International Congress Series 1280 (2005) 353–358

www.ics-elsevier.com

Changes in life-style and function in 70–83-year-old subjects participating in a 1-year strength training programme

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Abstract. *Objective:* To determine the changes in life-style (time and energy expenditure, EE, of physical activities) and function (leg extensors power and handgrip) in a group of 38 (19 M, 19 F) healthy elderly aged 70–83 years after a 1-year strength training programme. *Design:* Volunteers were assigned to a training (T, n.23) and to a control (C, n. 15) group according to a quasi-experimental design. *Main outcome measures:* Life-style: PA profile (type, time and EE). Function: leg extensors power (LEP) and handgrip (HG). *Results:* M showed higher PA time than F (15 vs. 7 h week^{-1}, $p=0.02$), and were engaged in higher intensity PA (cycling, gardening, sports) as F. F and C are more engaged in light-intensity (domestic and social–recreational) activities as M and T, respectively. Medium–high intensity PA time increased by 58% in T ($p=0.02$). Light-intensity PA time increased by 76% in F ($p=0.02$) and by 36% in C ($p=0.04$). At baseline, M showed higher LEP (+ 89%) and HG (+ 65%) values than F ($p<0.001$). At end training, T showed a 11% increase in LEP ($p=0.001$), whereas C showed a significant loss (− 5% LEP, − 8% HG, $p<0.001$). Trained females particularly increase LEP (+ 17%, $p=0.008$). *Conclusions:* The 1-year training program was effective in improving life-style (PA) and functional abilities (LEP, HG) in healthy M and F elderly subjects.

Keywords: Elderly; Physical activity; Life-style; Function

1. Introduction

Intensity and time devoted to physical activity (PA) decrease with age, due to a combination of factors: structural modifications in the metabolism, a decrease in lean

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0531-5131/
doi:10.1016/j.ics.2005.02.052

muscle mass and mechanical efficiency, and self-posed limitations [1]. The PA decrease is secondary to the deterioration of biological functions (i.e. balance, poor eyesight, breathlessness) and pain (i.e. arthrosis). On top of that, environmental barriers and socio-cultural influences might contribute to the popular belief that PA is somehow unsafe for elderly people. Limitations in PA, both self- or disability-determined, may reduce quality of life. The PA decrease together with an increase of body fat mass, contribute to the age-related deterioration of aerobic power [2] and thus of the capacity to perform moderate-to-vigorous PA in daily life, such as lifting a shopping bag, walking up a moderate slope, lifting the body mass from a chair. The potential unbalance between individual physical capacity and energy requirements may threaten the accomplishment of the most demanding daily tasks in old age. Exercise and PA contribute to enhance muscle function and improve both basic and instrumental ADL [3]. The maintenance of the functional capacities and of the general state of health is a very important issue for the ageing population [4]. Long-term programmes are more likely to influence the life-style of the individuals. Simple indirect methods as questionnaires [5–8] can quantify PA. In this study, we observed the changes in life-style, in terms of PA habitually performed, and muscle function in elderly subjects after a 1-year strength training programme.

2. Methods

2.1. Subjects

Thirty-eight healthy retired elderly (19 M, 19 F) aged 70–83 years (mean 77.0 ± 3.5) volunteered in the project [9]. Exclusion criteria were: neoplasticity, previous stroke, Alzheimer, major lung pathology, motor neuron disease, Parkinson, major musculoskeletal disorders, major endocrine disorders, severe diabetes, history of hypertension or myocardial infarction within the previous 2 years, use of beta-blockers or not in sinus rhythm, acute febrile or systemic disease within the previous 2 years. They were then assigned to the training (T: 11 M–12 F) and to the control group (C: 8 M–7 F) according to a quasi-experimental design.

2.2. Intervention

Group C was not engaged in the PA programme. Group T underwent a regular physical training. Twice-a-week PA was supervised and exercise classes were held in the hospital gym; once a week, the training session was held at home. Strength training was carried out with multi-gym machines for the lower limbs (Sitting calf and Leg press, Technogym, Italy). At home subjects used elastic bands (Theraband©) reproducing the movements trained on the two variable-resistance machines. As for the aerobic work, subjects were encouraged to perform some outdoor 30-min aerobic exercise once a week. Flexibility and balance exercises were also carried out.

2.3. Measurements

Habitual PA was assessed with a questionnaire (Paqap©) at the beginning (t1), at 6-month (t2) and at 12-month (t3) intervals. Paqap© is an interview-based 7-day recall computerized questionnaire that elicits responses about PA habitually performed by the