Effectiveness of a home-based strengthening program for elderly males in Italy. A preliminary study

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ABSTRACT. Background and aims: The practice of regular physical exercise has been shown to be effective in slowing the age-related progressive functional deterioration. Most exercise trials have been conducted with supervised training programs. The purpose of this study was to investigate the effectiveness of a 4-month home-based strength training on strength, function and personal satisfaction. Methods: Ten elderly men (mean age 68.5 years) were enrolled for home-based training one month after completing a 4-month supervised program; 12 age-matched men served as the control group. Subjects were asked to perform 3 sessions a week consisting of six resistance exercises with elastic bands involving the major muscle groups of the upper and lower limbs. We had calculated the correlation between the elongation and resistance of the elastic bands. The subjects were instructed to keep a diary reporting the execution of the session. We measured dynamic concentric strength of the muscle groups involved in the resistance exercises and maximal isometric strength of the knee extensors and elbow flexors before and after the 4-month home training. The Satisfaction Profile (SAT-P) questionnaire was administered before and one month after the completion of the training program for assessing personal satisfaction. Results: The final to baseline comparison showed a non-significant decrease in mean isometric maximal strength values for knee extensors and elbow flexors in the control group, while the exercise group significantly (p=0.001) improved the average baseline values. Maximal dynamic concentric strength values decreased significantly in the control group, while significant improvements were observed in the exercising subjects. The SAT-P questionnaire did not show any difference in either group from baseline. The adherence-to-protocol rate based on self-report was 78%. Conclusions: Home training with elastic bands appears to be an effective low-cost modality of maintaining strength and function in an elderly population.

INTRODUCTION

Aging is associated with reduced maximal aerobic power, muscle strength and power; namely, reduced fitness. Taken together, these factors make activities such as walking, climbing stairs, getting up from a chair, or boarding a bus more difficult and tiring, and eventually impossible. As a consequence of diminished exercise tolerance, a large and increasing number of elderly persons will be living below, at, or only just above thresholds of physical ability, and it will take only a minor intercurrent illness to render them completely dependent.

There is increasing evidence that the practice of regular physical exercise is effective in slowing the age-related progressive deterioration of all biological functions (1-7).

Typically, most exercise trials have been conducted with supervised training programs in laboratory or clinical facilities under well controlled conditions (1, 2, 4-7). Although these studies provide important results regarding the effectiveness of physical exercise for improving fitness and health-related parameters in older adults, little can be inferred about the feasibility of enhancing physical activity levels among older persons under more representative circumstances. Given that the vast majority of older adults do not engage in any regular physical exercise, and many report some kind

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of difficulty in attending exercise classes or reaching
the facilities on a regular basis (8), feasible intervention
strategies that can be widely disseminated to the old-
er population in need of increased activity are needed.

A recent study (9) reported positive results of a 15-
week in-home strength training strategy using elastic
bands in American elderly people over 65 years of age.

The purpose of our study was to investigate the ef-
effectiveness of a home-based strength training strate-
gy designed for healthy elderly males in north Italy.
Specifically, our aim was to test whether a 4-month
home-based training with commercially available elas-
tic bands could maintain the strength and functional
levels reached by a group of elderly men over 65 years
of age who had previously participated in a 4-month
supervised strength training program with isotonic
strength machines as compared to a group who
stopped training for personal reasons, and not for
medical conditions, after the same 4-month period of
supervised training.

Another goal of this study was to assess the effects
of home training on personal satisfaction in an elderly
population. Training programs have the potential to
affect the quality of life of the elderly in many ways. It
is generally expected that improved muscular strength
will increase physical activity and independence,
which in turn will produce increased confidence,
greater social activity and independence. The value of
such changes are real only when they are expressed
through the perceived state of satisfaction and well-be-
ing, and the daily functioning of the participants. We
therefore used a specific outcome to assess changes in
physical self-perceptions, satisfaction, quality of life, in-
creased physical activity independence and social
functioning.

SUBJECTS AND METHODS

Twenty-two healthy elderly men (age range 65-80
years; body weight kg 80±8; height cm 172±7,
mean±SD), who had previously participated in a 4-
month experimental protocol consisting of super-
vised strength training sessions with isotonic ma-
achines 3 times a week (10), were enrolled for this
study. Six different commercially available strength-
ening machines (Technogym S.p.A., Italy) were used
in the previous resistance training protocol, which con-
sisted of exercises involving the main muscle groups of
the upper and lower limbs (Table 1). The training
frequency was three times a week, and the work-
load was progressively increased during the first four
weeks from 50 to 80% of the individual repetition
maximum (1RM) for lower limbs, and from 40 to

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Main Muscles Involved</th>
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</thead>
<tbody>
<tr>
<td>1 “Leg press”</td>
<td>Quadriceps femoris, glutaeus, gastrocnemius, soleus</td>
</tr>
<tr>
<td>2 “Shoulder press”</td>
<td>Deltoid, triceps brachii, trapezius</td>
</tr>
<tr>
<td>3 “Chest press”</td>
<td>Triceps brachii, pectoral</td>
</tr>
<tr>
<td>4 “Lat machine”</td>
<td>Dorsal major, teres major, biceps brachii</td>
</tr>
<tr>
<td>5 “Sitting calf”</td>
<td>Soleus, gastrocnemius</td>
</tr>
<tr>
<td>6 “Vertical row”</td>
<td>Deltoid posterior, trapezius, dorsal major, biceps brachii</td>
</tr>
</tbody>
</table>

65% for upper limbs. The 1RM value was individual-
ly updated every two weeks to adjust the training
stimulus. Subjects performed one set of 10 repetitions
on each training machine. All training sessions were
conducted under supervision.

The subjects had previously undergone a screening
including cardiological, geriatric and physiatric ex-
aminations, an ergometric step-test, and a detailed in-
terview focusing on physical and leisure activities.
Only moderately physically active subjects, free from
neurological, cardiovascular, metabolic and inflam-
atory diseases were admitted to the study.

One month after completing the previous hospital-
based 4-month supervised program, ten subjects
(mean age 68.5 years, range 65-81) who expressed
their will to continue some form of training were en-
rolled for home-based training in the exercise group.
The other twelve subjects (mean age 72.1 years,
range 67-82), who for personal reasons no longer
wanted to enter any form of structured training,
served as the control group.

Protocol

To maximize the safety and effectiveness of the ex-
cercises, subjects were provided with handles specific
for the elastic bands (Theraband) and taught how to at-
tach them in their own home (Fig. 1). We had previ-
ously tested the degree of resistance of the elastic
bands (grey Theraband) in our laboratory by mea-
suring their elongation in centimeters when fixed
loads were applied, and calculated the correlation
between elongation (cm) and resistance (kg) (Fig. 2). It
was therefore possible to give clear instructions on the
magnitude of the recommended exercise intensity
(expressed in centimeters of elongation of the elastic
band) and familiarize the elderly subjects with the ex-
cise loads. Six resistance exercises with the elastic
bands were chosen in order to reproduce the move-