

Impact of training on Cardio-pulmonary functions of national level athletes involving in running events.

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Introduction

Most of the national level athletes do their regular training about four hours per day for five to six days per week. Even though they train in the maximum level, their performance at international level and local level is very poor. Is that because of the training errors or physical and physiological errors of the athlete?

Physiology of highly trained athletes is quite different than general physiology of normal adults. Therefore a good knowledge of physiological changes that occur with physical training in athletes is very important. Updated exercise physiology knowledge must be used to fine tune the training schedules of the athletes. Cardio pulmonary fitness assessment (CPET) of athletes is very important to improve and monitor their sports performance and health status. Main CPET parameters which has association with training are peak O₂ uptake VO_{2peak}, anaerobic threshold VO_{2AT}, exercise capacity-METs, peak heart rate-HR_{peak}, Anerobic Threshold- AT, heart rate at AT- HR at, total exercise duration-VO_{2time}, peak energy expenditure-EE and post exercise peripheral oxygen saturation-SpO₂. These parameters show different associations According to the sports event, competitive level of the athlete and the duration scientific training.

Objectives

The study was planned to determine,

1. Cardiopulmonary fitness parameters of national level athletes engaged in running events
2. Effect of training on cardiopulmonary fitness parameters of national level athletes.

Method

National level and university level running athletes (n = 62; male= 40, female= 22) were studied. Cardio-Pulmonary fitness parameters (*peak O₂ uptake (VO_{2peak}), anaerobic threshold (VO_{2AT}), exercise capacity-(METs), peak heart rate-HR_{peak}, anaerobic threshold- AT, heart rate at AT- HR at, total exercise duration-VO_{2time}, peak energy expenditure-EE, maximum load-W, oxygen saturation- SpO₂)*) were assessed by a Cardiopulmonary exercise testing machine with a Cycle ergometer (COSMED). Data were compared with age, height, weight and gender matched controls not engaged in regular sports training (n= 60; male= 30, Female=30). Data were analyzed using SPSS-16 statistical package.

Results

There was significant improvement of some cardiopulmonary fitness parameters amongst male national athletes compared to controls (VO_{2max}, VO_{2max} time, LOAD peak, MET, BP rest, BP ex) (p>0.05). But there were no significant correlation of cardiopulmonary functions with the training duration. Amongst female athletes too some cardiopulmonary fitness parameters (VO_{2max}, HR p, HR 3min, HR at, EE, MET) were significantly improved than the controls (p<0.05). There was a positive correlation of only SpO₂ and negative correlation of, HR_{peak}, HR_{at} with training duration.

Discussion

Optimal usage of Oxygen by active muscles; represented by VO_{2max} is an important factor behind the optimal sports performance of an athlete. Any regular physical training for more than 06 weeks results increase of VO_{2max}.level of the individual (positive correlation). The present study group showed a significant improvement of the VO_{2max} among athletes with regular training when compared to the control group. Along with the increased VO_{2max} the other parameters like VO_{2max} time, LOAD peak, MET also will increase. However the association of improvement in VO_{2max} and related other parameters of national level athletes with the duration of training was poor. The improvement of VO_{2max} alone is not adequate to improve performance and other parameters too need to be suitably improved.

The anaerobic threshold (AT) of an average healthy adult is around 50% to 55% of VO_{2max}.for an athlete participate in sprint events AT has to be much lower level and for middle distance runners it should be around 25% to 35% (negative correlation). For the endurance athletes (long distance runners) AT should be around 75% to 85% of VO_{2max} (positive correlation). Trained runners have about 40 times high energy expenditure at the peak exercise in compared to resting energy expenditure. High energy expenditure is positively correlated with high VO_{2max} level and the training level and duration.

Highly trained heart has low resting heart rate sometimes low rate as 30 beats per minute (eg: endurance swimmers). When starting heart rate is low the peak heart rate after a strenuous exercise will also be at low level (negative correlation with training).

Cardiorespiratory parameters are very important to evaluate the training level of an athlete. It is essential that the athletes should be evaluated by an exercise physiologists to determine the reasons for the low level of cardiopulmonary fitness. The reasons may be biological issues as pulmonary problems, cardiac problems or problems in peripheral circulation or training errors.

Conclusions

Sub optimal performance of an athlete should be investigated with cardiopulmonary fitness testing in consultation with an exercise physiologist. The training schedules must be fine tune or reorganized with the physiological backup.

Key words: cardiopulmonary exercise fitness, training, national athletes, university athletes

References

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