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CASE REPORT

THE TESTING AND TRAINING OF AN INTERNATIONAL FAST BOWLER — DENNIS LILLEE

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After sustaining stress fractures in the lumbar vertebrae during the early part of 1973, the Australian fast bowler, Dennis Lillee rested from first-class cricket during the 1973-74 season. He had done no intensive exercise for almost eighteen months when he commenced his comeback training programme.

It was the objective of the programme to cater for the general metabolic and muscular demands of fast bowling with particular emphasis on the strength and flexibility of his lower back.

Testing

A battery of tests were administered to evaluate the effects of training. These tests included weight, body fat (Yuhasz, 1962 — skinfold measurements), circulatory and metabolic responses to submaximal and maximal treadmill performance (Pyke et al, 1974), arm, shoulder and wrist strength (Clarke 1953 — cable tensiometry), arm and shoulder power (Glencross, 1966), and lower back and hamstring muscle flexibility (Wells and Dillon, 1952).

Training

The subject trained under supervision for three sessions per week for a period of nine weeks.

(a) Running:

Initially the subject ran continuously for 20 minutes in each session at a pace which represented 80% of maximal speed for the distance. This was later supplemented with interval work in which 5 second sprints were alternated with 15 second periods of walking;

(b) Strengthening:

During the early stages of the programme general weight training exercises, such as bench presses, biceps curls, dumbbell flys and inclined sit-ups were prescribed. At first light loads were used with emphasis on correct technique. These were gradually increased until 3 sets of 8 repetitions were performed with a load of 15 R.M. Only short recovery periods (less than one minute) between sets were permitted. Towards the end of the nine week period

the load was reduced so that the exercise could be performed more explosively. In addition, the general work was supplemented with routines which simulated the bowling action and more appropriately overloaded the muscles involved. This was done both with a pulley system which allowed duplication of the full bowling movement against a 10 kg resistance and, more explosively, by having the subject bowl a light weight (2 kg) medicine ball.

(c) Flexibility:

The exercises described by Holt (1974) were selected for development of flexibility of those muscles important in the bowling action and which surrounded the injured lumbar vertebrae. Attention was given to the trunk and thigh extensors, arm extensors, arm horizontal adductors, trunk lateral flexors, and thigh adductors. This technique utilizes the principle of proprioceptive neuromuscular facilitation. While in a lengthened state the muscle group is firstly isometrically contracted. This is followed by concentric contraction of the opposite muscle group which permits a new position to be reached and increased flexibility to be displayed. The isometric contractions also facilitate strength development.

Results

Table I shows that Lillee made substantial improvements in all tests administered. He reduced his body fat content by 10% which undoubtedly gave him an advantage in the stamina tests. It is interesting to note that despite this decrease in body fat, his weight actually increased. This probably resulted from an increased muscle mass attributable to the strength training.

Improved cardiovascular function was reflected by a 25 beat/minute reduction in heart rate during a 10 minute sub-maximal treadmill run at 7½ minute mile pace. This change was consistent with that observed in other training studies and indicated that his heart improved its stroke volume. During maximal work his capacity to consume oxygen improved by 9.3% due to a better cardiac output and an ability of the muscles to absorb more oxygen presented to them by the blood. This contributed to maximum running time being in-

creased by 90 seconds. At the end of the training period his capacity for stamina work was equivalent to many athletes participating in stamina-oriented sports such as soccer, hockey and squash, but was still well below the standard of a good inter-club distance runner.

Lillee also improved his strength. However, in the light of Davis's findings (1975), future training programmes should concentrate more on development of the muscles responsible for hand flexion. This can be done with reverse grip wrist rolling and specific pulley work.

Noticeable increases in arm extension power also occurred. Lillee's performance on this test substantially exceeded that of several other fast bowlers studied by Davis (1975). His remarkable improvement in flexibility was similar to the gains reported by Holt (1974) and confirmed the value of the technique employed.

TABLE I

*Dennis Lillee's Test Results Before and After
Nine Weeks of Training*

Test	Before Training	After Training	Percent Change
Physical Characteristics			
Height (cm)	183.5	183.5	—
Weight (kg)	84.5	86.4	2.2
Percent body fat*	13.0	11.7	10.0
Stamina (Treadmill)			
Submaximal Heart Rate (beats/min)	180	155	13.9
Maximal Oxygen Consumption (ml/kgXmin)	50.5	55.2	9.3
Maximal Running Time (min)	7.5	9.0	20.0
Strength			
Arm extension (kg)	71.8	82.3	14.6
Hand flexion (kg)	25.9	27.7	6.9
Power			
Arm extension (kgm/sec)	199	245	23.1
Flexibility			
Sit and Reach (cm)	2	9	350.0

*From Skinfold Measurements

The success of Lillee's comeback to first class cricket can be gauged from his performances during the first three months of the 1974-75 season when he played in six Sheffield Shield matches and in five Test matches against England. His statistics can be compared to those

of his Australian opening partner Jeff Thomson and the English fast bowler Bob Willis.

Lillee bowled in 22 innings and took a total of 55 wickets while Thomson took 53 wickets in 23 innings. In 17 first-class innings on the tour Willis took 26 wickets. Lillee averaged 18.5 overs per innings to Thomson's 13.3 and Willis's 13.1 which indicated the former's capacity for sustained spells.

In Test matches Lillee's efforts were overshadowed by those of Thomson. However, his record was superior to that of Willis who was the leading English wicket-taker.

The question that remained unanswered was whether Lillee was able to bowl as fast as before his injury. Unfortunately while measurements of his bowling speed prior to his injury were not available, high speed cinematography (see photograph) was used to calculate the velocity of his bowling just prior to the second Test in Perth in 1975. The recorded velocity of 39.5 metres/second (88.2 mph) was 1.34 metres/second (3 mph) faster than any member of a group which included several first class fast bowlers.

While this value is approximately 3 mph slower than that recorded by Jeff Thomson, it still indicates that Lillee has recaptured his ranking among the world's fastest bowlers. His match statistics also suggest that he has regained his status as one of the world's most prolific wicket-takers.

Conclusion

It would appear that the exercise programme prescribed for Dennis Lillee combined with his ability to develop a smoother approach and delivery action, have given him a considerable degree of protection against the stresses imposed by fast bowling. However, apart from this, he was content to gradually increase his speed during his comeback and has avoided sustained spells of bowling at top pace. In their wisdom his captains have limited him to no more than 5 or 6 overs in a spell and he personally has resisted the temptation to deliver each ball with a maximal explosive effort. His example shows that with proper training and sensible harnessing of talent, the athletic life of a fast bowler can be prolonged.

Acknowledgement

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ANALYSING LILLEE'S BOWLING ACTION AND SPEED OF DELIVERY

The grid facilitates measurement by providing a background free from visual interference. The hurdle is marked in 10 centimetre black and white sections to give a standard distance dimension and the clock indicates elapsed time by making a complete revolution on 0.6 secs.

The sequence of photographs was taken by Bill Plowman, West Australian Newspapers Ltd.