

Long term preparation for advanced female discus throwers

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“Peter Rachmanliev, who is Bulgaria’s Senior National Coach for the Javelin, and Edward Harness, a Norwegian who has been a national coach in the Federal Republic of Germany, have cooperated and exchanged training information for several years. This article, compiled by Harness, describes the methods used by Rachmanliev to train the discus throwers Tsvetanka Khristova and Svetla Mitkova between 1977 and 1987. In addition to giving sample training schedules and explaining the methods used to develop these two into top level athletes, the adjustments in preparation which were made when their performance development stagnated are also detailed. In the final section the requirements for further improvement of these athletes are discussed.”

1. Introduction

Coaches generally agree that the training of female discus throwers and the training of female shot putters have much in common. In this article, however, the similarities between discus and javelin training will be pointed out.

While principally a javelin coach with outstanding success (e.g. Antoaneta Todorova who achieved a World Record of 71.8 in 1981), my colleague Peter Rachmanliev, due to being the only throws coach in his area, has had to teach the other throwing events as well. In the beginning he found it difficult to adjust to coaching the discus at the same high level. On the other hand, athletes are motivated by the presence of a former world record holder in their own country and this has contributed to the development of other female athletes.

Rachmanliev took a completely new approach to the discus, due to the fact that he had never coached it before. One could say that he approached the event with an open mind. To my mind, he emphasized speed more than has been generally accepted by coaches. However, if you compare the weights of the implements you will notice that the weight of the discus (1.0 kg) is closer to

the weight of the javelin (0.6 kg) than it is to the shot (4.0 kg).

Rachmanliev's most successful athlete in the discus to date has been Tsvetanka Khristova who won the European Championship in 1982 and achieved 73.22m in 1987. At 1.76m and 86 kg she is not one of the tallest or heaviest athletes in the event. Her arm span from finger tip to finger tip is 1.87m. His second most successful discus thrower has been Svetla Mitkova who threw 69.14 to place fourth in the 1988 Olympic Games.

The early performance development of these two athletes is shown in Table 1.

2. Khristova's training 1981-82

A. Year Planning

The year is traditionally subdivided into three main periods (preparation, competition and transition period). Both the preparation and competition periods are further divided into three cycles each. Thus the year has seven of these cycles in all. Each of the cycles has a specific target of its own.

Figure 1 gives an overview of Khristova's preparation for the European Championships in 1982, beginning in October 1981. The graphical representation of the cycles shows the relationship of the heavy to the light

weeks. The 3:1 ratio in the first cycle, for instance, means that 3 hard weeks are followed by 1 light week. Notice that a year of 54 weeks was planned.

B. Technique preparation

Training in October and November is designed to take advantage of the good weather in Bulgaria and is used for throwing to maintain technique as well as to correct faults. To improve the basic qualities and to develop explosiveness (power), emphasis is placed on the throwing of implements of various weights with both one and two hands. The greatest number of throws is attained in the first three months and again in July in the so called micro-preparation period. In the months of October, November, December and July heavier implements (up to 8 kg) are thrown. In the months when there is less throwing with implements other than the discus, a higher intensity is required and the weight is reduced to 4 or even 3 kg.

The use of implements heavier than the discus (1.6-2.0 kg) is mostly done in those months where the emphasis is on strengthening work since in this period the athletes have not yet sufficiently developed their speed attributes.

The throwing of heavy implements of 1.2 to 1.5 kg is done all the year round, except at the time of the most important

Table 1: Performance development - Khristova and Mitkova 1977-82

Year	Khristova	(age)	Mitkova	(age)
1977	46.90	(16)	-	(13)
1978	48.84	(17)	-	(14)
1979	54.76	(18)	44.30	(15)
1980	58.44	(19)	52.70	(16)
1981	64.38	(20)	59.86	(17)
1982	70.64	(21)	60.58	(18)

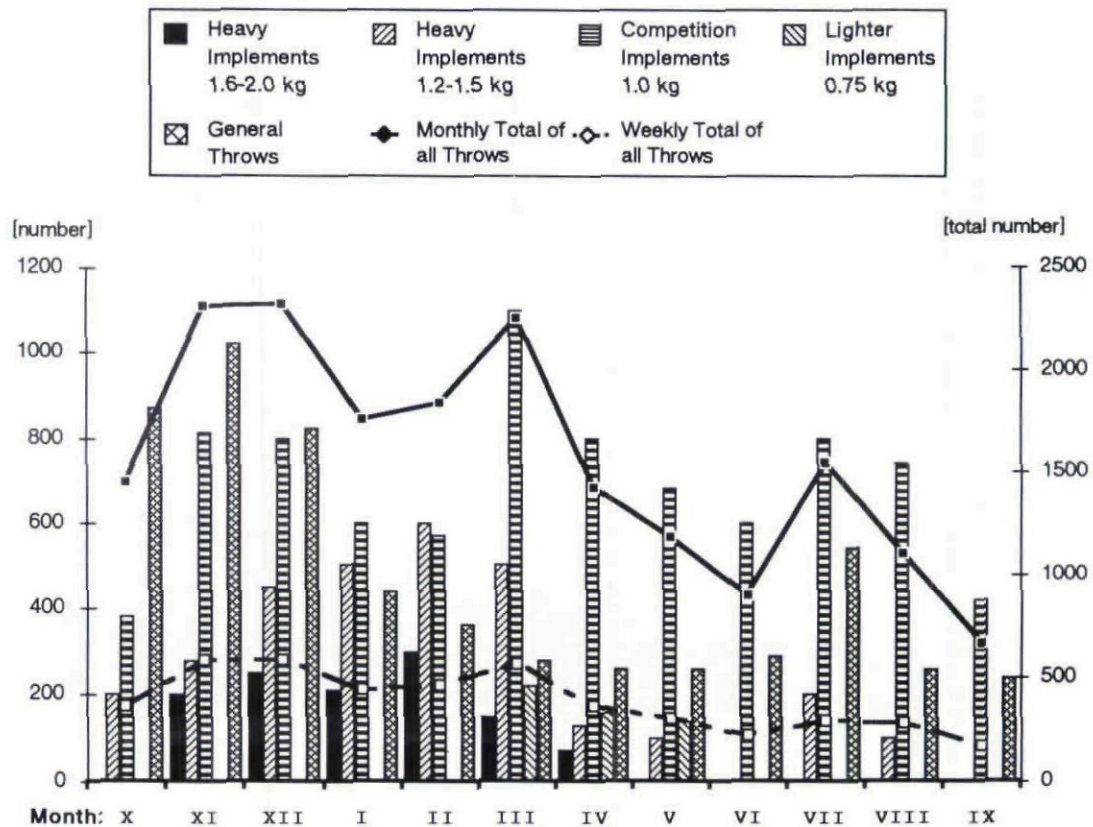


Figure 2: One Year frame plan for female discus throwers (range 67 - 71m)

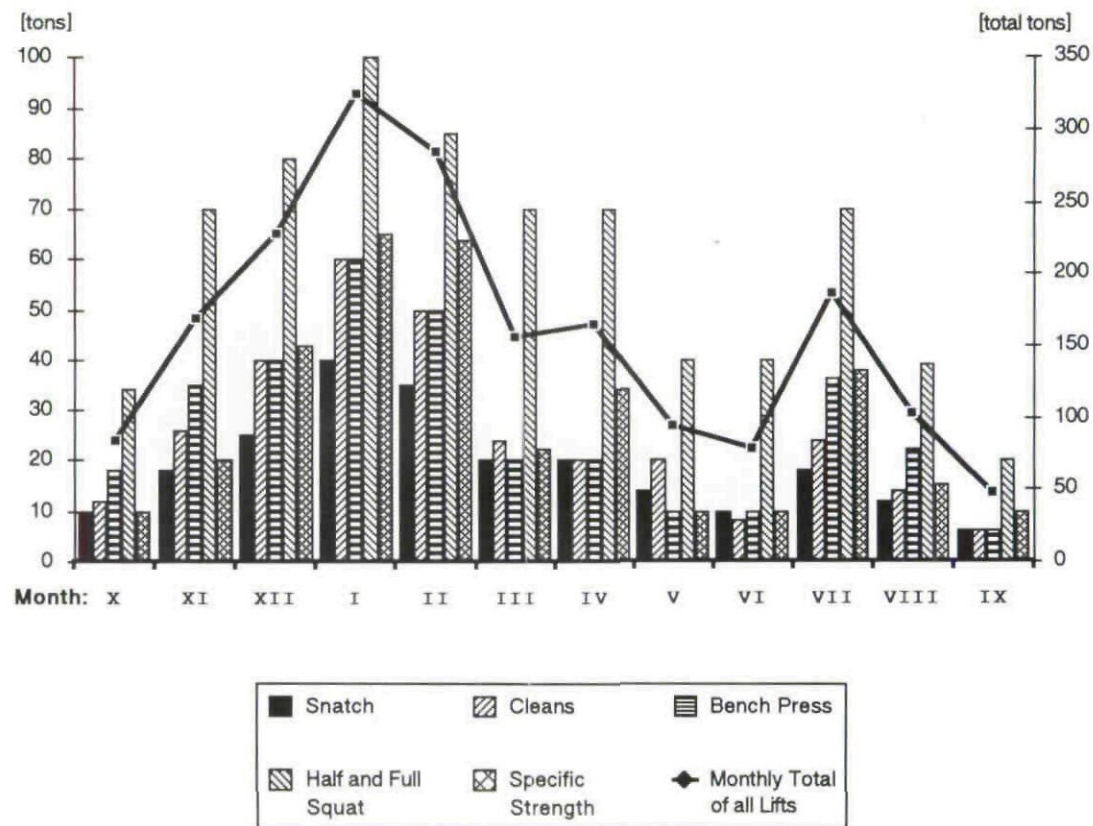


Figure 3: Volume of weight training in one year

competitions. The 1 kg discus is also thrown all year round and, as far as possible, all throwing is done outdoors. For this purpose, training camps are organised in southern European countries where the weather is warmer. The greatest quantity of throwing is done in March and April when the athletes throw the discus up to 6 times per week with 90 to 100 throws per day.

A lighter discus (less than 1 kg) is also used occasionally to improve specific speed prior to or at the start of the competitive period. Figure 2 shows the number of throws taken with the various weight implements throughout the year.

C. Strength Preparation

In October the weight used on the bar-bell is light and the intensity of the exercises is low - 40-55 % of the maximum. In November the quality and intensity increase, reaching up to 65-70 % of the athlete's maximum. In December, January and February the volume of weight training is at its highest. The intensity in these months ranges from 70-90 % of the maximum and 100 % is reached during the weight tests.

During March, in cycle 6, there is a break in weight training. Intensity is still

important but less strength work is done so as not to interfere with technique training.

In May and June sufficient strength training to maintain muscle tone is carried out, keeping in mind the dates of competitions. Taking part in important competitions leads to a reduced quality of strength work. In the transition period the bar-bell is put aside for 2 to 3 weeks.

Figure 3 (page 88) gives an overview of the total amount of weight training and the various exercises used throughout the year.

To be more precise, some examples of weight training during different months are given below. After three weeks of weight training in October, there is a test in the 4th week with different exercises. On the basis of these results the plan for the following months (cycles) is worked out.

For example, taking the test results given, the plan for November could be as follows:

Test results:

Snatch	70 kg
Cleans	95 kg
Bench press	100 kg
Full squat	140 kg

Training plan:

	Set	x	Rep	x	Kg	=	Kg
Monday							
Snatch	4	x	5	x	45	=	900
	6	x	5	x	50	=	1500
Bench Press	10	x	5	x	70	=	3500
Half and Full Squats	5	x	5	x	90	=	2250
Half Squats	5	x	5	x	110	=	2750
Specific Strength					ca.		2000
							12.9 Tons
Wednesday							
Cleans	8	x	5	x	65	=	2600
Bench Press	10	x	5	x	70	=	3500
Full Squats	6	x	5	x	90	=	2700
Half Squats	6	x	5	x	120	=	3600
Specific Strength					ca.		2000
							14.4 Tons

Friday

Snatch	5	x	5	x	45	=	1125
	6	x	5	x	50	=	1500
Bench Press	10	x	5	x	70	=	3500
Full Squats	6	x	5	x	90	=	2700
Half Squats	6	x	5	x	120	=	3600
Specific Strength					ca.		1500
							13.925 Tons

Thus there is a total load of 41-42 tons per week. Sometimes other exercises, such as the "Behind the Neck Press" are used in smaller quantities. As can be seen from the example, the repetition

method is used. In January weight training is done 5 times per week and a weekly load of up to 100 tons is reached within three weeks. An example is given below:

Monday morning / Friday afternoon

Snatch	5	x	50	=	250	
	5	x	55	=	275	
	4	x	60	=	240	
	3	x	65	=	195	
	2	x	70	=	140	
	1	x	75	=	75	
	1	x	77.5	=	77.5	
	1	x	80	=	80	
	3	x	75	=	225	
	5	x	70	=	350	
	5	x	65	=	325	
	6	x	4	x	60	= 1440
						= 3.6725 tons
Bench Press	10	x	5	x	85	= 4250
Full Squats	8	x	5	x	110	= 4400
Press behind Neck	6	x	5	x	70	= 2100
Half Squats	6	x	7	x	160	= 6780
						17.470 tons

Tuesday afternoon

Cleans			5	x	60	=	300	
			5	x	70	=	350	
			5	x	75	=	375	
			5	x	80	=	400	
			5	x	85	=	425	
			2	x	90	=	180	
			1	x	95	=	95	
			1	x	100	=	100	
			1	x	105	=	105	
			1	x	107.5	=	107.5	
	5	x	4	x	90	=	1800	
	2	x	4	x	85	=	680	
								4.9175 tons
Full Squats	10	x	4	x	110	=	4400	
Bench Press	8	x	5	x	85	=	3400	
Half Squats	4	x	10	x	140	=	5600	
Specific Strength					ca.		3500	
								16.900 tons

Wednesday morning / Saturday afternoon

Bench Press	10	x	5	x	85	=	4250
Snatch	8	x	4	x	65	=	2080
Full Squats	8	x	4	x	100	=	3200
Jerk behind Neck	5	x	4	x	65	=	1300
Half Squats	6	x	8	x	150	=	7200
Specific Strength					ca.		3000
							21.030 tons

On Friday mornings the training is similar to Mondays except that, instead of the "Behind the Neck Jerk", special weights are used. On Saturday afternoons training is the same as on Wednesdays. This is a very heavy training programme for a woman and therefore it is done only for a period of 2 to 3 weeks. Then one goes back gradually to 4, and in March to 3, weight training units per week.

D. Running, jumping and functional preparation

As was previously mentioned, there are certain deviations from the normal procedure concerning the volume of training for female discus throwers. This results from the greater quantity of training as shown in Figures 4, 5 and 6 (Jumping, running and functional preparation). Here the volume performed by female javelin throwers is approached. Sometimes it is even higher. This, however, has a high cost in terms of energy and time for a training medium which, at first glance, is not very specific.

When examining the information presented, one should keep in mind that in the training of young female athletes (up to 21 years of age) the emphasis should be placed on speed. Heavy strength training loads have a negative effect on the heart and the circulatory system which can be only be partially compensated for in a natural way by cross country runs, games, swimming and a good deal of mobility work.

3. Khristova's training - 1985-86

A. Preliminary remarks

Khristova's training from 1983 to 1985 followed the general format described above. However, as can be seen in Table 2, her progress, like that of Mitkova, came to a halt during this period. While the development from 70 to 72m in the women's discus is not an easy task, the lack of progress by both these athletes between 1983 and 1985 indicates that several mistakes were probably made.

After these years of stagnation, Khristova's training was altered and a

Table 2: Performance development - Khristova and Mitkova 1982-86

Year	Khristova	(age)	Mitkova:	Discus and Shot	(age)
1982	70.64	(21)	60.58	18.03	(18)
1983	66.88	(22)	66.80	18.83	(19)
1984	68.34	(23)	64.84	19.11	(20)
1985	68.68	(24)	64.34	18.77	(21)
1986	72.52	(25)	68.90	20.05	(22)

NOTE:

In 1983, Khristova placed 4th at the World Championships in Athletics in Helsinki and in 1985 she was placed 4th at the World Cup in Athletics.

At the age of 17, Mitkova placed 2nd in the discus (behind Sachse) and 3rd in the shot at the 1981 European Junior Championships.

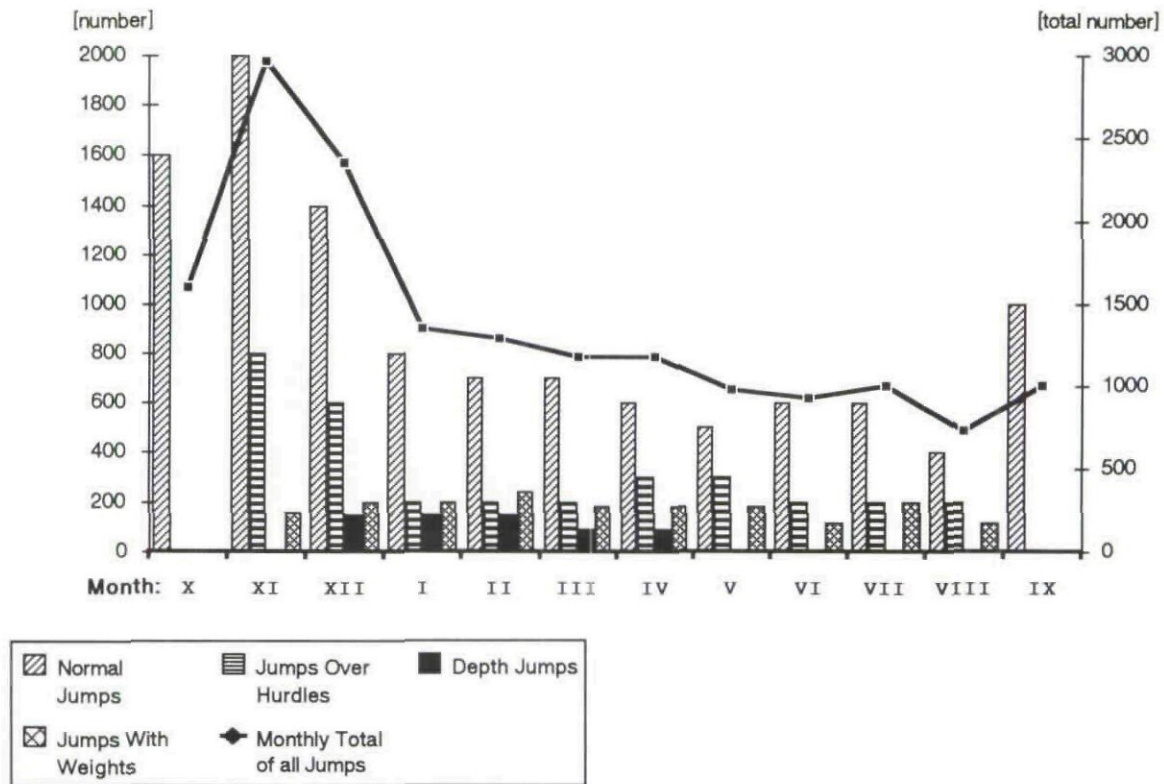


Figure 4: Volume of jumps in one year

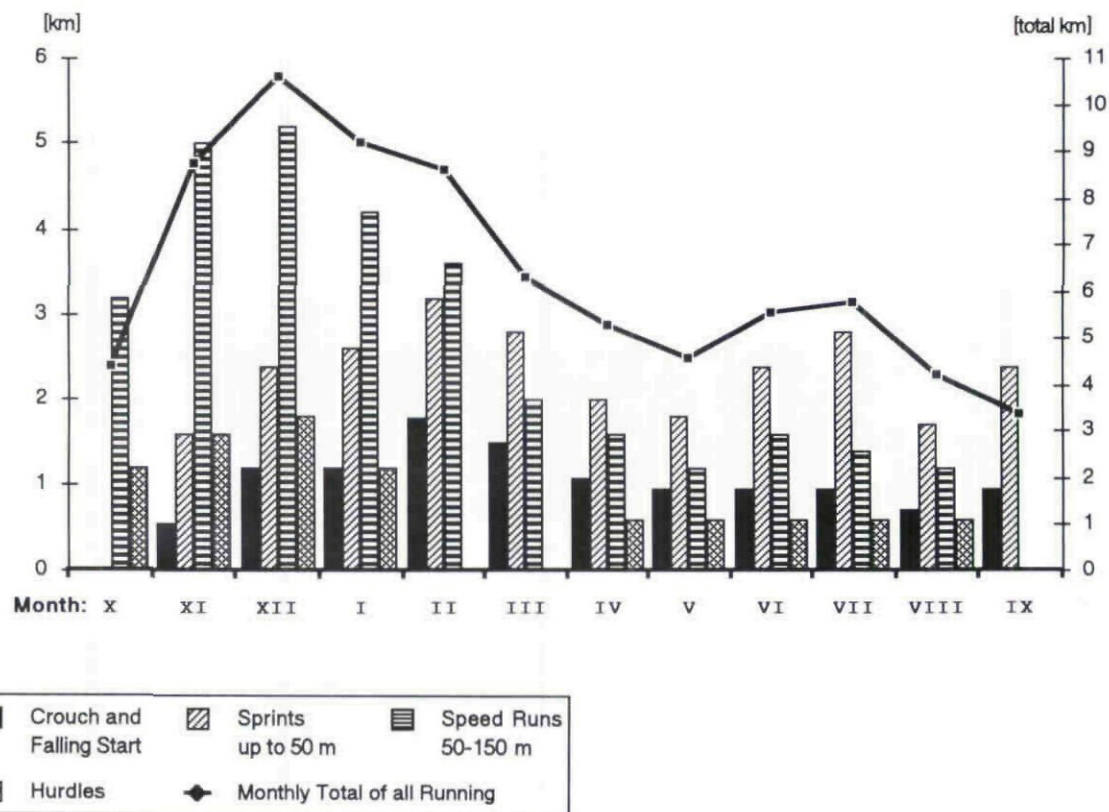


Figure 5: Volume of running preparation in one year

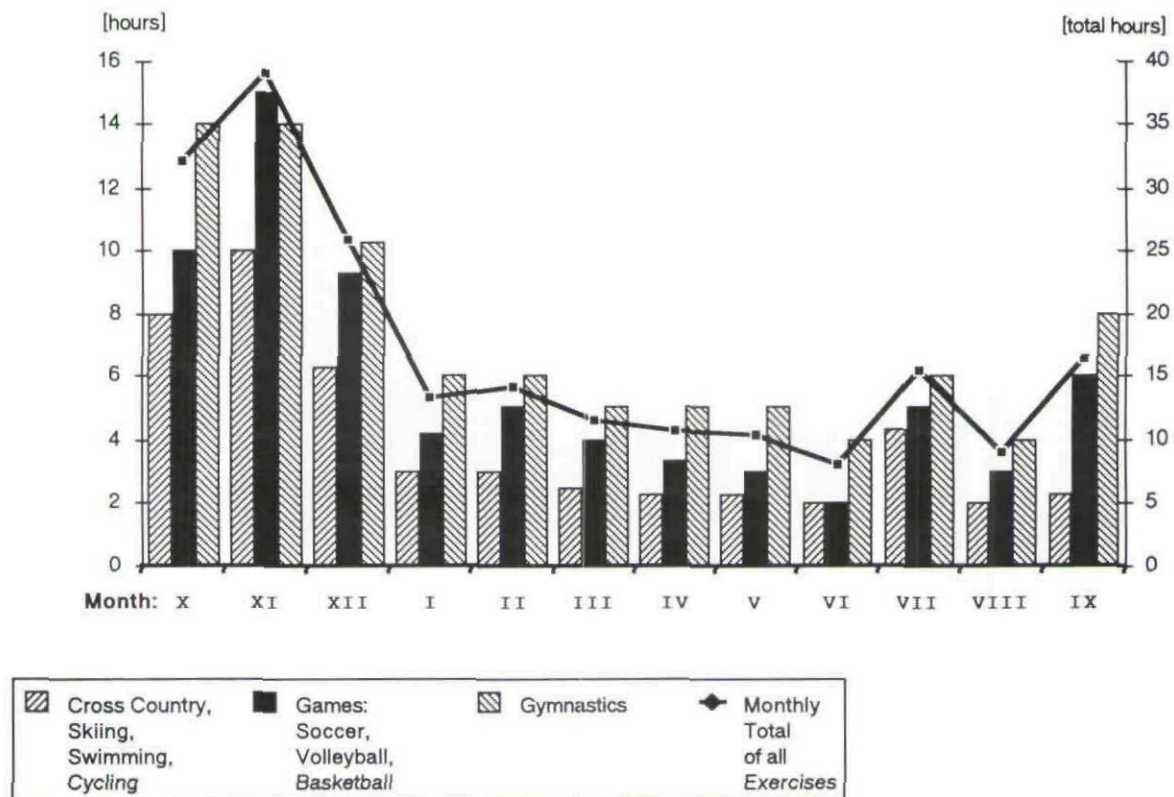


Figure 6: Volume of functional preparation in one year

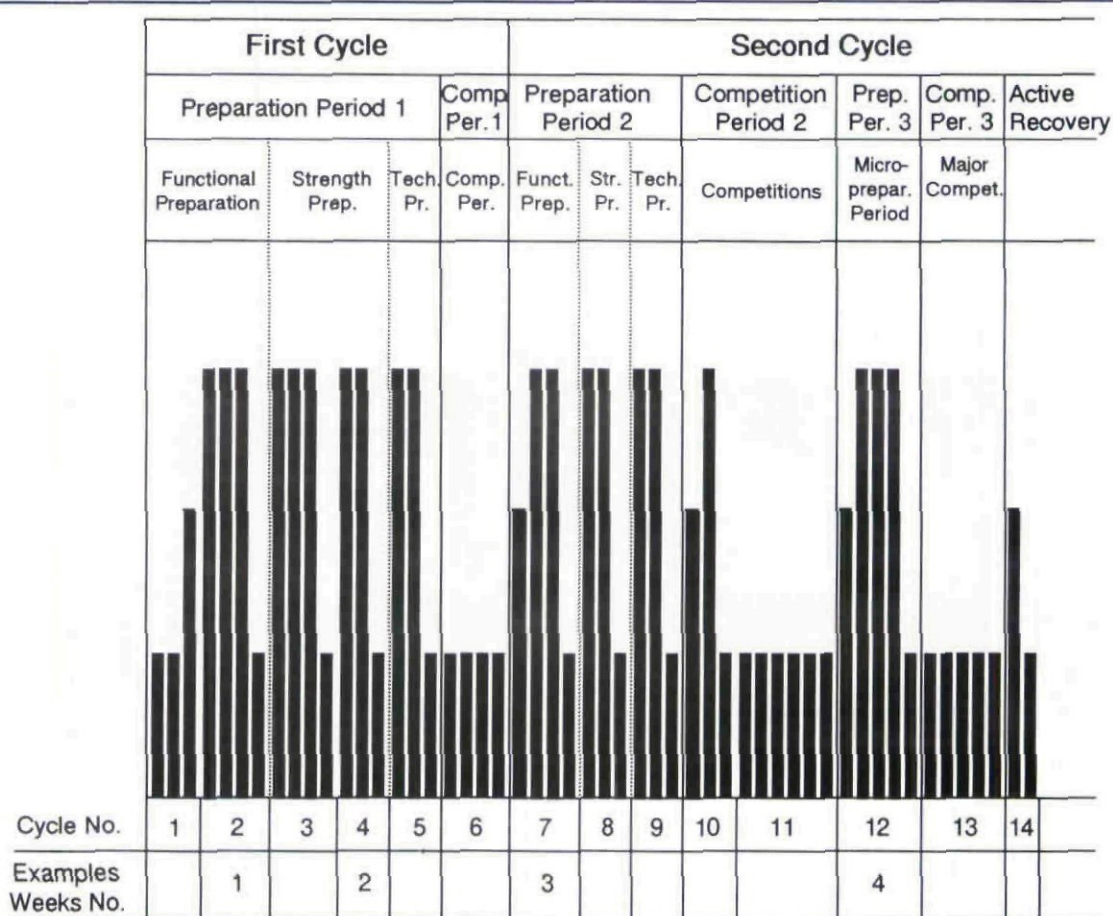


Figure 7: Training load in cycles - 1985-6

series of successes and high level performances followed in 1986. In my talks with Rachmanliev, during the 1986 European Championship in Stuttgart 1986 and on a visit to Bulgaria in 1987, my interest naturally turned to the new training concept responsible for these successes. He told me that the training plan used had been re-examined prior to beginning preparations for the 1986 European Championships. The changes which were made are detailed below in Rachmanliev's words. To summarize, however, the most important change in the concept was a) the introduction of a double periodization and b) an increase of intensity with a reduction in volume.

B. Changes in training

"The basic mistake in thinking was that the aim was for one period of competition only. For years, as we had only one competition period, just as with the javelin and hammer throws, we had only one long preparation period. This kind of planning leads to training of very high volume. This high volume of training had negative effects on the quality of technique work. The high volume and number of training sessions also lead to knee injuries for the athletes. Due to the conclusions made and the experience gained in other events, we decided to work with a double periodization in 1986.

Modifying the year's plan in this way turned out to be very useful.

"The principles for the planning of the yearly cycle were maintained. However, as we felt the great training volume was not totally necessary, we reduced the volume of training. In our opinion, this change resulted in a rationalisation of the training. Tables 3 to 6 show the reduced volume of the training means which are not totally specific for discus training (e.g. acceleration running, hurdles and others). The volume of throwing and weight training were also reduced.

"Due to this reduction of volume, the quality of training work was improved and we were able to intensify the work in the areas of speed and jumping power. In addition, the improved quality produced a considerable improvement in the tests carried out. Because of this, the athletes became highly motivated.

"The throwing of heavy, normal and lighter implements was carried out outdoors throughout the whole training year. (Note: In previous years a lot of throwing against nets indoors was carried out. At the annual training camp in the GDR in January they even threw outside in the freezing snow!) Throwing outdoors is more time-consuming, but it helped us to stabilize the technique under competition conditions.

C. Comparisons of training volumes between 1981-85 and 1985-86

Table 3

<u>Training means</u>	<u>Average 1981-85</u>	<u>Average 1985-86</u>
Heavy implements 1,2-2,0 kg	4240	3340
Competition implements 1,0 kg	8300	5600
Lighter implements 0,75 kg	520	525
General throws	5640	3165
Total	18700	12630

Table 4

<u>Training means</u>	<u>Average 1981-85</u>	<u>Average 1985-86</u>
Weight training (trad. exercises)	1918 tons	170 tons
Other weight training (incl. mobility)	21 hours	43 hours

Table 5

<u>Training means</u>	<u>Average 1981-85</u>	<u>Average 1985-86</u>
Jumps	16510	12285

Table 6

<u>Training means</u>	<u>Average 1981-85</u>	<u>Average 1985-86</u>
Crouch and falling start (x 30 m)	396m	420m
Sprints up to 50 m	25,7km	26,6km
Speed runs 50-150 m	30,2km	9km
Hurdles	8,8km	3,5km

Table 7

<u>Training means</u>	<u>Average 1981-85</u>	<u>Average 1985-86</u>
Competitions	14	24
Functional preparation	203 hours	209,5 hours

D. Changes to the competition schedule

"In addition, we prepared for and competed in 5 competitions between the 9th of February and the 9th of March, 1986. In the last of these competitions Khristova reached 65.84m. That was a signal for us that we were on the right track. The competitions in February and March and the following competitions from May up to the 10th of July, as well as the last competition period from the 11th of August until the 12th of September made it possible for us to take part in a total of 24 competitions.

"It is interesting to note that the Bulgarian weight lifters achieve an extremely high intensity at top levels from their four periods of preparation and competition (four preparation periods and four competition periods!).

"Increasing the number of competitions led to an improvement as well as a stabilization of the competition technique. In the previous years — 1984 and 1985 — there were times when the results before the competitions were

better than those on the day of the competition. The modified training also led to an increase of the athletes quality of conditioning, which — on top of that — led to an improvement in the whole series of important competitions.

E. Results of the changes

With this series of top level performances, (see Tables 8 and 9), as well as victories against her most important opponents, Khristova's 2nd place at the European Championships seems somewhat unfair. Unfortunately the rain in Stuttgart prevented another win, because the circle was too slippery for her fast turn.

4. Towards further improvement

Rachmanliev has drawn up a list, given in Table 10, of requirements which he feels an athlete must be able to meet in order to achieve 75 metres in the women's shot put.

The targets in weights presented may seem too low to many other coaches. Especially in the case of the full squats and bench press as we know that achievements

from other female discus throwers in the 70m range are up to 50% higher.

With reference to this statement Rachmanliev told me of a training session in which he witnessed the female throwers from the GDR carry out sets of bench presses at Khristova's personal best level.

At that time he comforted his athletes with the fact that the women's discus weighs only 1 kg which makes speed more relevant. Of even greater importance, when one considers the 78 metre requirement for the 750 gram discus, is the need for an extremely high standard of technique combined with speed, since the lighter discus has poorer aerodynamic qualities.

Table 8: Results of Khristova compared to other top class discus throwers in 1986

Date	Place (Competition)	Performance/Place	Khristova	Mitkova
14.06	Bratislava (Grand Prix)		71.80/1	65.16/2
03.07	Dresden (Grand Prix)		70.52/1	69.04/2
05.07	Oslo (Grand Prix)		69.78/1	69.02/2
08.07	Moscow (Grand Prix)		69.54/1	68.46/3
11.08	Budapest (Grand Prix)		72.52/1	69.04/2
28.08	Stuttgart (European Ch.)		72.52/1	68.90/2
05.09	Brussels (Grand Prix)		69.52/2	71.36/1
07.09	Ljubljana (Balkan Games)		69.84/1	66.24/2
10.09	Rome (Grand Prix -Final)		69.58/1	62.26/3
			68.90/1	64.68/1
				58.98/2

Table 9: Performance development - Khristova and Mitkova 1986-88

Year	Khristova	(age)	discus	Mitkova	(age)	discus	shot
1986		(25)	72.52		(22)	68.90	20.05
1987		(26)	73.22		(23)	69.72	20.91
1988		(27)	71.06		(24)	68.78	20.58

Table 10: Theoretical requirements for a female discus thrower to reach 75m

Snatch	95-97.5 kg
Full squat	120 kg
Bench press	125-130 kg
Discus 2.0 kg	46-47m
Discus 1.75 kg	49-50m
Discus 1.5 kg	56-57m
Discus 1.25 kg	60-61m
Discus 0.75 kg	76-78m
30m crouch start	4.1-4.3 sec
Standing triple jump	8.20-8.40m
4 kg shot throwing backwards	22-23m
3 kg shot throwing backwards	24-25m

Furthermore, it is interesting that the training performances of Diana Gansky (Sachse)(GDR), who has achieved 74.08m,

presented at a coaches convention in Aix-les-Bains in 1987 - come quite close to Rachmanliev's table.

Diana Gansky 1.84m/88 kg

Discus throwing 1.6 kg	54.52m
Shot throwing 2 kg	41.54m
Snatch	97.5kg
Shot throwing backwards 4 kg	22.40m
Standing long jump	3.02m

**Krystova's Typical Week Training Schedules
Training Year 1985/86**

Week Schedule no. 1: 4-10 November 1985

Monday	morning:	20 min warm-up: 10 min imitation exercises (drills) heavy discus 30 throws normal discus 35 throws sprints 4 x 40m; 2 x 100m
	afternoon:	weights 12 tons 20 throws both arms 60 jumps 25 min cross country
Tuesday	morning:	20 min warm-up sprinting exercises, total 200m 8 x 20m-40m sprints 35 general throws 140 jumps 30 min games
	afternoon:	15 min run 30 min power-gymnastics for stomach and back 10 min drills 30 min games
Wednesday	morning:	20 min warm-up 12 min drills heavy discus, 30 throws normal discus, 35 throws 5 x 40m sprints 20 min games
	afternoon:	weights 13 tons 20 throws both arms 60 jumps
Thursday	morning:	20 min games 15 min drills 40 throws both arms 20 min gymnastics 60 jumps with weights
	afternoon:	recovery (sauna and massage)

Friday	morning:	20 min warm-up 12 min drills heavy discus 35 throws normal discus 30 throws 5 x 40m sprints 2 x 100m
	afternoon:	weights, 14 tons 20 throws both arms 60 jumps 20 min cross country
Saturday	morning:	20 min warm-up 8 x 35m hurdles 35 throws both arms 160 jumps 20 min gymnastics
	afternoon:	20 min drills 30 min power gymnastics 30 min games 10 min swim
Sunday		recovery

Week Schedule no. 2: 13-19 January 1986

Monday	morning:	20 min warm-up 10 min imitation exercises (drills) heavy discus, 50 throws sprints 6 x 40m weights 4 tons
	afternoon:	20 min warm-up 10 min drills normal discus, 30 throws weights 14 tons
Tuesday	morning:	20 min warm-up sprinting exercises, total 200m sprints 6 x 30m (crouch start) 30 general throws 80 jumps 20 min gymnastics
	afternoon:	20 min warm-up 10 min imitation exercises heavy discus, 40 throws weights 14 tons
Wednesday	morning:	20 min warm-up 20 standing jumps 10 min imitation exercises heavy discus, 50 Throws
	afternoon:	20 min warm-up 15 min imitation exercises normal discus, 30 throws 25 min power gymnastics 60 jumps with weights

Thursday	morning:	20 min warm-up weights 18 tons 15 min imitation exercises 20 general throws 50 jumps
	afternoon:	recovery
Friday	morning:	20 min warm-up 20 standing broad jumps 12 min imitation exercises heavy discus, 50 throws sprints 5 x 40m
	afternoon:	20 min warm-up 10 min imitation exercises normal discus, 30 throws 20 min power gymnastics 40 jumps with weights
Saturday	morning:	20 min warm-up 10 min imitation exercises heavy discus, 40 throws sprints 5 x 40m 20 min mobility
	afternoon:	20 min warm-up 10 min imitation exercises weights 16 tons
Sunday		recovery

Week Schedule no. 3: 24-30 March 1986

Monday	morning:	20 min warm-up 10 min imitation exercises normal discus, 35 throws sprints 4 x 30m
	afternoon:	20 min warm-up 10 min drills normal discus, 30 throws weights 11 tons 10 min mobility for relax
Tuesday	morning:	20 min warm-up 20 standing broad jumps sprinting exercises, total 200m sprints 6 x 30m (crouch starts) 30 general throws 15 min mobility
	afternoon:	20 min warm-up 10 min drills heavy discus, 30 throws normal discus, 15 throws 20 min power gymnastics 80 jumps

Wednesday	morning:	20 min warm-up weights 12 tons general throws, 25 throws 40 jumps 20 min games
	afternoon:	recovery
Thursday	morning:	20 min warm-up 10 min drills heavy discus, 30 throws normal discus, 12 throws sprints 4 x 30m , 2 x 100m
	afternoon:	20 min warm-up 10 min drills normal discus, 30 throws 20 min power gymnastics 60 jumps with weights
Friday	morning:	15 min warm-up weights 12 tons; 10 min drills
	afternoon:	15 min warm-up sprint exercises, total 200m sprints from crouch start 5 x 30m general throws, 20 throws 60 jumps 20 min mobility
Saturday	morning:	20 min warm-up 10 min drills heavy discus, 30 throws normal discus, 12 throws sprints 4 x 30m
	afternoon:	20 min warm-up 10 min drills normal discus, 30 throws 10 min powergymnastics 40 jumps with weights
Sunday		recovery

Week Schedule no. 4: 21-27 July 1986

Monday	morning:	20 min warm-up 20 jumps 10 min drills normal discus, 35 throws sprints 5 x 30m
	afternoon:	20 min warm-up 10 min drills weights 12 t

Tuesday	morning:	20 min warm-up sprint exercises, total 200m sprints 6 x 30m (crouch start) general throws, 25 throws 60 jumps 20 min mobility
	afternoon:	recovery
Wednesday	morning:	20 min warm-up 10 min drills normal discus, 40 throws sprints 4 x 30m
	afternoon:	20 min warm-up 10 min drills normal discus, 30 throws weights 10 tons
Thursday	morning:	recovery
	afternoon:	20 min warm-up sprint exercises, total 200m sprints standing start, 5 x 30m general throws, 20 throws 15 min mobility 60 jumps
Friday	morning:	20 min warm-up 10 min drills normal discus, 40 throws sprints 4 x 30m
	afternoon:	20 min warm-up 10 min drills normal discus, 30 throws weights 10 tons
Saturday	morning:	20 min warm-up sprint exercises, total 200m sprints (crouch starts) 6 x 30m general throws, 25 throws
	afternoon:	20 min warm-up 10 min drills normal discus, 30 throws 20 min power gymnastics
Sunday		recovery

Week Schedule no. 5: 23-28 August 1986

Saturday	morning:	recovery
	afternoon:	20 min warm-up sprint exercises, total 200m sprints (crouch start) 5 x 30m general throws, 20 throws 60 jumps 20 min mobility

Sunday	morning:	20 min warm-up 20 jumps 10 min drills normal discus, 20 throws
	afternoon:	20 min warm-up 10 min drills normal discus, 20 throws weights 5,5 tons
Monday	morning:	travel from Sofia, Bulgaria via Vienna and Frankfurt to Stuttgart
	afternoon:	30 min warm-up 15 min drills 20 min power gymnastics
Tuesday	morning:	recovery
	afternoon:	20 min warm-up 10 min drills normal discus ,15 throws 15 min mobility 40 jumps
Wednesday	morning:	recovery
	afternoon:	30 min warm-up 15 min drills weights 3 tons (As there was no qualification round for the final!)
Thursday	morning:	recovery
	afternoon:	European Championships, Final: Second place 69.52m (Rain) 63.74m; 67.60m; 69.52m; 66.70m; 69.20m; 66.00m

Figures 8 to 13 (on the following pages) show a comparison of selected weeks in 1982 and 1986 to demonstrate the changes of Khristova's training.

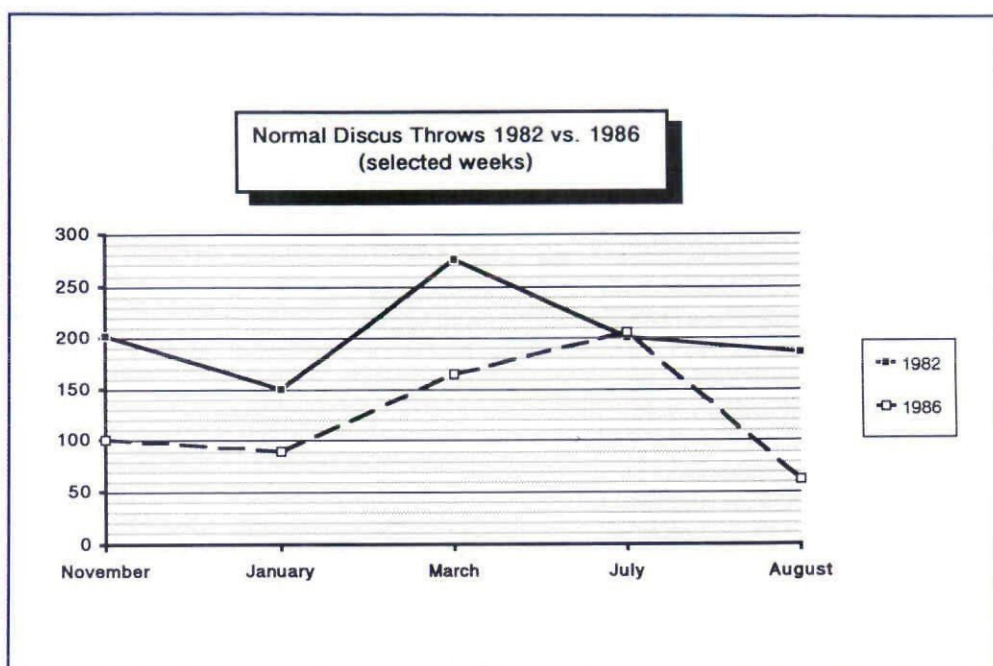


Figure 8: Normal Discus Throws

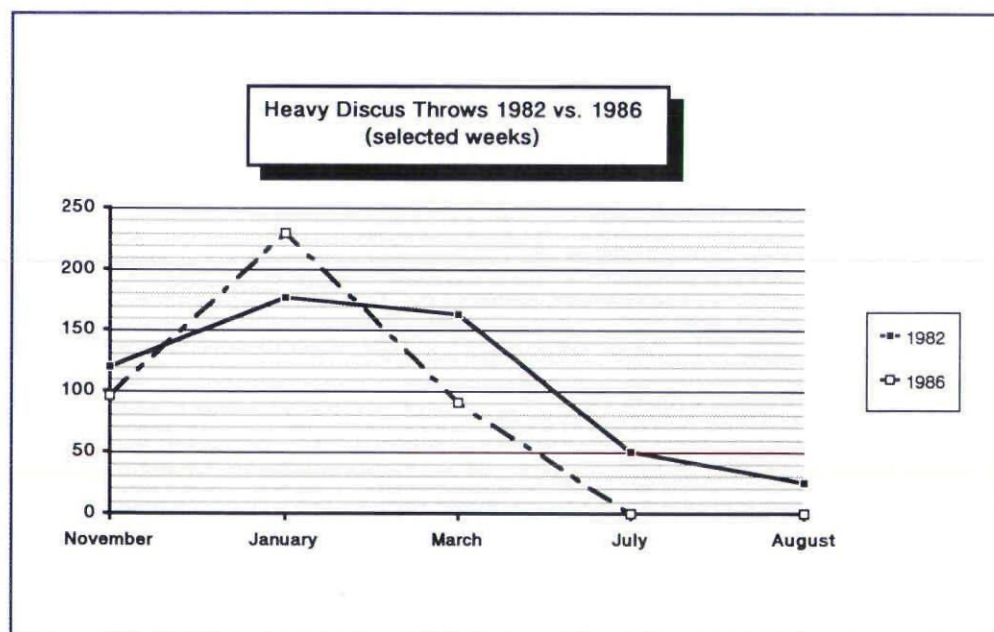


Figure 9: Heavy Discus Throws

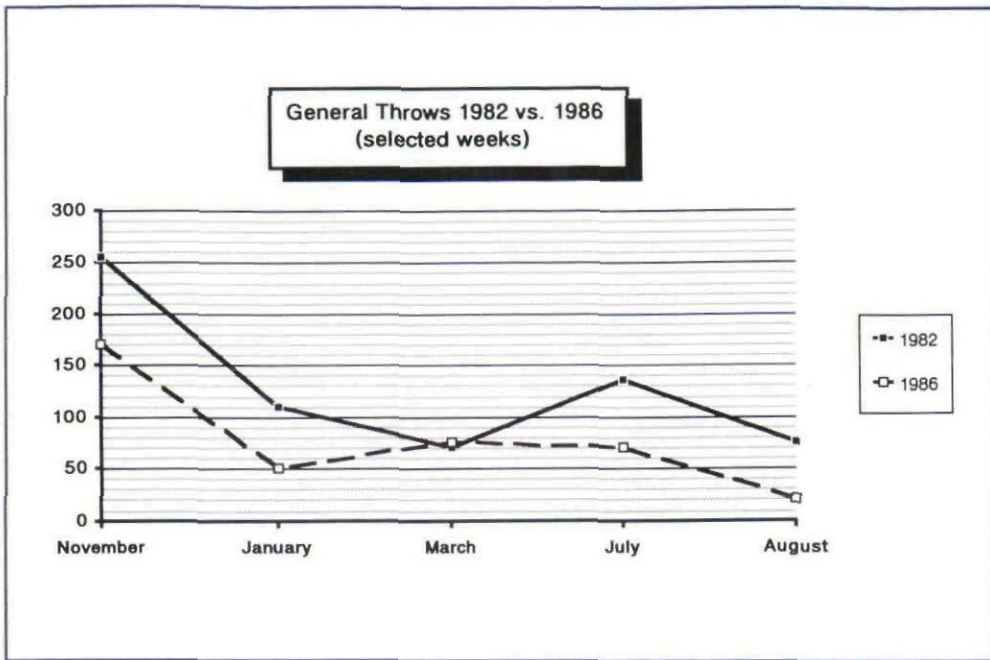


Figure 10: General Throws

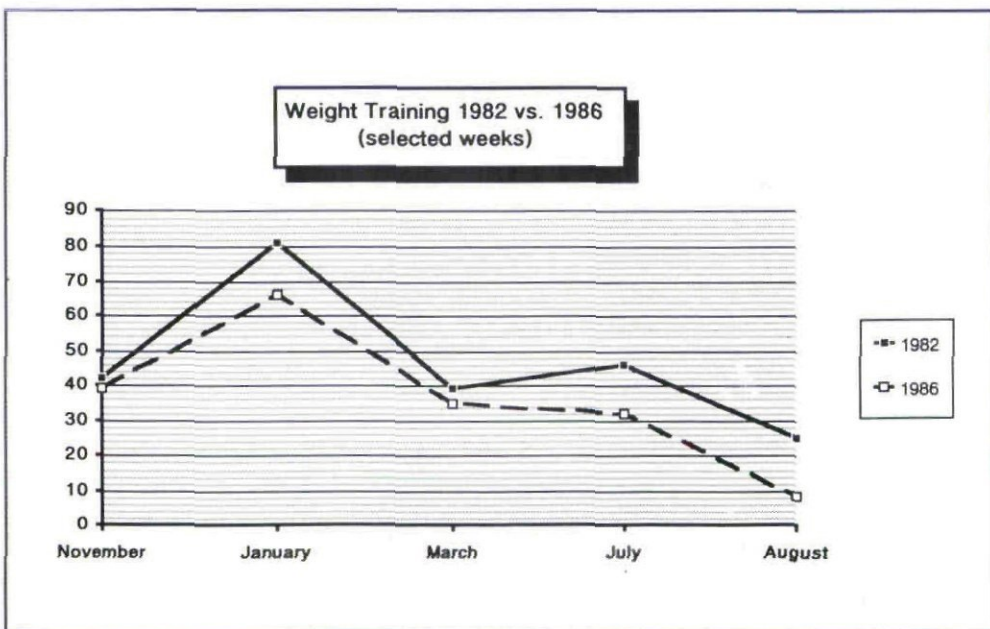


Figure 11: Weight Training

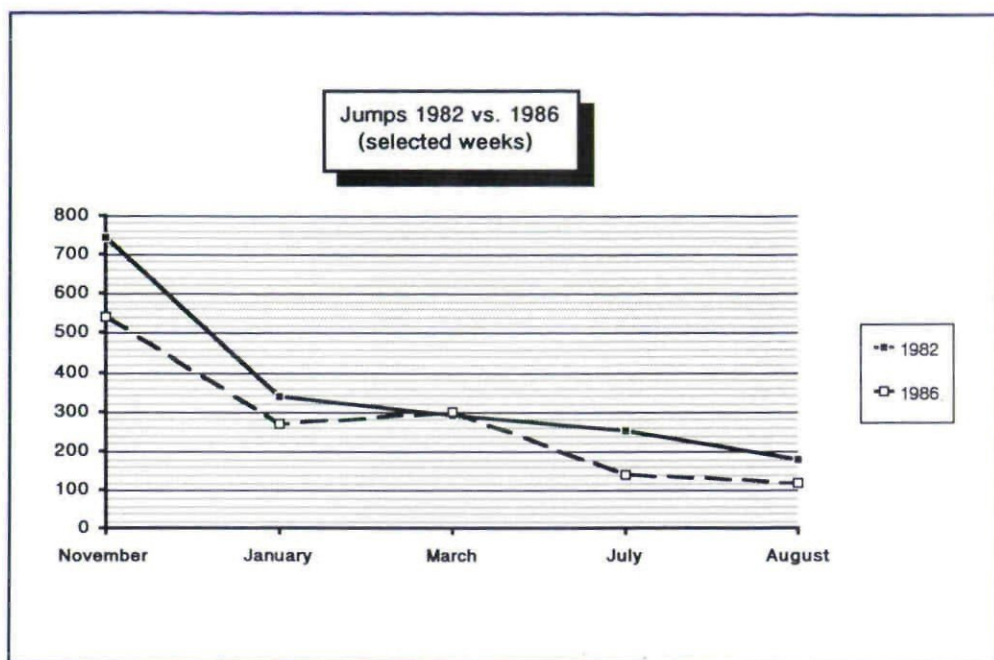


Figure 12: Sprints

