Effects of 12-month exercise training on physical performance and habitual physical activity in the very elderly

Naoto Taguchi¹), Yasuki Higaki¹), Shinichi Inoue²), Hiromi Kimura³), Keitaro Tanaka¹)

1)Department of Preventive Medicine, Faculty of Medicine, Saga University, Saga, Japan
2)Department of Sports Science, Faculty of Culture and Education, Saga University, Saga, Japan
3)Department of Community Health and International Nursing, Faculty of Medicine, Saga University, Saga, Japan
Background

2000  The Long-term Care Insurance System started in Japan

Elderly people with light disabilities has increased steeply about 2.4 fold

2006  The revised Long-term Care Insurance System (prevention-oriented)

- Improved physical fitness
- Improved nutrition
- Improved oral function
- Prevention or support of withdrawal
- Prevention of dementia and depression
Aim

To determine the effects of multicomponent physical exercise training on physical performance and physical activity in the elderly with light disabilities
Methods

- **Study design**  Non-randomized controlled trial
  - Intervention group from one nursing home
  - Control group from another nursing home

- **Subjects**  65 light disabled elderly, 74-96 years
  - 31 in the intervention group
  - 34 in the control group

- **Study period**  May 2004-May 2005, 12 months
  - Exercise intervention during the whole period
Two nursing homes in mid-SAGA prefecture, Japan

Matching

Intended to participate in the Intervention facility (n = 33)  
Could not participate in baseline survey (n = 2)  
Training group (n = 31)  
Failed to complete the program (n = 6)  
Attended reassessment (n = 24)

Intended to participate in the Control facility (n = 37)  
Could not participate in baseline survey (n = 3)  
Control group (n = 34)  
Attended reassessment (n = 23)

Could not participate in reassessment (n = 1)  
12-month
Exercise intervention

- Class-based exercise: 90 minutes once a week
- Home-based exercise: Recommended to do for 10 minutes everyday
• Outcome measurements
  1) Physical performance
      - knee extension strength, whole body flexibility, 6-minute walking distance, grip strength, timed one-legged standing with open eyes
  2) Daily physical activity
      - one-axis accelerometer (Suzuken Co. Ltd)
  3) Walking ability
      - walking speed, stride length, kinematics analysis
  4) Hospitalization

• Statistical analysis  Two-way ANOVA, Paired t-test, Unpaired t-test
## Characteristics of study subjects at baseline

<table>
<thead>
<tr>
<th></th>
<th>Training group (facility A)</th>
<th>Control group (facility B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>31</td>
<td>34</td>
</tr>
<tr>
<td>Male/female</td>
<td>6 / 25</td>
<td>6 / 28</td>
</tr>
<tr>
<td>Age (years)</td>
<td>84.5±5.7</td>
<td>85.6±5.3</td>
</tr>
<tr>
<td></td>
<td>(74-96)</td>
<td>(77-96)</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>147.8±10.1</td>
<td>146.8±8.7</td>
</tr>
<tr>
<td></td>
<td>(130-172)</td>
<td>(134-175)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>49.5±10.0</td>
<td>48.4±8.4</td>
</tr>
<tr>
<td></td>
<td>(32.8-73.5)</td>
<td>(35.0-65.5)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>22.6±3.6</td>
<td>22.5±3.4</td>
</tr>
<tr>
<td></td>
<td>(16.5-32.7)</td>
<td>(15.8-29.2)</td>
</tr>
</tbody>
</table>

Values in parentheses are min-max.
Physical performance

Knee extension strength (kg)

Whole body flexibility (cm)

Grip strength (kg)

6-minute walk (m)

* p<0.05 vs. Pre (mean±SD)

Training group

Control group
Walking ability, Physical performance, Physical activity

Walking speed (m/sec)

Stride length (m) *; p<0.05 vs. Pre (mean±SD)

Timed one-legged standing (sec)

Daily physical activity (steps/day)

Training group  
Control group
Rate of improvement in physical performance (Pre ⇒ Post)

* ; p<0.05 Training group vs. Control group
** ; p<0.01 Training group vs. Control group

( mean±SD )

- Knee extension strength
- Grip strength
- Whole body flexibility
- 6-minute walk

Training group
Control group
Rate of improvement in walking ability (Pre ⇒ Post)

* * ; p<0.01 Training group vs. Control group

( mean±SD )
Hospitalization

<table>
<thead>
<tr>
<th></th>
<th>Training group (n = 31)</th>
<th>Control group (n = 34)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of hospitalized persons</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Cumulative hospitalization days</td>
<td>258</td>
<td>628</td>
</tr>
</tbody>
</table>

- Hospitalization during the follow-up period (May 2004-May 2005) was investigated from medial records.

- No significant difference was observed between the Training and Control groups
Discussion

- The current multicomponent training can cause beneficial effects in physical fitness among the very elderly, without using special training machines.
- However, daily physical activity (i.e. total steps) was not increased by the training program.

Limitation

- Non-randomized trial
- About 25% of the participants could not be followed until the end of intervention.
Conclusions

- The present training program improves lower-limb strength and flexibility, without using training machine, in the elderly with light disabilities.

- In addition, grip strength, endurance capacity (6-minute walk) and walking ability (walking speed and stride length) were maintained by the present training.

- The present training is considered to be a useful prevention program for the very elderly in the new Long-term Care Insurance System.
Collaborator

○ Tenjyukai Nursing Home

  S. Morokuma
  H. Morokuma
  R. Takimoto
  Y. Huzita
  S. Noguchi
  The staff of day service

○ Zikeikai Nursing Home

  H. Sakata
  M. Tutsumi
  The staff of day service

○ Fitness instructor

  K. Maeda

○ Wide Area’s Association of the Mid-SAGA