

## Determinants of functional ability following high-intensity resistance training and detraining in older adults

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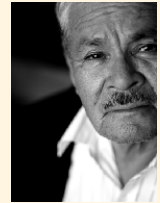


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## Changes in muscle with ageing

- Most predictable feature of ageing is the loss of muscle mass
- Changes in fibre composition and size
  - ⇒ 50% decrease in muscle strength
  - ⇒ 75% decrease in muscle power
  - ⇒ Decreased muscle quality
- Compromised functional capabilities



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## Resistance training and the older adult

- Increased total muscle and specific muscle fibre size
- Increases in muscle parameters
- Increased functional performance
- Positive residual impact during training cessation



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## Aim

This study examined the lower-body physiological determinants of functional ability following training and detraining



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## Study Design and Methods

### Participants

- Non-controlled, randomised
- 33 healthy community dwelling (18 women;  $70.6 \pm 0.9$  years)

### Intervention

- 24 weeks training and 24 wks detraining
- Twice weekly progressive resistance training:  
*Chest press, Supported row, Biceps curl, Leg press, Leg curl and Leg extension*

### Assessment

#### Functional performance

- 6 metre fast, habitual and tandem backwards, and 400 metre walk
- Floor rise to standing
- Stair climbing

#### Muscle function

- Total lower-body muscle strength,
- Peak and average lower-body muscle power

#### Muscle quality

- Ratio muscle strength to lean mass (DXA)



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## Results



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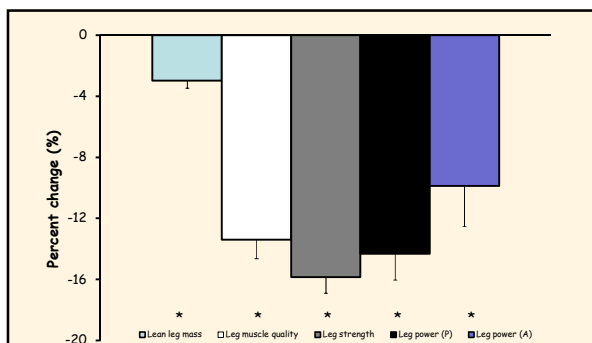


Figure 1. Change in lower-body muscle parameters during 24 weeks detraining. Data are mean  $\pm$  SE. \*  $p < 0.001$

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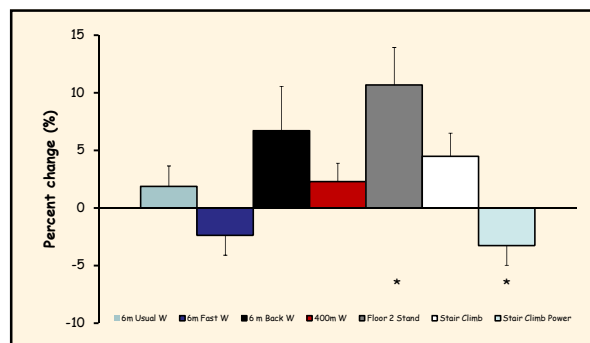


Figure 2. Change in functional performance during 24 weeks detraining. Data are mean  $\pm$  SE. \*  $p < 0.05$

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Table 1. Post-training correlations.

	Usual walk	Fast walk	Backward walk	400 m walk	Floor 2 stand	Stair climb	Stair climb power
Lean mass	-.219	<b>-.443</b>	<b>-.476</b>	-.264	-.382	<b>-.423</b>	<b>.705*</b>
Muscle quality	-.091	.026	<b>-.518</b>	-.198	-.212	<b>-.435</b>	<b>.443</b>
Muscle strength	-.316	<b>-.339</b>	<b>-.612*</b>	<b>-.443</b>	<b>-.331</b>	<b>-.466</b>	<b>.788*</b>
Peak muscle power	-.295	-.242	<b>-.423</b>	<b>-.382</b>	-.216	<b>-.371</b>	<b>.674*</b>
Average muscle power	<b>-.344</b>	-.322	<b>-.467</b>	<b>-.382</b>	-.202	<b>-.422</b>	<b>.722*</b>

In bold  $p < 0.05$ , \*  $p < 0.001$ .

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Table 2. Post-detraining correlations.

	Usual walk	Fast walk	Backward walk	400 m walk	Floor 2 stand	Stair climb	Stair climb power
Lean mass	-.051	<b>-.544</b>	<b>-.489</b>	<b>-.404</b>	<b>-.451</b>	<b>-.546</b>	<b>.793*</b>
Muscle quality	.161	-.200	-.215	-.121	-.212	-.275	.297
Muscle strength	-.245	<b>-.689*</b>	<b>-.622*</b>	<b>-.505</b>	<b>-.550</b>	<b>-.744*</b>	<b>.890*</b>
Peak muscle power	-.307	<b>-.539</b>	<b>-.495</b>	-.242	<b>-.453</b>	<b>-.547</b>	<b>.766*</b>
Average muscle power	-.317	<b>-.500</b>	<b>-.461</b>	-.198	<b>-.415</b>	<b>-.487</b>	<b>.715*</b>

In bold  $p < 0.05$ , \*  $p < 0.001$ .

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Table 3. Full model linear regression, primary predictor muscle strength<sup>1</sup>, peak<sup>2</sup> and average<sup>3</sup> muscle power.

	Variance	F value	Degress of freedom	p value	$\beta$
Usual walk					
Fast walk <sup>3</sup>	28.7%	6.023	2,23	0.008	-.448
Backward walk <sup>1</sup>	38.5%	61.632	1,24	< 0.001	-.640
400 m walk <sup>3</sup>	19.5%	7.070	1,24	0.014	-.477
Floor 2 stand <sup>2</sup>	21.4%	7.798	1,24	0.010	-.495
Stair climb <sup>3</sup>	42.9%	19.814	1,24	< 0.001	-.674
Stair climb power <sup>1</sup>	60.0%	38.468	1,24	< 0.001	.785

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**Conclusions**

- Muscle power and strength are significant determinants of functional ability after training and after extended training cessation.
- Also, better predictors of functional ability than muscle quality or muscle mass
- This data further supports the need for resistance training to be an integral part of an older adults exercise regime.

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**Thank you**

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