

Effect Of Interval Training And Circuit Training On VO₂ Max Among Middle Distance Runners

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ABSTRACT

The present study investigated the effect of interval training (IT) and circuit training (CT) on maximal oxygen uptake (VO₂max) among middle-distance runners. A total of 60 inter-college athletes were randomly assigned into three groups: interval training group (n=20), circuit training group (n=20), and a control group (n=20). The experimental groups underwent 12 weeks of their respective training protocols, while the control group did not receive any special intervention. VO₂max was measured pre- and post-intervention.

The results revealed significant improvements in VO₂max for both experimental groups. The interval training group improved from 37.00 ± 1.84 to 40.50 ± 2.01 ml/kg/min, and the circuit training group improved from 36.23 ± 1.76 to 40.01 ± 1.98 ml/kg/min. The control group showed minimal change (36.87 ± 1.79 to 37.01 ± 1.82 ml/kg/min). Analysis of covariance (ANCOVA) indicated significant differences among the groups ($F=10.82$, $p<0.05$), and post hoc analysis revealed that both IT (MD: 3.41) and CT (MD: 3.39) were significantly superior to the control group, while no significant difference was observed between the two training methods (MD: 0.02).

These findings suggest that both interval and circuit training are effective in enhancing VO₂max among middle-distance runners, providing flexibility for coaches in designing conditioning programs. Incorporating either training modality can improve aerobic capacity, endurance, and competitive performance.

Keywords: Interval Training, Circuit Training, VO₂max and Middle-Distance Runners.

INTRODUCTION

Middle-distance running, encompassing events like the 800m and 1500m, demands a unique blend of aerobic endurance and anaerobic power. A key determinant of performance in these events is maximal oxygen uptake (VO₂max), which reflects the body's capacity to transport and utilize oxygen during intense exercise. Enhancing VO₂max is crucial for improving endurance and overall race performance.

Interval Training (IT) has emerged as a potent method to elevate VO₂max. Characterized by short bursts of intense activity followed by brief recovery periods, IT pushes the cardiovascular system to adapt rapidly, leading to significant improvements in aerobic capacity. Studies have demonstrated that IT can be more

effective than traditional continuous training in boosting VO_2max , particularly in athletes with a solid endurance base.

Circuit Training, another popular training modality, involves performing a series of exercises targeting different muscle groups with minimal rest between them. While traditionally associated with strength and muscular endurance, circuit training can also enhance cardiovascular fitness. By incorporating aerobic exercises into the circuit, athletes can achieve improvements in VO_2max , making it a versatile training approach for middle-distance runners.

The comparative effectiveness of IT and Circuit Training in enhancing VO_2max among middle-distance runners remains an area of interest. Understanding how these training methods influence aerobic capacity can inform training strategies and optimize performance outcomes. This study aims to investigate and compare the effect of IT and Circuit Training on VO_2max in middle-distance runners, providing insights into their relative efficacy.

Given the importance of VO_2max in middle-distance running performance, it is essential to explore training interventions that can effectively enhance this parameter. By examining the impacts of IT and Circuit Training, this research seeks to contribute valuable knowledge to the field of sports science and athletics, aiding coaches and athletes in designing targeted training programs to improve endurance and competitive performance.

EXPERIMENTAL DESIGN

Find out the study effect of interval training and circuit training on vo_2 Max among middle distance runners. The study was formulated as a true random group design consisting of a pre-test and post test. The subjects who are participated inter collegiate tournaments in kadapa district and their age ranged between 18-22 years ($N=60$) were randomly assigned to three equal groups of twenty. The selected subjects were divided into three groups randomly. Experimental Group I was interval training group, experimental group II was circuit training group and control group was not involved in any special treatment. Pre test was conducted for experimental Groups I and II and the control group on vo_2 Max. Experimental groups underwent the respective training for 12 weeks. Immediately after the completion of 12 weeks training, all the subjects were measured of their post test scores on the selected criterion variable. The difference between the initial and final scores was considered the effect of respective treatments. To find out statistical significance of the results obtained, the data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level was fixed to test the significance of the study.

RESULTS ON VO_2 MAX

The statistical analysis comparing the initial and final means of VO_2 max due to interval training and circuit training among Middle distance runners is presented in Table I

Table I

COMPUTATION OF ANALYSIS OF COVARIANCE OF VO₂ MAX

	INTERVAL TRAINING	CIRCUIT TRAINING	CONTROL GROUP	SOURCE OF VARIANCE	SUM OF SQUARES	df	MEAN SQUARE	OBTAINED F
Pre Test Mean	37.00	36.23	36.87	Between	6.78	2	3.39	0.17
				Within	1152.61	57	20.22	
Post Test Mean	40.50	40.01	37.01	Between	142.72	2	71.36	4.89*
				Within	831.73	57	14.59	
Adjusted Post Test Mean	40.32	40.30	36.91	Between	153.90	2	76.95	10.82*
				Within	398.31	56	7.11	
Mean Diff	3.50	3.78	0.14					

Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.16, 2 and 56 (df) =3.16.

*Significant

As shown in Table I, the obtained pre test means on VO₂ max on interval training group was 37.00, circuit training group was 36.23 was and control group was 36.87. The obtained pre test F value was 0.17 and the required table F value was 3.16, which proved that there was no significant difference among initial scores of the subjects.

The obtained post test means on VO₂ max on interval training group was 40.50, circuit training group was 40.01 was and control group was 37.01. The obtained post test F value was 4.89 and the required table F value was 3.16, which proved that there was significant difference among post test scores of the subjects.

Taking into consideration of the pre test means and post test means adjusted post test means were determined and analysis of covariance was done and the obtained F value 10.82 was greater than the required value of 3.16 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table II.

Table II

Scheffe's Confidence Interval Test Scores on VO2 max

MEANS				Required C I
interval training Training Group	circuit training Group	Control Group	Mean Difference	
40.32	40.30		0.02	2.12
40.32		36.91	3.41*	2.12
	40.30	36.91	3.39*	2.12

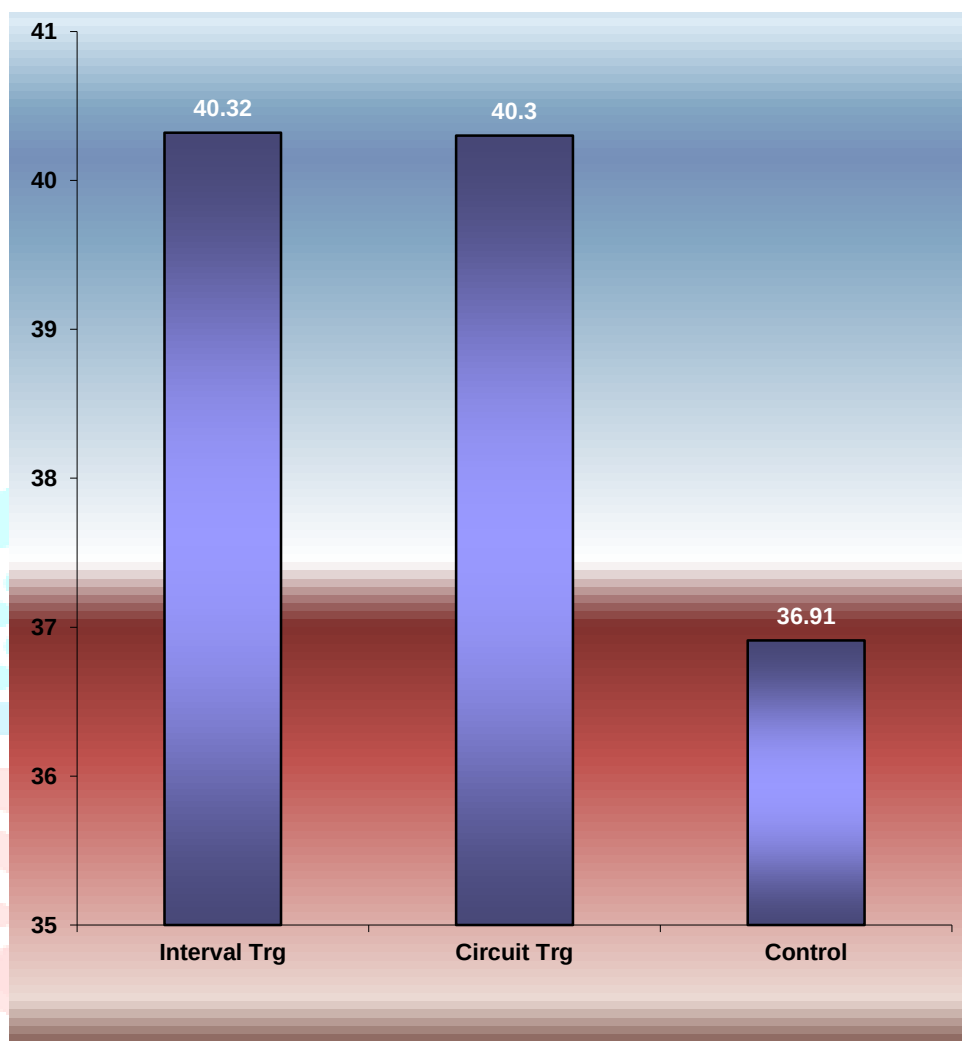
* Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between interval training group and control group (MD: 3.41). There was significant difference between circuit training group and control group (MD: 3.39). There was no significant difference between treatment groups, namely, interval training group and circuit training group. (MD: 0.02).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure I.

Figure I

BAR DIAGRAM ON ORDERED ADJUSTED MEANS ON VO₂ MAX



DISCUSSIONS ON FINDINGS ON VO₂ MAX

The effect of interval training and circuit training on VO₂ max is presented in Table I. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 10.82 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table II proved that there was significant difference between interval training group and control group (MD: 3.41) and circuit training group and control group (MD: 3.39). Comparing between the treatment groups, it was found that there was no significant difference between interval training and circuit training group among Middle distance runners.

Thus, it was found that interval training and circuit training were better than control group in improving VO₂ max of the Middle distance runners.

CONCLUSION

The present study demonstrates that both interval training and circuit training significantly improved VO₂max among middle-distance runners compared to the control group. The statistical analysis confirmed notable enhancements in aerobic capacity, as evidenced by the increase in VO₂max scores for both experimental groups. Post hoc analysis revealed that interval training (MD: 3.41) and circuit training (MD: 3.39) were both significantly more effective than no special training, while no significant difference was observed between the two training modalities (MD: 0.02).

These findings indicate that either interval training or circuit training can be effectively incorporated into middle-distance runners' conditioning programs to enhance cardiovascular fitness and aerobic performance. Both training methods appear equally beneficial for improving VO₂max, allowing flexibility in program design based on athlete preference, resource availability, and specific training goals.

Implementing interval or circuit training can also contribute to improved endurance, delayed onset of fatigue, and overall race performance. Coaches and trainers can leverage these results to optimize training schedules, ensuring that athletes develop both aerobic capacity and muscular endurance simultaneously.

In conclusion, the study confirms that targeted training interventions, such as interval and circuit training, are crucial for improving VO₂max in middle-distance runners. Incorporating these training methods into regular practice can provide measurable physiological benefits and support competitive performance enhancement.

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