiring explosiveness, power, and endurance.

The organizers of the 1912 Olympic Games in Stockholm decided to include a one-day pentathlon (long jump, javelin, 200m, discus, and 1,500m), as well as a two-day decathlon (100m, long jump, shot, high jump, 400m, 110m hurdles, discus, pole-vault, javelin, and 1,500m) in to the programme. In fact, because of the high number of athletes taking part, the decathlon was extended to three days and there was a change in the order of disciplines (between the discus and the 110m hurdles). However, the original sequence of disciplines was approved by the IAAF Congress in 1914 and has remained unchanged until the present time.

The First Scoring Tables

Initially, the combined events were assessed on the basis of an athletes' position in each of the individual disciplines. The winner was the one who had the lowest sum of positions. However, it soon became apparent that a common denominator was needed to evaluate performances and this led to the creation of points tables.

There are three basic types of combined events points table: linear, progressive, and regressive. In linear tables, the increase in points is even and in line with the improvement in performance, from the lowest score up to the peak. This is expressed as a straight line on a graph. With progressive tables, the growth in points increases with the improvement in performance. Graphically, this is shown as a rising concave curve. With regressive tables, the growth in points falls with improving performance. This is shown as a downward concave curve on a graph.

All the early scoring tables were linear because this structure was easier to work with. In a graphic form, it is necessary to decide on two points - the peak (national/ world record etc.) and the beginning and to draw a straight line between these points. The first documented linear table was prepared in the USA in 1884.

When the decision was made to include the men's decathlon in the 1912 Olympic Games, the Organizing Committee prepared a new set of tables for international competitions. Keeping in mind the workload involved, the Committee produced a set of linear tables, where the Olympic records valid in 1908 were given a value of 1000 points. A special feature of the 1912 tables was that fractions of points were used (to more than two decimal places), so that every possible performance in each discipline was given a specific number of points.

Athletes and trainers were not keen on the 1912 tables, because the comprehensive points system involved was very complicated. In 1915, the Americans adjusted the tables by, replacing the original records with the Olympic records as they stood in 1912. These tables were formally approved by the IAAF in 1921 (although they had already been used in the 1920 Olympics) and were applied at the Games in 1924, 1928, and 1932, as well as at the first European Championship in 1934 in Turin.

Progress in Scoring Table Theory

In the 1920s, three concepts were central to thinking on the development of scoring tables and they have had an impact on the design of all subsequent tables. They were:

1) The fact that each improvement in performance is more difficult the closer the athlete comes to the maximum performance achieved. This can be expressed statistically as follows: the probability that an athlete will achieve or beat a given performance falls rapidly when his/her performance comes close to his/her personal best or the record. The evaluation of the performance can be derived as inverse probability. The scoring tables that follow this principle will be progressive, but, if the principle is applied simply, the tables will tend to be excessively progressive. One task for the designers of any new tables is to eliminate this extreme nature.

2) The need to enable a comparison of performance in one discipline with performance in another discipline (an athlete's own performance or that of another athlete). The aim was to make possible comparisons of various disciplines and of various individual competitions.

3) The desire to have a truly scientific basis for the selected points system. With increasing research into human physiology and improved knowledge of sport, it seemed possible to base the tables on physiological indicators, such as heat rate, number of breaths, oxygen intake, etc.

The attempts to incorporate these and other concepts into the development of scoring tables over the past 65 years have created a fascinating history.

The 1934 Tables

At the end of the 1920s, the Finnish Athletic Federation started developing a new set of scoring tables, which eventually would be completed by J. Ohls in 1931. In these tables, fractions of points were eliminated and points in all disciplines were counted from 0 to 1150. The tables were progressive and based on the formula $P = (e\ M)$, where P is the points, e is the basis of natural logarithms, and M is the performance. These tables met with such a positive response worldwide that they were approved for international competition at the next IAAF Congress in 1934 and used at the 1936 Olympic Games and the European Championships in 1938, 1946, and 1950.

The 1950/52 Tables

Post-war improvement in athletic performance, rule changes and development of technical equipment led to further work to modify the tables. The 1946 IAAF Congress in Oslo set up a Table Committee and Sweden's Gosta Holmer and Axel Jorbeck were responsible for the design of the new tables. The result was introduced in 1950 but, as their progressiveness was considerable, the tables were subject to criticism. In the following two years, they were revised and the whole set of tables were approved at the 1952 IAAF Congress in Helsinki.

The 1962 Tables for the Decathlon

In the late 1950s, the disadvantages of the very progressive tables from 1950/52 became increasingly apparent. A working team led by Jorbeck started preparing new tables for men in accordance with principles proposed by Dr Karl Ulbrich from Vienna. These were very simple. The basis of each performance is the speed v. Using all the statistical data available, two performances had to be determined and given the values 0 and, for example, 1000 points. For running competitions, the time has to be converted into speed and this is used to construct the table. The result of Jorbeck's processing was a very slightly progressive scoring table for running events.

For the technical disciplines, the problem was much more complicated. Ulbrich proposed that the basic indicator contributing to the performance should be the speed of the body in jumps or of the implement in the

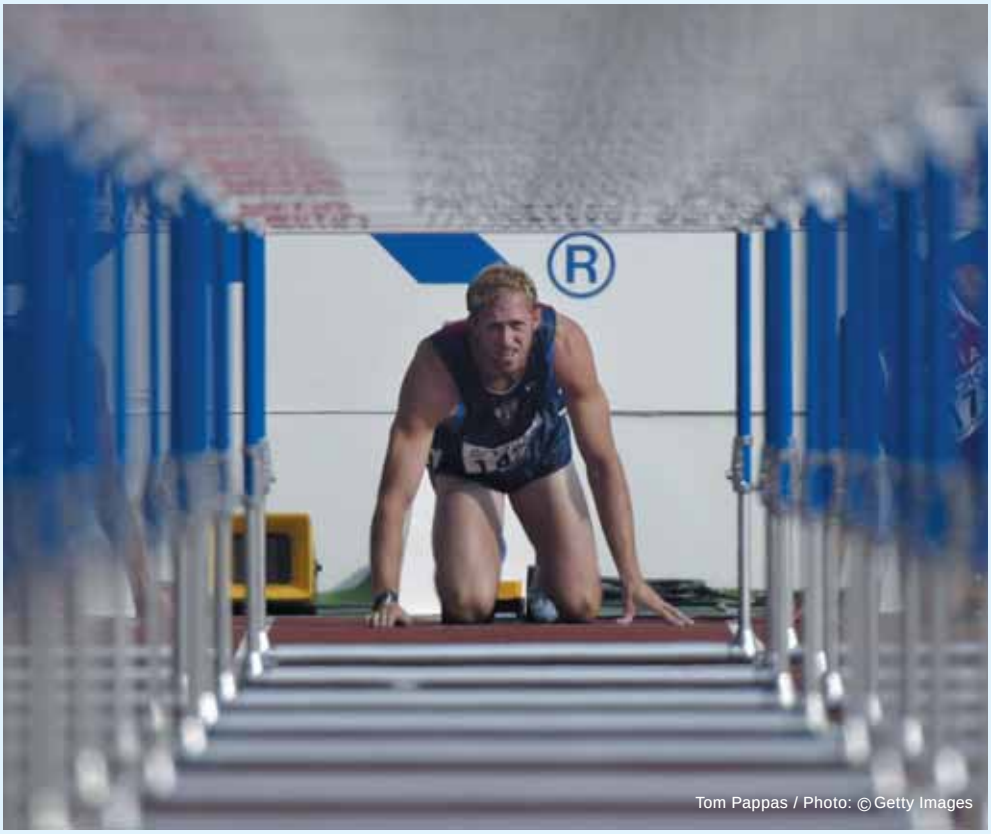
throws. In this case, the basis is the physical relation for the throw perpendicularly upwards, where the speed occurs in the power of two, v2. Jorbeck's working team did away with the powers in the relationship, in order to arrive at v to the power of one, and thereby produced a points table of a regressive nature. This meant that the runs were evaluated on a progressive basis and the technical disciplines on a regressive basis.

The 1962 IAAF Congress in Belgrade approved these tables. To take into account timing in hundredths of a second, made possible by electronic timing equipment, the tables for the running events were modified in the 1970s.

Development of the Present Tables

At the end of the 1970s, the athletics movement applied considerable pressure for a review of the 1962 tables. The feeling was that they were becoming increasingly unfair for evaluations and comparisons of disciplines.

There were two reasons for this demand. Firstly, hitherto the tables were meant to be used as a points system in combined events and for comparing the performances of various athletes in various disciplines. Improved, more intensive methods of preparing athletes, changes in technique (e.g. the use of a different method of jumping over the crossbar in the high jump) and the use of different materials for the manufacture of vaulting poles contributed to radical changes to performances in some events and thereby did away with the equivalence that had previously existed. For example, the evaluation of Daley Thompson's pole vault of 5.10m (not an exceptional performance these days) was 1075 points, which in these tables was equivalent to running the 100m in 9.99 seconds!



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Secondly, by following Ulbrich's principle, the scoring tables used for the runs were progressive while for the technical disciplines they were regressive. This was not to the liking of many people as it seemed hardly sensible for an athlete who, for example, in the high jump achieves performances of around 1.60m to receive more points for an improvement of 5 cm than the same improvement at around the 2.00m level.

The first to try and prepare new tables was Bob Sparks, Chairman of the International Association of Statisticians, whose unfinished draft was accepted by an Extraordinary IAAF Congress in Rome in 1981. These tables were very progressive and, because of the extreme disagreement voiced by combined event athletes and their trainers, the IAAF Council withdrew them before the end of 1981 and commissioned the Technical Committee to draw up a new proposal.

At the next meeting of the Committee, on the occasion of the European Championships in Milan (1982), I was tasked with leading a working group that was to try to find an acceptable solution. After studying all hitherto unused proposals and suggestions regarding the current tables and discussing the matter personally with Dr Ulbrich, I proposed to the working group, which agreed, that the new tables should be developed according to the following nine principles:

1) The tables should only be used for combined events.
2) The results in different disciplines that are evaluated with approximately the same point value should be comparable as far as the quality and difficulty of achieving these results are concerned.
3) The tables in all disciplines should be:
   a. a modification of current tables
   b. linear in all disciplines
   c. very slightly progressive in all disciplines
4) The tables must be usable with combined events for beginners and juniors as well as top-class athletes.
5) There will be separate tables for men and women.
6) The tables must be based on decathlon statistics, taking into account the statistics of specialist athletes in the individual disciplines.
7) The tables should be usable now and in the future.
8) The sum of points scored by world-class athletes should remain approximately the same.
9) As far as possible, the tables should eliminate the possibility that an athlete specializing in one discipline is able to acquire sufficient points in that discipline to overcome a low scores in weaker disciplines and beat more versatile, all-round athletes.

It was decided that work on variations to meet the conditions in no. 3 would be carried out by sub-groups of 1 to 3 persons. I personally took responsibility for 3c.

My starting point was the idea that athletic performance is physical work. This is represented primarily by kinetic energy of the given system, irrespective of whether a run, jump, or throw is involved. Speed v is to the second power in all cases, and this indirectly implies a progressive form for the necessary curve. The American J Gerry Purdy, PhD., has published two articles on the evaluation of performances in athletics, and I studied these. Using statistical data from the countries then included in the IAAF's AA and A groups on the disciplines of combined events, I elaborated a variation that became known as the Czechoslovak proposal.

The tables were slightly progressive in all disciplines with slight variations in climb rate for the curves of the different disciplines. I respected the weight of the decathlete (men) or heptathlete (women), especially in the longer runs.

The Technical Committee assessed a number of other proposals from Portugal, the USA, East Germany, West Germany, Hungary, Sweden, and Czechoslovakia. On the recommendation of the working group, the committee approved a modified version of the Czechoslovak proposal, while respecting some suggestions from Hungary, West Germany, and Sweden, which it recommended for discussion at the 1984 IAAF Congress in Los Angeles. The Congress adopted the tables for use in men's and women's combined event competitions from 1985. Since then no modifications have been made.

The 2001 IAAF Congress in Edmonton approved the inclusion of the women's decathlon among the disciplines, for which world records are kept and approved supplementary tables for the disciplines expanding the heptathlon into a decathlon for women.

I am convinced that even if it is never possible to evaluate equivalent performances in individual performances absolutely precisely, the current system of evaluation is the fairest of all those used in athletics so far. The tables guarantee that an athlete's performance will be fairly assessed as a set of points taking into account his/her possibilities from the aspect of physical proportions (i.e. weight and height).

Practical Implications

What are the implications of the IAAF Combined Event Scoring Tables now in use for the preparation for the combined events and in particular the decathlon? Because the tables are based on the theoretical requirement that kinetic energy exerted by the athlete is responsible for the performance (the work), it is necessary in training to emphasize primarily the speed element of preparation. It is also important to control an athletes' weight, so that an optimal balance, in terms of strength, agility and coordination, can be found in the ability to cope with the disciplines.

It is down to the art of trainers and their support teams to find the optimal condition for each athlete, along with the best possible management of techniques in the individual disciplines. When trying to make the correct choice of training strategy, it is important to realize that the decathlon is a combination of technically different disciplines, and, therefore physiologically different training approaches are required. Besides the sprint disciplines, there are jumps and throws, and the 1500m assumes a special position.

At the level performance between 6000 and 8000 points, it should be taken into account that to gain 50 points, a decathlete has to improve on average as shown in table 1.

A successful performance may depend on the choice of training strategy preferring mobile features in disciplines where the athlete of average weight is likely to make an impact (jumps, sprints), and, on how to cope, in this situation, with the shot put and the throws, so that the necessary power training does not work too much to the detriment of performance in the 1500m. This means placing an emphasis on the correct technical management of the throwing and jumping disciplines.

100m	LJ	SP	HJ	400m	110mH	D	PV	J	1500m
0.25	22	82	5-6	1.20	0.53	2.45	17-18	3.30	7-8
Sec	cm	cm	cm	sec	sec	M	cm	m	sec

Table 1