Performance development in the jumping and combined events

by Hartmut Dickwach & Karin Scheibe

1 Introduction

This article is the first of a two part series which will examine performance trends in athletic events. We are studying these trends because their identification makes it possible to assess and categorise current results more reliably.

Performance trends can best be seen over long periods of time. We have concentrated our attention on results of the world’s best athletes as well as on results from the world’s major championship competitions.

In this article we focus on jumping and combined events. The combined events have been studied along with the jumps because it can be argued that the performance structure of the combined events are akin to those of the jumps. The next part of this series will analyse the throwing events and also compare them to the jumps.

2 Data base & method of analysis

Our source of reference for the analysis of results by the world’s best athletes was the annual World Top 50 results lists from 1965 to 1991.

Our study of Championship results was done by comparing those who finished 1st, 3rd and 8th in Olympic Games finals (1968 onwards) and World Championship finals (1983 onwards).

Most of the results in the World Top 50 lists will have been achieved when individual athletes were in peak condition, under optimal climatic conditions, and when the competition rules were stretched to the limit as, for example, when some events (100 metres, 200 metres, 110 metres hurdles etc) are aided by a maximum allowable 2 metres per second tail wind.

Unlike most results in the world lists, performances in finals at individual Olympic Games and World Championships are achieved under identical, not necessarily optimal, climatic conditions,
and when athletes may not be at their peak for the year.

Also, only three athletes of each country may take part in these championships. In some cases highly qualified athletes may fail to make their national team. This could be because of strength in depth within a nation (for example, Kenya in the steeplechase or the USA in the sprint events) or because of strict trial conditions. For example, World Decathlon champion Dan O’Brien did not compete in the 1992 Olympic Games because he did not finish in the first three at the US Olympic trial.

2 Performance development

The assessment of the world lists' performance trend is done on the basis of the smoothed curves of the mean values of the Top 10 and following 40 best marks from 1965 to 1991.1 The figures also include the best marks of the respective year. The best marks of the year 1992 and the mean value of the Top 10 best marks of 1992 (Vogel 1992) are presented in Table 1, as the 1992 World Top 50 lists were not available at the time of writing this article.

Table 1: 1992 results (Vogel).

<table>
<thead>
<tr>
<th>Event</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-10 mean</td>
<td>1-10 mean</td>
</tr>
<tr>
<td>High Jump</td>
<td>2.37 2.35</td>
<td>2.05 1.98</td>
</tr>
<tr>
<td>Pole Vault</td>
<td>6.13 5.92</td>
<td>- -</td>
</tr>
<tr>
<td>Long Jump</td>
<td>8.68 8.44</td>
<td>7.48 7.10</td>
</tr>
<tr>
<td>Triple Jump</td>
<td>17.72 17.42</td>
<td>- -</td>
</tr>
<tr>
<td>Comb. Events</td>
<td>8891 8464</td>
<td>7044 6641</td>
</tr>
</tbody>
</table>

As far as the jumping events are concerned, the assessment can be seen in Figure 1.

Over the period from 1965 to 1984/1986 (depending on the event) both curves show a steep rise. From 1984/86 onward the curves level off. The best mean values for the Top 10 athletes were achieved between 1985 and 1989, except in the Pole Vault, and the best performances of the following 40 athletes were achieved between 1984 and 1988 except in the men’s High Jump where the peak occurs in 1990. In the majority of events a plateau occurs, which means that there is a stagnation in performance values. A reduction of the mean values for the women’s Long Jump from 7.28 m to 7.08 m and from 6.82 m to 6.71 m is statistically relevant. A similar trend can be observed in the men’s Triple Jump and the women’s High Jump.

The Pole Vault proves to be the exception. There is a further increase of the mean values although the curves also level off.

‘Random’ variations in best performances can clearly be seen in Figure 1. This is particularly noticeable in the men’s Long and Triple Jump as a result of world performances in 1968 and 1975.

As far as the combined events are concerned, a change to the scoring system in 1985 and the replacement of the women’s Pentathlon with the Heptathlon in 1981 do not allow such a long-term analysis. Figure 2 includes best marks and mean values for the Top 10 and following 40 best marks for the period from 1985. For the period from 1980 to 1984, best marks and mean values for the Top 10 have been inserted in modified form according to the new scoring system.

Even with these changes taken into account, a stagnation in performance values is evident. In Figure 2 the highest mean value for women occurs in 1988 and for men in 1984. Thus, the combined events are at the same stage of development as the jumping events.

The four yearly variations of the mean values of heptathletes should also be mentioned. More clearly than in the other events, these variations reflect the significance of Olympic year.

In all the event groups, development in the area of the highest performance level was compared to the following performance level using the course of the Top 10 and following 40 best marks.

As far as the smoothed curves are concerned, Figure 1 shows a high agreement with regards trends.

The differences between the Top 10 athletes and the following 40 becomes more obvious if one makes a graph of the differences between the mean values over time. By way of example, Figure 3 shows the men’s Long Jump: Here the difference becomes greater (from 1972 onward from about 0.22 to 0.28 m). The men’s High Jump and the women’s Long Jump show a similar trend. In the other events (with the exception of the combined events) the trend remains unchanged.
Figure 1: Best marks and smoothed mean value curves in the jumping events.
In spite of the differences between individual events, we can see a relatively high degree of agreement between the values of the Top 10 athletes and the following 40 (performance density). This contradicts the widely held opinion that the values differ considerably between these two groups. In the long term, this trend of performance density in the Top 10 best performances has shown no tendency to change.

3 Competition results

Results of the Olympic Games from 1968 on and of the World Championships from 1983 on have been analysed in relation to the World Top 50 lists. As far as the competition results are concerned, our focus is on the medallists and finalists. Therefore, we have selected the performances of the athletes who finished 1st, 3rd and 8th. In Figure 4 these performances are presented against
the background of the smoothed mean value curves from the World Top 50 lists.

As far as placings are concerned, it is noteworthy that the level of performances in the men’s jumping events (and in the combined events) in the past Olympic cycle has stagnated in spite of some variations and extraordinary marks such as the 8.95m men’s Long Jump world record and the 18.15m wind-aided men’s Triple Jump mark. This corresponds to the stagnation in performance development mentioned previously. As far as the women’s Long Jump and, to some extent, the High Jump are concerned, there is a decline in the winners’ performances after 1988.

As far as the differences in competition performances between 1st, 3rd and 8th placed are concerned, the graphs show also an increasing performance density. However, we feel that a relatively ‘poor’ winning performance, and, therefore, similarity to the 3rd place result, is not necessarily evidence of increasing performance density since other factors will be involved.

Against the background of the performance development curves, the figures show to what extent individual competition performances can deviate from the mean values of the results of the World Top 10 athletes. For example, the winning performances in the men’s Long Jump and men’s and women’s combined events are much higher than the development curves. On the other hand, performances of 8th placed athletes in the men’s and women’s Long Jump are far below the curves.

These seemingly ‘random’ variations make the prediction of future competition performances considerably harder.

4 Future results

Table 2 is an attempt to predict future championship results. In order to increase the reliability of the prediction, the period has been restricted to 1993 to 1996, and relatively broad ranges of performances given.

Table 2: Prediction of major competition results in the jumps between 1993 and 1996.

<table>
<thead>
<tr>
<th>Events</th>
<th>1st place</th>
<th>8th place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Jump</td>
<td>2.34-2.38</td>
<td>2.28-2.32</td>
</tr>
<tr>
<td>Pole Vault</td>
<td>5.80-5.95</td>
<td>5.50-5.60</td>
</tr>
<tr>
<td>Long Jump</td>
<td>8.60-8.70</td>
<td>7.85-8.05</td>
</tr>
<tr>
<td>Triple Jump</td>
<td>17.60-17.90</td>
<td>16.90-17.10</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Jump</td>
<td>2.02-2.05</td>
<td>1.88-1.92</td>
</tr>
<tr>
<td>Long Jump</td>
<td>7.10-7.30</td>
<td>6.60-6.75</td>
</tr>
</tbody>
</table>

Because the women’s Triple Jump will be part of an outdoor Major Games’ programme for the first time at the 1993 World Championships a reliable prediction is hard to make. We expect a mark of between 14.40-14.60m to gain 1st place and 13.50-13.70m 8th place.

A conclusion and references will be presented in the next part of this series.

FOOTNOTES
1 See NSA 2, Volume 4: pages 51-56
2 All calculations and graphic presentations have been done with the STATGRAPHICS Statistical graphics System. For smoothing, a moving average of the 7th order was used.

We are grateful to Mr Günter Hering from Halle for the provision of the original data. This data come from the lists of world best performances published in the periodical ‘Der Leichtathlet’ and from the statistical yearbooks published by Peter Matthews. We thank Mr Manfred Grieser from Leipzig for his counselling on questions concerning rules.
Figure 4: Marks of athletes who were 1st, 3rd and 8th in jumping event finals at Olympic Games and World Championships (with the smoothed curve of mean values).