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**Benefits of combined aerobic/resistance/inspiratory training in patients with chronic heart failure. A complete exercise model? A prospective randomised study.**

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**Abstract**

**BACKGROUND:**

We hypothesised that combined aerobic training (AT) with resistance training (RT) and inspiratory muscle training (IMT) could result in additional benefits over AT alone in patients with chronic heart failure (CHF).

**METHODS:**

Twenty-seven patients, age  $58 \pm 9$  years, NYHA II/III and LVEF  $29 \pm 7\%$  were randomly assigned to a 12-week AT (n=14) or a combined AT/RT/IMT (ARIS) (n=13) exercise program. AT consisted of bike exercise at 70-80% of max heart rate. ARIS training consisted of AT with RT of the quadriceps at 50% of 1 repetition maximum (1RM) and upper limb exercises using dumbbells of 1-2 kg as well as IMT at 60% of sustained maximal inspiratory pressure (SPI(max)). At baseline and after intervention patients underwent cardiopulmonary exercise testing, echocardiography, evaluation of dyspnea, muscle function and quality of life (QoL) scores.

**RESULTS:**

The ARIS program as compared to AT alone, resulted in additional improvement in quadriceps muscle strength (1RM,  $p=0.005$ ) and endurance ( $50\%1 \text{ RM} \times \text{number of max repetitions}$ ,  $p=0.01$ ), SPI(max) ( $p<0.001$ ), exercise time ( $p=0.01$ ), circulatory power (peak oxygen consumption  $\times$  peak systolic blood pressure,  $p=0.05$ ), dyspnea ( $p=0.03$ ) and QoL ( $p=0.03$ ).

**CONCLUSIONS:**

ARIS training was safe and resulted in incremental benefits in both peripheral and respiratory muscle weakness, cardiopulmonary function and QoL compared to that of AT. The present findings may add a new prospective to cardiac rehabilitation programs of heart failure patients whilst the clinical significance of these outcomes need to be addressed in larger randomised studies.

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**KEYWORDS:**

Aerobic training; Exercise; Heart failure; Inspiratory muscle training; Rehabilitation; Resistance training

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