Iran J Public Health, Vol. 45, No.8, Aug 2016, pp.1085-1086

Letter to the Editor

Comparison of Body Composition of Trunk and Extremities of Affected Sides at Different Aerobic Exercise Intensities in Chronic Stroke Patients: A Randomized Controlled Preliminary Report

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(Received 20 Dec 2015; accepted 11 Jan 2016)

Dear Editor-in-Chief

Most previous studies undertaken to examine the effects of aerobic exercises in stroke patients have focused on improvements in gait while walking on a treadmill (1, 2), and relatively, few studies have been conducted on the training using fixed ergometers for arms and legs in stroke patients undergoing rehabilitation treatment, or on the effects of aerobic exercise on body composition in affected extremities. Furthermore, whereas aerobic exercise has been applied at intensities determined by physical strength and ability in normal individuals (3), exercise intensities in stroke patients have been prescribed with no specific intensity.

Therefore, the purpose of this study was to investigate the effects of aerobic exercise on body composition of the trunk and extremities of affected sides in stroke patients and to compare changes in body composition after training at different intensities of aerobic exercise.

The samples were 81 patients with a diagnosis on stroke, and who were receiving rehabilitation treatment. Twenty-one participants met the inclusion and exclusion criteria. The 21 samples were randomly assigned to the experimental group (heart rate reserve, HRR 60%) (n=11) or the control group (HRR 40%) (n=10). The experimental and control groups performed exercise programs for 70 min (30 min of comprehensive rehabilitation therapy and 40 min using a fixed ergometer for arms and legs) a day five days a week for six wk. The experimental group performed the high-intensity aerobic exercise program at 60% of HRR and the control group performed the low-intensity aerobic exercise program at 40% of HRR. Each session of the aerobic exercise program consisted of 5 min of warming-up exercises, 30 min of main exercise, and 5 min of wrap-up exercises.

In accordance with the manufacturer's guidelines, the body composition was measured with subjects in supine. After sufficient water was supplied to thumbs and index fingers of both hands and the ankles of both feet, holder electrodes (touch type) were attached and alternating current was passed through the body. All measurements were taken on an empty stomach and after a prolonged rest (several hours).

Wilcoxon's signed-rank test or paired samples *t*-test was used to compare averages before and after the six wk intervention period in each group, and the independent t-test was used to compare the two groups with respect to differences in values before and after aerobic exercise. The statistical software, SPSS 21.0 (SPSS, Chicago, IL, USA), was used for the analysis, and sta-

tistical significance was accepted for *P*-values<0.05.

No significant intergroup difference was found for general characteristics (sex, paretic side, age, height, weight, duration of brain damage, body mass index, and modified Bathel index). Changes in body composition of trunk and extremities of affected sides after intervention are shown in Table1.

Table 1: Comparison of changes in lean mass and ECW ratio (ECW/TBW) in the experimental and control groups

		Experimental group (n = 11)			Control group (n = 10)		
		Pre-test	Post-test	*P*	Pre-test	Post-test	*P*
UE	LM (kg) [a,b]	2.07 ± 0.56	2.11 ± 0.55	0.024	2.16 ± 0.89	2.11 ± 0.85	0.091
	ECW/TBW	0.386 ± 0.004	0.385 ± 0.005	0.476	0.389 ± 0.005	0.390 ± 0.005	0.282
LE	LM (kg)	6.38 ± 1.70	6.35 ± 1.71	0.347	6.56 ± 2.38	6.48 ± 2.23	0.189
	ECW/TBW	0.403 (0.392 – 0.412)	0.401 (0.395 – 0.410)	0.088	0.410 (0.404 – 0.413)	0.407 (0.400 – 0.419)	0.516
Trunk	LM (kg) [a,b]	18.71 ± 3.83	19.00 ± 3.71	0.002	18.8 ± 5.71	18.7 ± 5.60	0.287
	ECW/TBW	0.394 ± 0.009	0.394 ± 0.008	0.197	0.397 ± 0.008	0.397 ± 0.010	0.338

Values are presented as mean ± standard deviation or as median (25% – 75% percentiles).
UE, upper extremity; LE, lower extremity; LM, lean mass; ECW, extracellular water; TBW, total body water.
[a] Significant difference in gains between the two groups, $P < 0.05$. [b] Effect size greater than 0.8.

The experimental group showed significant differences in muscle masses of trunk and upper extremity of affected sides after intervention; upper extremity muscle mass increased from 2.07 kg to 2.11 kg (by 1.9%), and trunk muscle mass increased from 18.71 kg to 19.00 kg (by 1.5%). The control group showed no significant differences in either muscle mass or edema. A significant difference in post-training gains for muscle masses of trunk and upper extremity of affected sides was observed between the experimental group and the control group (*P*=0.023, *P*=0.011, respectively). In addition, the effect size for gains in the experimental and control groups was strong (effect size=1.0, 1.2, respectively). The two groups showed no significant difference in edema values.

In conclusion, aerobic exercise at 60% of HRR using a fixed ergometer for arms and legs was found to significantly increase muscle masses of trunk and upper extremities of affected sides of stroke patients. Furthermore, our findings suggest that aerobic exercises in stroke patients at 60% of HRR are more effective at increasing muscle masses than exercises at 40% of HRR.

Acknowledgements

This research was financially supported by the Daejeon University research fund in 2014. The authors declare that there is no conflict of interests.

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