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RESEARCH ARTICLE

IDENTIFYING COMPETENT TRAINING AND DETRAINING METHOD TO IMPROVE SPEED, STRIDE FREQUENCY AND ANAEROBIC POWER AMONG VARSITY STUDENTS

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ABSTRACT

Research findings have indicated that the Competent Training Method (CTM) and Detraining Method (DM) to improve Speed, Stride Frequency and Anaerobic Power among Varsity Students. For the purpose fifty female students were selected as subjects. The age of the subjects' ranged from 17 to 20 years; height ranged from 150 to160 centimeters and weight is 40 to 55 kilograms. The experimental design used in this study was random group design. The selected subjects were divided at random into five groups of ten each (n=10). Group I underwent speed training, Group II underwent power training, Group III underwent combined training, Group IV underwent complex training and Group V acted as control group.

INTRODUCTION

Sport is in its origin and intention a movement into transcendence which carries over from the founding decision to play and which builds upon that decision an intensified thrust towards the values of self-consciousness tested through performance, competition and victory. There is certainly a return to seriousness in the discipline of formal sport. There is training, performance and competition. Sport can be demanding, but its essence is as delicate as any perfume and can be as readily dissipated (Hart, 1976).

Isolated training is specific training schedule to meet the needs of highly focused objective. The term itself specifies its unique and solitary way of focus on a single component or a motor ability that determines performance. Speed training and power training were used as isolated training for this study. Combined training one of the training methods that develop the motor qualities by means and methods of applying two modes of training. In this study, speed and power trainings are combined and given one after other in alternative days. The complex training program can be used in the general, specific and competition phases of training. To get the best from these training workouts the athlete need to be physically fresh and motivated. Type II B fibers are not magically recruited by just doing the workout, it is to focused on the exercises and perform them as explosively as possible. One of the major requirements in many sports is speed. In sports such as sprinting, soccer, cycling, hockey, fencing, games and many other team sports, speed is a major factor determining the overall outcome. For endurance athlete's speed can mean the ability to win in a spring finish or break away from an opponent in a tactical situation.

Power and physical performance have been closely related and investigated by various investigators using different protocols. The ability of the athlete to produce high force at high velocity is an important component of the physical performance and functional capacity. However, power has been defined as the product of force (or torque) and velocity, it is rate of doing work (Baechle *et al*, 1994). Anaerobic power training is the process of metabolizing body fuels through exercise without oxygen. The anaerobic exercise builds muscle mass. The main functional outcome of anaerobic exercise, however, is to move quickly and deliver great force, which is why anaerobic power training is highly relevant to sprinters and other athletes who must move explosively or deliver a substantial amount of force in a short time (Siedontop, 1998). Detraining refers to the cessation of regular physical training. The effects of stopping training are quite minor compared with those from immobilization. In general, greater the gains during training, the greater the losses during detraining simply because the

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well-trained person has more to lose than the untrained person (Costill, 1991).

Purpose of the Study

The present study was designed to identify the competent training method and its detraining effect on development of speed, stride frequency and Anaerobic Power.

- The ultimate goal of research in physical education is to help coaches and physical educators to train their athletes and players based on new concepts to improve their performance.
- The findings of the study would reveal the extent to which the speed and explosive power training improves the overall performance.
- The results of the study may be useful to the professional colleagues of physical education and sports to prepare training schedules for specific event.

Hypothesis

It was hypothesized as combined training may be found to be competent training to improve the selected variables to improve the performance of the selected subjects.

Review of related literature

Berthoin (2001) examined the relations among kinematic parameters measured during the first 10 seconds of 100-m sprint and anaerobic tests were studied in 22 male physical education students. Results fail to identify one anaerobic test that specifically explains one sprint kinematic parameter.

Rusko (1993) designed a study to investigate a new method for the evaluation of anaerobic running power (MARP) in the athletes. The [la-] b at sub maximal sprinting speed was suggested as describing the anaerobic sprinting economy.

Scott (2004) investigated the acute effects of a heavy dynamic preload, consisting of one set of five repetition maximum (5RM) back squats, on countermovement vertical jump (VJ) and horizontal jump (HJ) performance. The results indicated no significant differences occurred between the mean or maximal values for either VJ or HJ as a consequence of the dynamic preload exercise. In addition, the results reflected an inability of subjects to benefit from the repeated exposure to the heavy dynamic preload exercise protocol.

Jensen (2003) conducted a study on kinetic analysis of complex training rest interval effect on vertical jump performance. Repeated measures ANOVA determined a difference (p</=0.05) between genders and that jump performance immediately following the squat exercise was hindered (0.66 m), but no effect (p>0.05) was found comparing subsequent jumps (0.72-0.76 m) to the pre-squat condition (0.74 m). In conclusion, complex training does not appear to enhance jumping performance significantly and actually decreases it when the jump is performed immediately following the strength training set.

Table 1 Tests Selection

S. No	Criterion variables	Test items	Unit of measurements
1	Speed	50 metres run	$1/10^{th}$ of a second
2	Stride frequency	50 metres run	In numbers
3	Anaerobic power	Margaria Kalamen Test	In kgms cm sec^{-1}

Table 2 the mean and standard deviation on speed of pre test, post test and two cessations data of experimental and control groups

Groups		Pre Test	Post Test	First Cessation	Second Cessation
Speed Training	Mean	8.31	7.73	8.15	8.33
	± SD	0.26	0.35	0.32	0.31
Power Training	Mean	8.30	7.85	8.17	8.27
	± SD	0.33	0.25	0.22	0.27
Combined Training	Mean	8.34	7.42	8.14	8.26
	± SD	0.21	0.36	0.22	0.22
Complex Training	Mean	8.38	7.63	8.28	8.32
	± SD	0.52	0.31	0.42	0.41
Control Group	Mean	8.28	8.25	8.21	8.29
	± SD	0.26	0.20	0.44	0.26

Speed scores are expressed in Seconds

Table 3 Two factor ANOVA on speed of speed training, power training, combined training, complex training and control groups at three different stages of testing periods

Source of Variance	Sum of Squares	Df	Mean Squares	F-ratio
A factor (Groups)	0.959	4	0.24	0.92
Error I	11.78	45	0.26	
B factor (Tests)	9.586	3	3.20	66.67*
AB factor (Interaction) (Groups and Tests)	3.073	12	0.26	5.42*
Error II	6.459	135	0.048	

*Significant at .05 level

Table 4 The simple effect scores of groups (rows) at three different stages of tests (columns) on speed

Source of Variance	Sum of Squares	df	Mean Squares	"F" ratio
Groups Within Pre test	0.06	4	0.02	0.42
Groups Within Post test	3.80	4	0.95	19.79*
Groups Within First Cessation	0.13	4	0.03	0.63
Groups Within Second Cessation	0.04	4	0.01	0.21
Tests Within Group I	2.33	3	0.777	16.19*
Tests Within Group II	1.27	3	0.42	8.75*
Tests Within Group III	5.33	3	1.78	37.08*
Tests Within Group IV	3.69	3	1.23	25.63*
Tests Within Group V	0.04	3	0.01	0.21
Error II	6.459	135	0.048	

***Significant at .05 level**

MATERIALS AND METHODS

Fifty female students were selected as subjects. The age of the subjects' ranged from 17 to 20 years; height ranged from 150 to160 centimetres and weight is 40 to 55 kilograms. The experimental design used in this study was random group design. The selected subjects were divided at random into five groups of ten each (n=10). Group I underwent speed training, Group II underwent power training, Group III underwent combined training, Group IV underwent complex training and Group V acted as control group. All the subjects were tested prior to and after the training and during detraining period the data were collected at the end of third and sixth week for all the selected variables. The collected data from the five groups on

pre-post experimentation and detraining (two cessation) were statistically analyzed by using two way (5x4) factorial ANOVA with last factor repeated measures (Broota, 1989).

Table 5 The scheffe's test for the differences between paired means of post test with different groups on speed

Speed Training Group	Power Training Group	Combined Training Group	Complex Training Group	Control Group	Mean difference	Confidence interval
7.73	7.85				0.12	0.31
7.73		7.42			0.31*	0.31
7.73			7.63		0.10	0.31
7.73				8.25	0.52*	0.31
	7.85	7.42			0.43*	0.31
	7.85		7.63		0.22	0.31
	7.85			8.25	0.40*	0.31
		7.42	7.63		0.21	0.31
		7.42		8.25	0.83*	0.31
			7.63	8.25	0.62*	0.31

*Significant at .05 level.

Table 6 The mean and standard deviation on stride length of pre test, post test and two cessations data of experimental and control groups

Groups		Pre Test	Post Test	First Cessation	Second Cessation
Speed Training	Mean	1.62	1.72	1.66	1.63
	± SD	0.04	0.09	0.07	0.07
Power Training	Mean	1.62	1.69	1.65	1.62
	± SD	0.06	0.09	0.07	0.07
Combined Training	Mean	1.61	1.82	1.65	1.65
	± SD	0.07	0.10	0.08	0.11
Complex Training	Mean	1.62	1.80	1.66	1.64
	± SD	0.06	0.10	0.08	0.08
Control Group	Mean	1.62	1.61	1.62	1.61
	± SD	0.09	0.08	0.07	0.06

(Stride length scores are expressed in Metres)

Table 7 Two factor anova on stride length of speed training, power training, combined training, complex training and control groups at three different stages of testing periods

Source of Variance	Sum of Squares	Df	Mean Squares	F-ratio
A factor (Groups)	0.114	4	0.029	1.45
Error I	0.743	45	0.017	
B factor (Tests)	0.347	3	0.116	40.00*
AB factor (Interaction) (Groups and Tests)	0.171	12	0.014	4.67*
Error II	0.381	135	0.003	

*Significant at .05 level

Analysis of the Data

The influence of independent variables on each criterion variables were analyzed and presented below.

Speed

The mean and standard deviation values on speed of speed training, power training, combined training, complex training and control groups at four different stages of tests have been analyzed and presented in Table II

The pre and post tests, first and second cessations mean values of speed training, power training, combined training, complex training and control groups on speed were graphically represented in the figure I. The data of speed have been analyzed by two way factorial ANOVA (5x4) with repeated measures on last factor and the obtained results are presented in Table IV.

Table 8 The simple effect scores of groups (rows) at three different stages of tests (columns) on stride length

Source of Variance	Sum of Squares	Df	Mean Squares	"F" ratio
Groups Within Pre test	0.001	4	0.0003	0.10
Groups Within Post test	0.25	4	0.06	20.00*
Groups Within First Cessation	0.01	4	0.003	1.00
Groups Within Second Cessation	0.01	4	0.003	1.00
Tests Within Group I	0.05	3	0.017	5.67*
Tests Within Group II	0.02	3	0.01	3.33*
Tests Within Group III	0.25	3	0.08	26.67*
Tests Within Group IV	0.19	3	0.06	20.00*
Tests Within Group V	0.001	3	0.0003	0.10
Error II	0.381	135	0.003	

*Significant at .05 level

Table 9 The scheffe's test for the differences between paired means of post test with different groups on stride length

Speed Training Group	Power Training Group	Combined Training Group	Complex Training Group	Control Group	Mean difference	Confidence interval
1.72	1.69				0.03	0.08
1.72		1.82			0.10*	0.08
1.72			1.80		0.08*	0.08
1.72				1.61	0.11*	0.08
	1.69	1.82			0.13*	0.08
	1.69		1.80		0.11*	0.08
	1.69			1.61	0.08*	0.08
		1.82	1.80		0.02	0.08
		1.82		1.61	0.21*	0.08
			1.80	1.61	0.19*	0.08

*Significant at .05 level.

Table 10 The mean and standard deviation on anaerobic power of pre test, post test and two cessations data of experimental and control groups

Groups		Pre Test	Post Test	First Cessation	Second Cessation
Speed Training	Mean	77.98	85.14	80.02	79.04
	± SD	0.04	0.02	0.02	0.02
Power Training	Mean	77.79	86.72	80.35	78.21
	± SD	0.03	0.04	0.02	0.02
Combined Training	Mean	77.19	88.67	79.18	78.71
	± SD	0.03	0.03	0.03	0.03
Complex Training	Mean	77.87	88.26	79.10	78.41
	± SD	0.04	0.03	0.03	0.03
Control Group	Mean	77.46	77.28	77.03	77.48
	± SD	0.06	0.05	0.04	0.03

Anaerobic Power scores are expressed in kgms cm sec^{-1})

Table IV shows that the obtained F-ratio for Groups within post test is 19.79 indicating that there was a significant difference between the paired means of groups within post test on speed. Table IV shows that F-ratio values obtained for tests within group I, tests within group II, tests within group III, and tests within group IV are 16.19, 8.75, 37.08 and 25.63 indicating that there was a significant difference exists among the paired means of tests within group I, tests within group II, tests within group III, and tests within group IV on speed. Rest of the pairs is not significant. Since, five groups and four different stages of tests were compared, whenever the obtained F-ratio value was found to be significant in the simple effect, the Scheffe's test was applied as post hoc test to find out the paired mean difference, if any and it has been presented in Table V

Table 11 Two factor anova on anaerobic power of speed training, power training, combined training, complex training and control groups at three different stages of testing periods

Source of Variance	Sum of Squares	df	Mean Squares	F-ratio
A factor (Groups)	390.722	4	97.68	3.34
Error I	1316.245	45	29.25	
B factor (Tests)	1801.614	3	600.54	107.74*
AB factor (Interaction) (Groups and Tests)	558.859	12	46.57	8.35*
Error II	752.506	135	5.574	

*Significant at .05 level

Table 12 The simple effect scores of groups (rows) at three different stages of tests (columns) on anaerobic power

Source of Variance	Sum of Squares	df	Mean Squares	"F" ratio
Groups Within Pre test	4.24	4	1.06	0.19
Groups Within Post test	864.71	4	216.18	38.78*
Groups Within First Cessation	66.79	4	16.7	3.00*
Groups Within Second Cessation	13.84	4	3.46	0.62
Tests Within Group I	302.66	3	100.887	18.10*
Tests Within Group II	509.58	3	169.86	30.47*
Tests Within Group III	818.78	3	272.93	48.96*
Tests Within Group IV	728.16	3	242.72	43.55*
Tests Within Group V	1.30	3	0.43	0.08
Error II	752.506	135	5.574	

*Significant at .05 level

Table 13 The scheffe's test for the differences between paired means of post test with different groups on anaerobic power

Speed Training Group	Power Training Group	Combined Training Group	Complex Training Group	Control Group	Mean difference	Confidence interval
85.14	86.72				1.58	3.31
85.14		88.67			3.53*	3.31
85.14			88.26		3.12	3.31
85.14				77.28	7.86*	3.31
	86.72	88.67			1.95	3.31
	86.72		88.26		1.54	3.31
	86.72			77.28	9.44*	3.31
		88.67	88.26		0.41	3.31
		88.67		77.28	11.39*	3.31
			88.26	77.28	10.98*	3.31

*Significant at .05 level.

The above table clearly indicates that the mean difference between speed training and combined groups, speed training and control groups, power training and combined training groups, power training and control groups, combined training and control groups, and complex training and control groups were 0.31, 0.52, 0.43, 0.40, 0.83 and 0.62 respectively. The values are greater than the confidence interval value 0.31, which shows significant difference at .05 level of confidence.

It may be concluded from the results of the study that there is a significant difference between the post test means of speed training and combined groups, speed training and control groups, power training and combined training groups, power training and control groups, combined training and control groups, and complex training and control groups on speed at post test period.

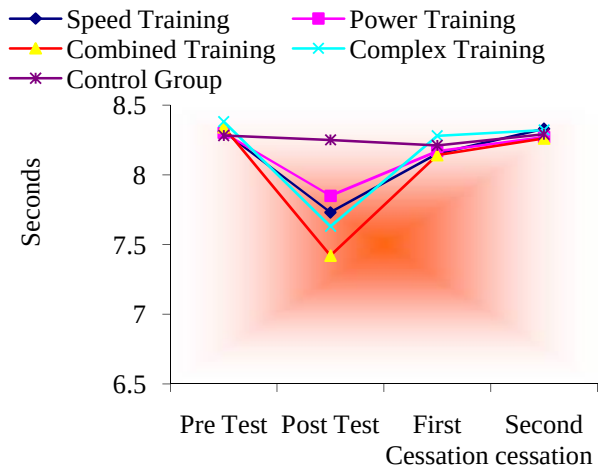

Figure 1 Mean scores of pre test, post test and two cessations among speed training, power training, combined training, complex training and control groups on speed.

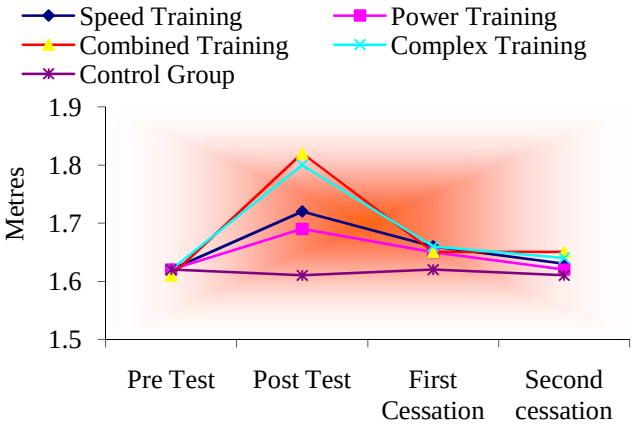

Figure 2 Mean scores of pre test, post test and two cessations among speed training, power training, combined training, complex training and control groups on stride length.

Variable: II - Stride Length

The mean and standard deviation values on stride length of speed training, power training, combined training, complex training and control groups at four different stages of tests have been analyzed and presented in Table VII. The pre and post tests, first and second cessations mean values of speed training, power training, combined training, complex training and control groups on stride length were graphically represented in the figure II. The data of stride length have been analysed by two way factorial ANOVA (5x4) with repeated measures on last factor and the obtained results are presented in Table VII.

From the table VII and the obtained F-ratio, Factor A (Groups) did not differ significantly. The result of the study indicates that there is no significant difference among the paired means of Factor A (Groups) on Stride length and observed that differences among the paired means of Factor B (Tests) on stride length are statistically significant ($P<0.05$)). From the table VII, the obtained F value of Interaction- A x B (Groups x Different stages of Tests) show that there is significant difference existing among the paired means of interaction A x B on stride length ($P<0.05$). The results of the study indicated

that there was a significant difference in the interaction effect (between rows (Groups) and columns (Tests)) on stride length. Since, the interaction effect was significant, the simple effect test was applied as follow up test and they are presented in Table VIII.

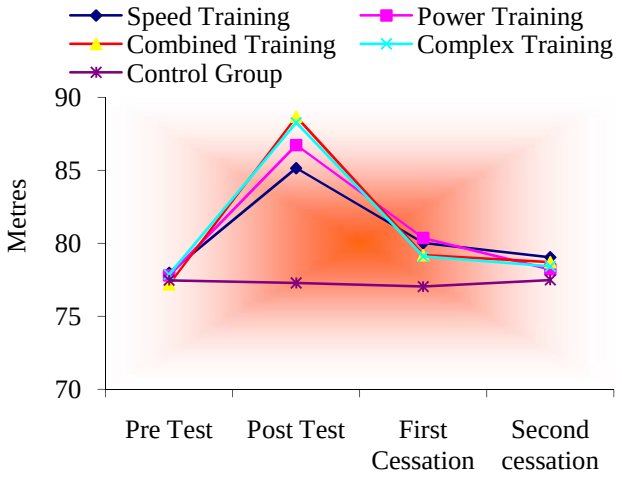

Figure 3 Mean scores of pre test, post test and two cessations among speed training, power training, combined training, complex training and control groups on anaerobic power.

Table VIII shows that the obtained F-ratio values for Groups within post test is 20.00 indicating that there was a significant difference between the paired means of groups within post test on stride length. Table VIII shows that F-ratio values obtained for tests within group I, tests within group II, tests within group III, and tests within group IV are 5.67, 3.33, 26.67 and 20.00 indicating that there was a significant difference among the paired means of tests within group I, tests within group II, tests within group III, and tests within group IV on stride length. Rest of the pairs is not significant. Since, five groups and four different stages of tests were compared, whenever the obtained F-ratio value was found to be significant in the simple effect, the Scheffe's test was applied as post hoc test to find out the paired mean difference, if any and it has been presented in Table IX

The above table clearly indicates that the mean difference between speed training and combined groups, speed training and complex groups, speed training and control groups, power training and combined groups, power training and complex groups, power training and control groups, combined training and control groups, and complex training and control groups were 0.10, 0.08, 0.11, 0.13, 0.11, 0.08, 0.21 and 0.19 respectively. The values are greater than the confidence interval value 0.08, which shows significant difference at .05 level of confidence. It may be concluded from the results of the study that there is a significant difference between the post test means of speed training and combined groups, speed training and complex groups, speed training and control groups, power training and combined groups, power training and complex groups, power training and control groups, combined training and control groups, and complex training and control groups on stride length at post test period.

Variable III - Anaerobic Power

The mean and standard deviation values on anaerobic power of speed training, power training, combined training, complex training and control groups at four different stages of tests have been analyzed and presented in Table X

The pre and post tests, first and second cessations mean values of speed training, power training, combined training, complex training and control groups on anaerobic power were represented in the figure III.

The data of anaerobic power have been analyzed by two way factorial ANOVA (5x4) with repeated measures on last factor and the obtained results are presented in Table XI.

From the table XI and the obtained F-ratio, Factor A (Groups) differ significantly. The result of the study indicates that there is significant difference among the paired means of Factor A (Groups) on Anaerobic power and also indicates that differences among the paired means of Factor B (Tests) on Anaerobic power ($P<0.05$). From the table XI, the obtained F value of Interaction- A x B (Groups x Different stages of Tests) show that there is significant difference existing among the paired means of interaction A x B on Anaerobic power ($P < 0.05$). The results of the study indicated that there was a significant difference in the interaction effect (between rows (Groups) and columns (Tests)) on anaerobic power. Since, the interaction effect was significant, the simple effect test was applied as follow up test and they are presented in Table XII.

Table XII shows that the obtained F-ratio values for Groups within post test and groups within first cessation values are 38.78 and 3.00 indicating that there was a significant difference between the paired means of groups within post test and groups within first cessation values on anaerobic power. Table XII shows that F-ratio values obtained for tests within group I, tests within group II, tests within group III, and tests within group IV are 18.10, 30.47, 48.96 and 43.55 indicating that there was a significant difference among the paired means of tests within group I, tests within group II, tests within group III, and tests within group IV on anaerobic power. Rest of the pairs is not significant. Since, five groups and four different stages of tests were compared, whenever the obtained F-ratio value was found to be significant in the simple effect, the Scheffe's test was applied as post hoc test to find out the paired mean difference, if any and it has been presented in Table XIII

The above table clearly indicates that the mean difference between speed training and combined groups, speed training and control groups, power training and control groups, combined training and control groups, and complex training and control groups were 3.53, 7.86, 9.44, 11.39 and 10.98 respectively. The values are greater than the confidence interval value 3.31, which shows significant difference at .05 level of confidence. It may be concluded from the results of the study that there is a significant difference between the post test means of speed training and combined groups, speed training and control groups, power training and control groups, combined training and control groups, and complex training and control groups on anaerobic power at post test period.

DISCUSSION ON FINDINGS

The results of the study indicate that all the experimental

groups namely speed training, power training, combined training and complex training significantly improved in their performance as selected dependent variables namely stride length, explosive power and elastic power when compared to the control group. It is also found that the improvement caused by combined training was greater when compared to the complex training, speed training and power training in all the selected dependent variables. The below mentioned studies supports the findings of the study.

Ingle *et al* (2006) stated that this complex training is a time effective and safe training modality that confers small improvements in anaerobic power and jumping, throwing and sprinting performance, and marked improvements in dynamic strength. And also stated that, after detraining, the benefits of complex training are lost at similar rates to other training modalities. Surakka *et al* (2006) concluded that external loads of 22.2kg, in total, increased the efficiency of power-type strength training in vertical jumps and in anaerobic power in leg muscles, but not in sprint running. Nummela *et al* (1996) suggested that sprint training induces an adaptive increase in the maximal anaerobic running power in well-trained male sprinters. Linossier *et al* (1997) suggested that a long interruption in training has negligible effects on short – spring ability and muscle anaerobic potential.

CONCLUSION

Hence, it is concluded that the systematic and scientific way of combined training is identified as the competent method and its detraining effect is also considered to be lesser when compared the other methods of training to improve speed, stride frequency and anaerobic power. Isolated and complex method of training these components is considered lesser enhancement in performance and detraining effect is also higher for this method. Combined training may be included as a main course of training for training kids, novice and elite athletes to maximize the performances.

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