EFFECTS OF RESPIRATORY MUSCLE TRAINING ON EXERCISE AND RECOVERY RESPONSES UNDER NORMOXIA AND HYPOXIA IN YOUNG AND OLD FEMALES

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Effects of Respiratory Muscle Training on Exercise and Recovery Responses under Normoxia and Hypoxia in Young and Old Females

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Abstract

The study aimed to investigate the effects of respiratory muscle training on the responses of muscle and body during exercise and recovery under normal and hypoxic conditions in young and old females.

Methods

A total of 16 female participants were divided into two groups of 8 each. The first group underwent respiratory muscle training, while the second group served as a control. All participants were tested for maximum oxygen uptake (peak oxygen uptake, VO2peak) and during a 6-minute, 85% VO2peak cycling test. The results were compared between the groups under normal and hypoxic conditions (21% O2 and 14% O2).

Results

After the training program, there was an improvement in respiratory muscle strength and endurance in both groups, with more pronounced changes in older females. The duration of muscle activity decreased in both groups, with no significant differences between the groups. There was a significant reduction in oxygen consumption during exercise and recovery in the hypoxic condition. Additionally, the response of the body during recovery was improved, with increased blood oxygen saturation and reduced muscle fatigue and discomfort in both groups.

Conclusion

Respiratory muscle training can improve the cardiovascular response during exercise and recovery in young and old females, especially in older individuals.
ABSTRACT

The aim of this study was to determine the effects of respiratory muscle training (RMT) on respiratory muscle function, exercise and recovery responses under normoxia (21% O\textsubscript{2}) and hypoxia (14% O\textsubscript{2}) in healthy young and old females. Eight young females (age 23-27 yrs) and eight old females (age 50-61 yrs) participated in this study. The protocol of RMT was 50-85% of individual maximal inspiratory pressure (MIP), 30 min/day, 5 days/week, for 8 weeks. Before and after RMT, inspiratory and expiratory muscle strength (assessed by MIP and maximal expiratory pressure, MEP), respiratory muscle endurance (assessed by breathing endurance time, BET), lung function, and aerobic exercise capacity (assessed by peak oxygen uptake, VO\textsubscript{2}peak) were determined. Two 6-minute exercise tests at 85% VO\textsubscript{2}peak were performed under normoxia and hypoxia for determination of respiratory muscle fatigue (measured by % drop in MIP from resting). Another two exercise tests under the same testing protocol and conditions as the previous tests were also conducted to determine the physiological responses during exercise and recovery. It was found that RMT caused no change in VO\textsubscript{2}peak but there was a significant increase in MIP and BET (p<0.05) in both subject groups, with greater increment in the old than the young subjects (p<0.05). RMT also significantly reduced the drop in MIP after exercise under both normoxia and hypoxia in both subject groups (p<0.05). Although there were no changes in ventilatory and gas exchange parameters during exercise and recovery under normoxia, oxygen uptake (VO\textsubscript{2}) and its kinetics (i.e. time constant, τ\textsubscript{1} and amplitude, A\textsubscript{1}'1) were significantly reduced in the old group under hypoxia. RMT also improved arterial oxygen saturation (SaO\textsubscript{2}), rating of perceived exertion (limb RPE) and dyspnea ratings during exercise and recovery in both groups. These results suggest that an 8-week course of RMT can be used as adjunct exercise for improving physiological responses during exercise and recovery under hypoxia, especially in old females. Further studies are needed to explain the underlying mechanism for these improvements after RMT.

KEY WORDS : RESPIRATORY MUSCLES TRAINING / HYPOXIA / EXERCISE / RECOVERY / AGE

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