The power of progressive resistance training within the aged care system

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The Cat in the Hat
On Aging

I cannot see
I cannot pee
I cannot chew
I cannot screw
Oh my god, what can I do?
My memory shrinks
My hearing stinks
No sense of smell
I look like hell
My mood is bad - can you tell?
My body's drooping
Have trouble pooping
The Golden Years have come at last
The Golden Years can kiss my ass.

[Graph showing functional capacity over age, with early life, adult life, and older age sections.

Range of function in individuals
Disability threshold*
Rehabilitation and ensuring the quality of life

Source: Kalache and Kickbusch, 1997]
Risk of disability

- ↓ Muscle mass
- 25% ↓ in muscle cross-sectional area
- 50% ↓ in muscle strength and 75% ↓ in muscle power

Contributing to:
- ↓ aerobic capacity
- ↓ metabolic rate
- ↓ total blood volume
- ↑ body fat
- ↓ bone mineral density
- ↓ quality of life

Leading to:
- Frailty
- Sarcopenia
- ↓ balance confidence
- ↑ incidence of falls
- ↓ functional ability
- ⇒ ↑ dependent care needs
In addition –

- Decreased muscle mass is associated to a reduced risk of mortality
- Decreased muscle strength is associated to a reduced risk of developing dementia
- Increased risk of geriatric syndromes such as sarcopenia and frailty
- Increase post-elective surgery complications
Progressive Resistance and Weight Bearing Exercise

↑ Muscle mass & strength
↑ Bone mineral density
↑ Sleep profile
↑ Capacity in ADL's
↓ Symptoms of disease
  ↓ Physical
  ↓ Mental
↓ Falls risk
  • Residual impact of training
=> ↓ dependant care needs
Community-dwelling, healthy adults

Strength Versus Muscle Power-Specific Resistance Training in Community-Dwelling Older Adults

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Community-dwelling, healthy adults

Figure 2. Detraining (0–24 weeks) and retraining (24–36 weeks) changes in muscle strength in older adults undertaking varied resistance training, adjusted for sex. A, Bench press; B, supported row; C, knee press; D, leg press; E, leg curl; F, leg extension. HV = high-velocity power training; ST = strength training. Within-group comparisons are presented above each exercise for week 0 (pretraining), 24 (detraining), and 36 (retraining), p < 0.05. Values shown are adjusted mean ± standard error.

Table 2. Functional Performance in Resistance-Trained Older Adults Following 24 Weeks of Detraining and 12 Weeks Retraining, Adjusted for Sex

<table>
<thead>
<tr>
<th>Variable</th>
<th>HV (N = 15)</th>
<th>ST (N = 12)</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Predetraining*</td>
<td>Detraining</td>
<td>Retraining</td>
</tr>
<tr>
<td>Floor-rise, s¹</td>
<td>3.6 ± 0.2</td>
<td>4.0 ± 0.3</td>
<td>3.9 ± 0.3</td>
</tr>
<tr>
<td>Stair-climb, s</td>
<td>4.5 ± 0.2</td>
<td>4.6 ± 0.2</td>
<td>4.4 ± 0.2</td>
</tr>
<tr>
<td>6 m walk, s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitual</td>
<td>4.0 ± 0.1</td>
<td>4.0 ± 0.1</td>
<td>3.9 ± 0.1</td>
</tr>
<tr>
<td>Fast</td>
<td>3.0 ± 0.1</td>
<td>2.9 ± 0.1</td>
<td>2.9 ± 0.1</td>
</tr>
<tr>
<td>Backward</td>
<td>16.4 ± 1.2</td>
<td>16.8 ± 1.2</td>
<td>15.4 ± 1.1</td>
</tr>
<tr>
<td>Chair-rise, s</td>
<td>10.4 ± 0.5</td>
<td>10.5 ± 0.4</td>
<td>9.7 ± 0.3</td>
</tr>
<tr>
<td>Functional reach, cm</td>
<td>33.7 ± 1.2</td>
<td>31.8 ± 0.9</td>
<td>34.5 ± 1.0</td>
</tr>
<tr>
<td>400 m walk, s</td>
<td>233.8 ± 5.9</td>
<td>238.3 ± 8.0</td>
<td>238.0 ± 7.8</td>
</tr>
</tbody>
</table>

Notes: *Data collected following 24 weeks of training prior to detraining. Values shown are adjusted mean ± standard error.
¹HV (n = 14).
HV = high-velocity power training; ST = strength training.
Community-dwelling, unhealthy adults

**FIGURE 1** Percent change in muscle function and functional performance in very old adults following 16 exercise training events. Values shown are mean ± SE. Str = strength; TUG = Timed “Up and Go.” *Variable was significantly improved after 16 exercise sessions (p < 0.05).
Falls prevention

Recommendations
1. Moderate to high balance challenge
2. Sufficient dose to have and effect
3. Ongoing
4. General community and those at greater risk
5. Group or home based
6. Not walking alone
7. Inclusive of strength training
8. Beware of (other) risk factors

**Project title:** Muscling-up against disability in older adults with home care packages (MUAD project): Implementing an evidence-based progressive resistance training service model of care.

**Funding organisation and scheme:** Department of Social Services Aged Care Services Improvement and Healthy Ageing Grant

### Community-dwelling, unhealthy adults

<table>
<thead>
<tr>
<th>Baseline assessment &amp; Randomisation</th>
<th>Assessment 1</th>
<th>Assessment 2</th>
<th>Assessment 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise – PRBT - N = 25</td>
<td>Follow-up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls – Usual care/activities - N = 50</td>
<td>Exercise</td>
<td></td>
<td>Follow-up</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 0</th>
<th>Week 24</th>
<th>Week 48</th>
<th>Week 72</th>
</tr>
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<tbody>
<tr>
<td>PRBT – Progressive Resistance + Balance training</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
Community-dwelling, unhealthy adults

AVERAGE ISOMETRIC EXTENSION RESULTS (KG)

Case Study 1

+166%  +360%  +219%
Review

Efficacy of Progressive Resistance Training Interventions in Older Adults in Nursing Homes: A Systematic Review

Trinidad Valenzuela, Master of Exercise Physiology *

Discipline of Exercise and Sport Science, Faculty of Health Sciences, The University of Sydney, Sydney, Australia
Residential aged care

Fig 3.—Effects of weight training on knee extensor strength. Maximum left knee extensor strength before and after 8 weeks of high-intensity progressive-resistance training in nine subjects aged 87 to 98 years (*P* < .0001 compared with baseline). Similar strength gains were seen in the right leg (see text). Symbols represent individual subjects.

Fig 4.—Muscle hypertrophy due to strength training. Percent change in muscle area of the nondominant midtigh by computed tomographic scan after 8 weeks of strength training in seven subjects. Total muscle area increased 9.0% ± 4.7% (*P* = .05); quadriceps area, 10.9% ± 7.0% (*P* = .09); and hamstring and adductors area, 8.4% ± 3.9% (*P* < .05). Symbols represent individual subjects.

The SUNBEAM Project
16 RAC facilities in NSW & Sth Queensland
RCT of 220 participants
86.04 ± 6.77 years, 26.07 ± 24.60 months in care
(range 1-120 months)

Adverse events:
• Nil serious,
• Minor muscle aches/pains only

Adherence:
• High

Preliminary data suggest:
• 53% less falls in Intervention group compared to UC
over the 12 month follow-up
### Residential aged care

Table. Sarcopenia status and its components in the whole cohort at baseline and by group at baseline and follow-up.

<table>
<thead>
<tr>
<th></th>
<th>Original cohort</th>
<th>Exercise group</th>
<th>Control group</th>
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<tbody>
<tr>
<td></td>
<td>(N=42)</td>
<td>(N=21)</td>
<td>(N=21)</td>
</tr>
<tr>
<td></td>
<td>Baseline</td>
<td>Baseline</td>
<td>Follow up*</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>%</td>
<td>N</td>
</tr>
<tr>
<td>Low muscle mass</td>
<td>15</td>
<td>35.7</td>
<td>6</td>
</tr>
<tr>
<td>Low muscle strength</td>
<td>34</td>
<td>81.0</td>
<td>16</td>
</tr>
<tr>
<td>Low physical performance</td>
<td>37</td>
<td>88.1</td>
<td>17</td>
</tr>
<tr>
<td>Sarcopenia</td>
<td>15</td>
<td>35.7</td>
<td>6</td>
</tr>
</tbody>
</table>

N = number
* N=20. One death before follow-up
Food for thought

- Consistent positive muscle strength and physical performance gains
- These promise:
  - Increased and/or prolonged independence
  - Reduced falls and falls associated injuries
  - A positive change in the direction of disease progression
  - Client and provider personal and financial burden savings
Jean Stewart 83 years

Dr Charles Eugster 95 years
Thank you