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Trends in the men's and women's sprints in the period from 1985 to 1990

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Translated from the original German by Jürgen Schiffer

1 Introduction

In the period from 1985 to 1990 the World Records in the sprints developed thus:

Men

100 metres

1987 - 9.93 - WR equalled - Carl Lewis (USA)

1988 - 9.92 - WR - Carl Lewis (USA)

400 metres

1988 - 43.28 - WR - Butch Reynolds (USA)

4 x 100 metres

1990 - 37.29 -WR - FRA

4 x 400 metres

1988 - 2:56.16 - WR equalled - USA

In the 200 metres Joe Deloach (USA) achieved a time of 19.75 in 1988, the best ever at sea-level and very close to the World Record of 19.72 set at altitude by Pietro Mennea (ITA).

Women

100 metres

1988 -10.49 - WR - F.Griffith-Joyner (USA)

200 metres

1985 - 21.71 - WR - Heike Drechsler (GDR)

1988 - 21.34 - WR - F.Griffith-Joyner (USA)

400 metres

1985 - 47.60 - WR - Marita Koch (GDR)

4 x 100 metres

1985 - 41.37 - WR - GDR

4 x 400 metres

1988 - 3:15.27 - WR - URS

Thus the period between 1985 and 1988 was characterized by a high level of performance and in some events the performances predicted by experts in the GDR were clearly surpassed:

	Prediction for 1988	WR 1985-1988
Men's 400 metres	43.75	43.29 (1988)
Women's 100 metres	10.70	10.49 (1988)
Women's 200 metres	21.60	21.34 (1988)
Women's 400 metres	47.65	47.60 (1985)

However, this picture of the development of World Records and of the world's best performances for the years 1985 to 1990 (see Figures 1 to 10, Performance Development) was not reproduced by the second and third best or the average of the 10 best performances.

The situation in the women's 400 metres clearly deviates downwards from the general trend of performance development. The decrease in performance is particularly obvious in 1989.

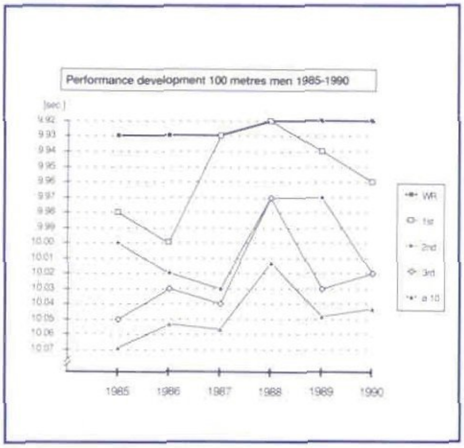
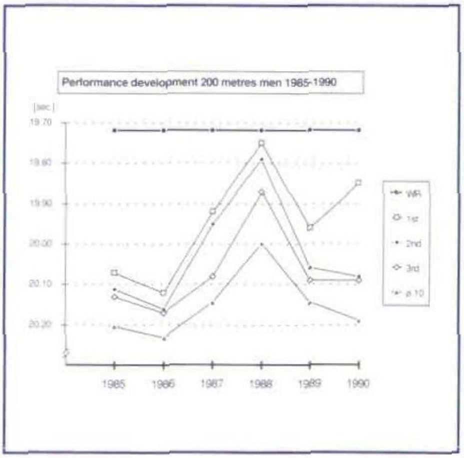


Figure 1



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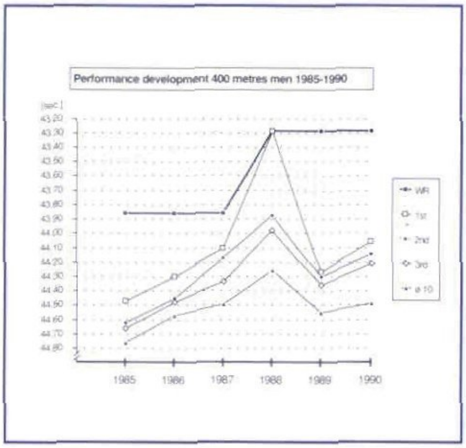

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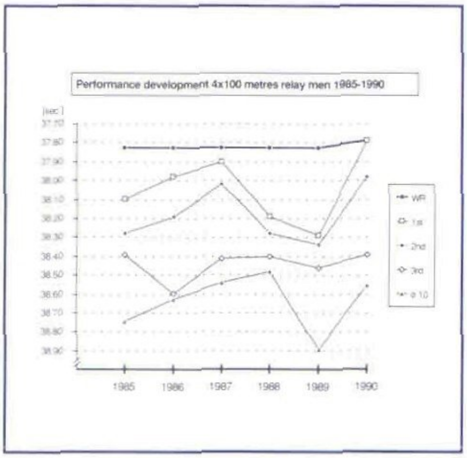

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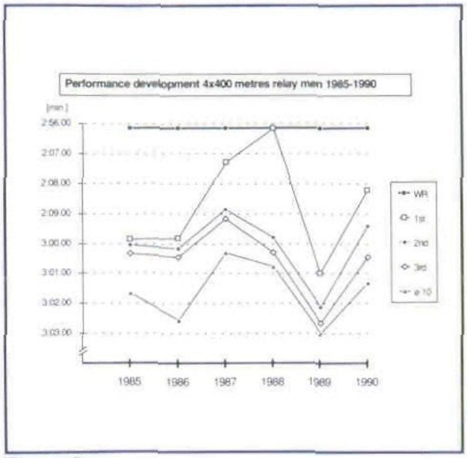

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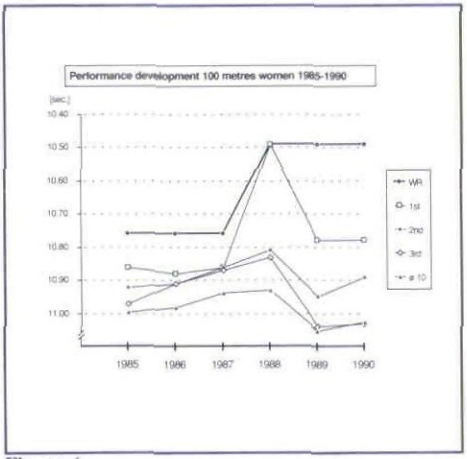

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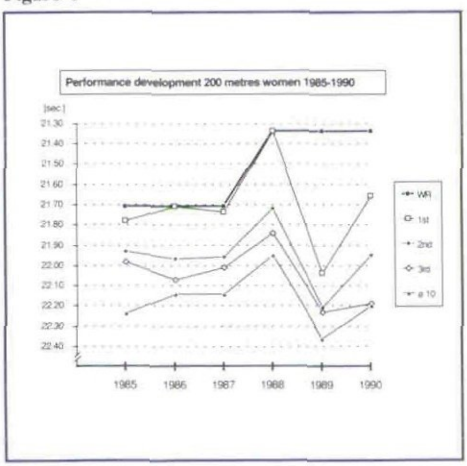

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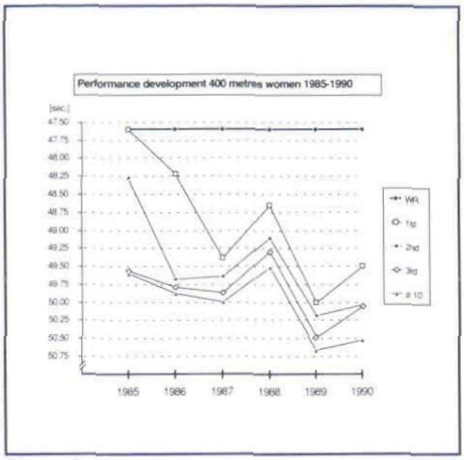

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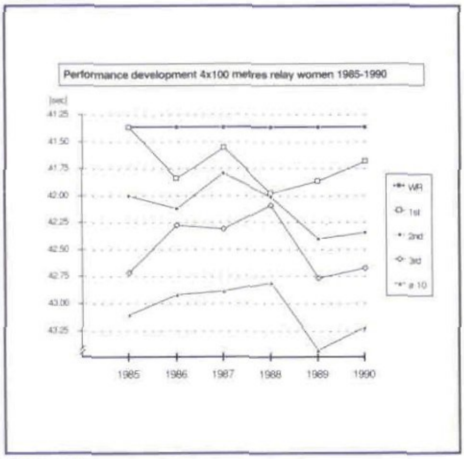

Figure 9

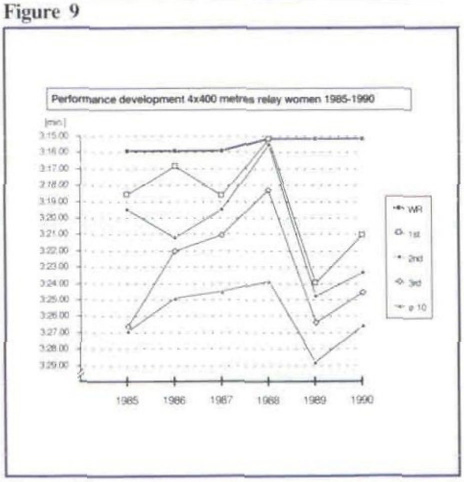

Figure 10

2 Presentation of selected performance structures

100 metres	Lewis (1988)	Griffith-Joyner (1988)
0 - 30m	3.90	4.09
30 - 60m	2.58	2.80
60m	6.48	6.89
60 - 80m	1.70	1.82
80m	8.18	8.71
80 - 100m	1.74	1.83
100m	9.92	10.54 (+3.00)
(see also Table 1 on the following page)		
200 metres	**Deloach (1988)**	**Griffith-Joyner (1988)**
0 - 50m	5.81	6.29
50 - 100m	4.54	4.89
100 - 150m	4.62	4.92
150 - 200m	4.78	5.24
0 - 100m	10.35	11.18
100 - 200m	9.40	10.16
0 - 150m	14.97	16.10
200m	19.75	21.34
400 metres	**Reynolds (1988)**	**Olga Bryzgina (URS, 1988)**
100m	11.15	11.94
100 - 200m	10.25	11.47
200m	21.40	23.41
200 - 300m	10.60	12.06
300m	32.00	35.47
300 - 400m	11.29	13.18
400m	43.28	48.65

3 Special aspects of these competition structures

3.1 100 metres

The attainment of new levels of maximum velocity is the most obvious characteristic of the 100 metres sprint.

These maximal velocities are closely related to high acceleration performances and the long acceleration distances required for this (up to 60m).

The 100 metres performance structure (selected races)		
Lewis	50 - 60m	0.83 sec. = 12.05 m/sec.
	50 - 80m	2.53 sec. = 11.86 m/sec.
Griffith-Joyner	60 - 70m	0.91 sec. = 10.99 m/sec.
	70 - 80m	0.91 sec.
	80 - 90m	0.91 sec.
	60 - 90m	2.73 sec. = 10.99 m/sec.

Griffith-Joyner	Stride rate	Stride length	Time
30 - 60m	4.68	2.29	2.80
60 - 90m	4.58	2.40	2.73

Table 1 - Structure of performance - 100 metres (selected competitions)

Carl Lewis (USA) 9.92 sec.

Olympic Games Seoul 1988 (wind + 1.10)

	10m	20m	30m	40m	50m	60m	70m	80m	90m	100m	30-60m	60-80m	80-100m
S	1.89	2.96	3.90	4.79	5.65	6.48	7.33	8.18	9.04	9.92	2.58	1.70	1.74
T	1.89	1.07	0.94	0.89	0.86	0.83	0.85	0.85	0.86	0.88			
m/sec	5.29	9.35	10.64	11.24	11.63	12.05	11.77	11.77	11.63	11.36			

Florence Griffith-Joyner (USA) 10.54 sec.

Olympic Games Seoul 1988 (wind + 3.00)

	10m	20m	30m	40m	50m	60m	70m	80m	90m	100m	30-60m	60-80m	80-100m
S	2.00	3.09	4.09	5.04	5.97	6.89	7.80	8.71	9.62	10.54	2.80	1.82	1.83
T	2.00	1.09	1.00	0.95	0.93	0.92	0.91	0.91	0.91	0.92			
m/sec	5.00	9.17	10.00	10.53	10.75	10.97	10.99	10.99	10.99	10.87			

The high velocity attained by Griffith-Joyner was mainly due to the increase in stride length. The stability in the section of *maximal velocity between 60 and 90m* should be emphasized here. There is virtually no loss in velocity observable (90 - 100m = 0.92 = 10.87 m/sec.).

These new aspects of competition structure point to higher sprinting- strength potentials in the short sprint. This finding *should be especially underlined as far as the* women are concerned.

3.2 200 metres

As in the 100 metres, the maximum velocity reached is also a new characteristic of the 200 metres. The length of the section of maximum velocity and the clearly reduced loss in velocity during the second half of the 100 metres and over the last 50m of the 200 metres are especially characteristic of the current performance situation (see tables on the following page).

3.3 400 metres

The high complexity of the 400 metres event enables the athletes to emphasize certain structural elements. In general it can be stated that the improved performance prerequisites for the 100 metres and the 200 metres have a lasting effect on performance development over 400 metres. High performances over the shorter distances enable the athletes to achieve a higher speed over the first 200m, taking into account the 'preservation time'. This also leads to a lengthening of the 'speed section', which is sometimes as long as 300m (see tables on the following page).

In these 4 examples it is important to notice that the individual strengths become visible particularly over the section from 200 to 300m, although the situations at the 200m point (21.40 - 21.40/23.41 - 23.39) are almost identical.

S = 10 metres running time (in seconds)
T = times of 10 metre segments (in seconds)
m/sec. = average speed of 10 metre segments (in metres per second)

	Griffith-Joyner (1988)	Deloach (1988)
0 - 50m	7.95 m/sec. = 77.8 %	8.61 m/sec. = 78.2 %
50 - 100m	10.22 m/sec. = 100 %	11.01 m/sec. = 100 %
100 - 150m	10.16 m/sec. = 99.4 %	10.82 m/sec. = 98.2 %
150 - 200m	9.54 m/sec. = 93.3 %	10.46 m/sec. = 95.0 %

The height and stability of velocity during the section between 50m and 150m must be particularly emphasized:

Griffith-Joyner	50 - 150m = 9.81 sec. = 10.19 m/sec.
Deloach	50 - 150m = 9.16 sec. = 10.91 m/sec.

Comparison of stride length and stride rate

	Griffith-Joyner		Deloach	
	Stride rate	**Stride length**	**Stride rate**	**Stride length**
0 - 50m	4.26	1.86	4.18	2.05
50 - 100m	4.53	2.25	4.53	2.42
100 - 150m	4.36	2.32	4.39	2.46
150 - 200m	4.06	2.34	4.26	2.45

	Reynolds (1988)	**Thomas Schönlebe (GDR, 1987)**
100m	11.15	11.11
100 - 200m	10.15	10.29
200m	21.40	21.40
200 - 300m	10.60	11.04
300m	32.00	32.40
300 - 400m	11.29	11.89
400m	43.29	44.33

	Bryzgina (1988)	**Koch (1987)**
100m	11.94	12.12
100 - 200m	11.47	11.27
200m	23.41	23.39
200 - 300m	12.06	11.44
300m	35.47	34.83
300 - 400m	13.18	13.32
400m	48.65	48.15

Reynolds	200 - 300m	10.60 = 96.7 % of 100 - 200m 10.25 sec.
Schönlebe	200 - 300m	11.04 = 96.7 % of 100 - 200m 10.29 sec.
Bryzgina	200 - 300m	12.06 = 99.0 % of 100 - 200m 11.47 sec.
Koch	200 - 300m	11.43 = 98.5 % of 100 - 200m 11.27 sec.

Marita Koch

	1978	**1979**	**1980**	**1981**	**1982**	**1983**	**1984**	**1985**	**1986**
100 m	11.16	11.12	10.99	11.16	11.01	10.83	11.13	10.97	11.44
200 m	22.06	21.71	22.34	22.27	21.76	21.82	21.71	21.78	22.20
400 m	48.94	48.60	48.88	——	48.16	——	48.16	47.60	48.22

The small loss of speed between 200 and 300m is the result of high-speed performances over under-distance runs, which, during training, can be converted to high-speed-endurance loads by a corresponding lengthening of the runs.

The performance development of Marita Koch (on page 12) underlines the significance of outstanding under-distance performance (100 metres/200 metres) for the 400 metres performance.

Although this development took place several years ago, the interrelationship between the performance prerequisites of the 100 metres, the 200 metres and the 400 metres can serve as a model and remain completely valid as far as assessment of the current performance development in the women's 400 metres event is concerned.

4 Performances predicted for 1992

	Men's 100 metres	Women's 100 metres
0 - 30m	3.82	4.09
30 - 60m	2.58	2.82
60m	6.40	6.91
60 - 80m	1.72	1.84
80m	8.12	8.75
80 - 100m	1.73	1.85
100m	**9.85**	**10.60**
	Men's 200 metres	**Women's 200 metres**
0 - 100m	10.32	11.25
100 - 200m	9.36	10.35
0 - 150m	14.92	16.30
200m	**19.68**	**21.60**
The following 100m partial performances are prerequisites for these performances:		
0 - 30m	3.85	4.15
30 - 60m	2.64	2.90
60m	6.49	7.05
80m	8.21	8.98
100m	**9.98**	**10.95**
	Men's 400 metres	**Women's 400 metres**
100m	10.90	11.90
100 - 200m	10.25	11.20
200m	21.15	23.10
200 - 300m	10.85	11.75
300m	32.00	34.85
300 - 400m	11.50	13.05
400m	**43.50**	**47.90**
Performance prerequisites:		
80m	8.45	9.10
100m	**10.25**	**11.05**
200m	**20.25**	**22.00**

5 Aspects of training methods and implications for training practice

5.1 100 metres and 200 metres

Current trends of performance development in the sprint events point to maximal velocities of 12 m/sec. in the men's 100 metres and 11 m/sec. in the women's 100 metres. To reach these velocities a high acceleration capacity with a lengthening of the acceleration section is required. The loss in velocity in the 100 metres is reduced to a minimum or is no longer existent.

In the 200 metres, the maximal velocities are about 1 m/sec. lower than those in the 100 metres. There is a tendency for the velocity over 50m to be about 5-6 % of the maximal velocity in the case of the men and about 7-8 % in the case of the women.

From these developing parameters of sprint performance the following training implications can be derived:

1 Increase in importance of sprinting strength, particularly of maximal speed and speed-strength ability, as a basis for improved speed and acceleration.
2 Increase in the proportion of maximal acceleration and speed runs in the course of the whole training year with the objective of developing the co-ordinative/neural aspect of speed performance.
3 A greater emphasis on technique in acceleration and speed training with specific reference to the individual development of stride rate and stride length.

5.2 400 metres

Analyses of the world-best 400 metres sprinters (men and women) show the greater importance of speed in the relation between speed and endurance. As the performance level of 400 metres rises, there is also an increase in the effect of better performances of 100 and 200 metres.

The improved performance over 400 metres is to a large extent (60 %) caused by the improvement of running velocity over the first 200m. There are hardly any differences between women and men.

For top-level performances the first 200m are covered at a very high velocity. This is, however, only possible if the 400 metres runner possesses such exceptional underdistance speed that he is still able to ensure a good 'preservation' time. Thus, for a top-class performer, pure speed capacity will be greater than would be indicated by the maximal velocity attained in a 400 metres race. Therefore the predicted performances are orientated towards the improvement of the first 200m section.

According to this, the development of the level of maximal velocity is a performance-determining criterion for the 400 metres and therefore of main interest as far as training methods are concerned. The speed prerequisites which must be developed determine to a high degree the intensity and the effectiveness of the speed-strength training.

Speed-orientated training is also an important performance reserve for the women's 400 metres.

□