



Efecto post intervención del ejercicio

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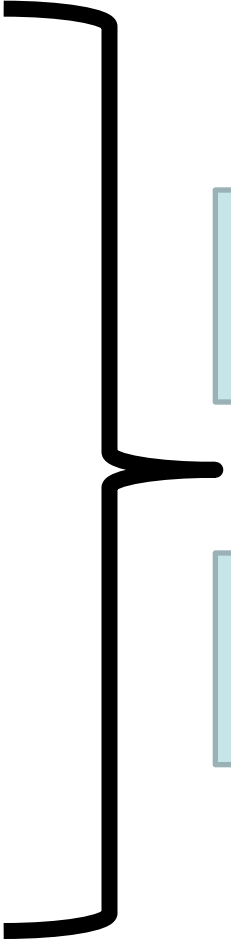


Programa de Ejercicio

Continúa el ejercicio a igual intensidad

Ejercicio de menor intensidad

No hace ejercicio



Beneficios

Perdidas

Un programa de ejercicio mejora:

Efecto cardiovascular

Osteoartritis

Depresión

Osteoporosis

HTA

SARCOPENIA?

Physical Activity and Public Health in Older Adults: Recommendation From the American College of Sports Medicine and the American Heart Association

Circulation 2007;116;1094-1105; originally published online Aug 1, 2007;

TABLE 3. Percent of older adults with selected chronic conditions in 1995 and 2001–2002.

Condition	Age 55–65	Age 65+	Age 65+
	1995	1995	2001–2002
Arthritis	32.8	48.9	n/a
Hypertension	28.9	40.3	50.2
Heart disease	18.0	30.8	31.4
Selected respiratory diseases	13.7	13.8	n/a
Diabetes mellitus	9.7	12.6	15.5
Cerebrovascular disease	2.5	7.1	8.9
Osteoporosis*			
Women		26.1	
Men		3.8	

Note: n/a = not available; selected respiratory diseases include chronic bronchitis, asthma, and emphysema. Percents for 1995 are based on self-reported data from National Health Interview Survey (16). Percents for 2001–2002 are based on self-reported data from National Health Interview Survey (18).

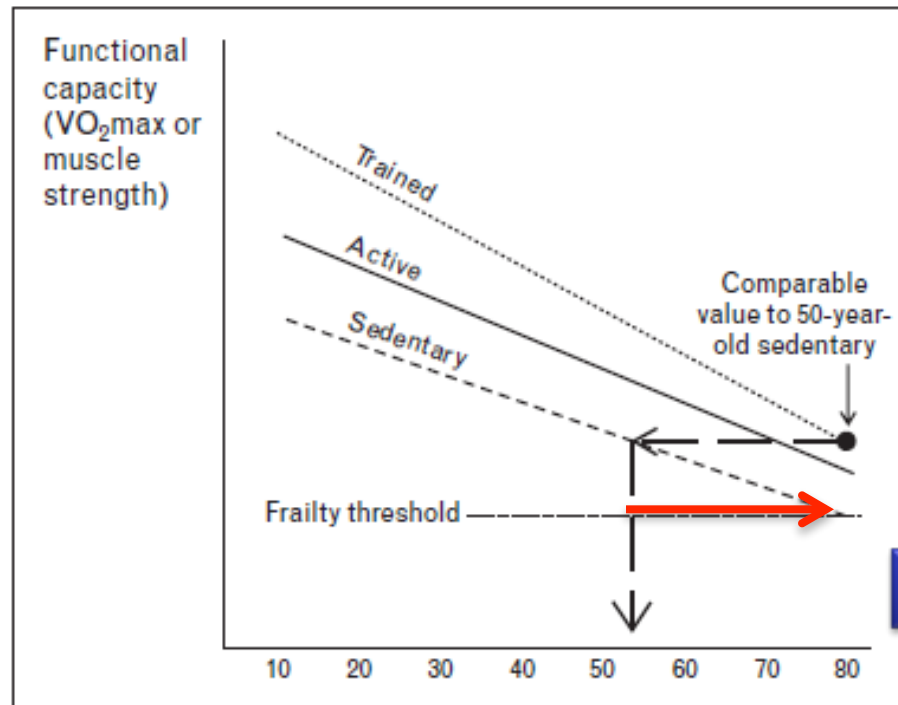
*Data for osteoporosis are from examinations conducted in 1988–1994 and are cited in the Surgeon General's report *Bone Health and Osteoporosis* (64).

¿Donde está la sarcopenia?

Sarcopenic obesity: satellite cells in the aging muscle

Lars-Eric Thornell

Figure 1 Physical activity delays the decline in physical function in elderly



Si deja actividad física

Muscular adaptations to resistance exercise in the elderly

¿Que pasa después del estudio?

Population	Training Duration (weeks)	Δ MVC (%)	Δ MVC /day (%)	Δ CSA (%)	Δ CSA/day (%)	Reference
Elderly (65-81 yrs)	16	19.0	0.17	7.4	0.07	26
Elderly (60-72 yrs)	12	16.7	0.20	9.3	0.11	17
Elderly (61 yrs)	10	17.0	0.25	9	0.12	19
Elderly (85-97 yrs)	12	37	0.44	10	0.11	15
Young adults	24	26.8	0.16	6.8	0.04	27
Young adults	12	15.0	0.18	5.7	0.06	28
Young adults	24	29.6	0.18	19.0	0.11	29

Optimal management of sarcopenia

Table 2 Summary of treatment options

Intervention	Effect	Comments
Exercise	Increased cardiovascular fitness with increased endurance	Pros: overall beneficial effects of exercise to individual
Aerobic	Increases mitochondrial volume and activity	
Resistance	Increased muscle mass and strength Increased skeletal muscle protein synthesis and muscle fiber size	Cons: motivation to exercise remains low

Resistance Exercise for Sarcopenic Outcomes and Muscular Fitness in Aging Adults

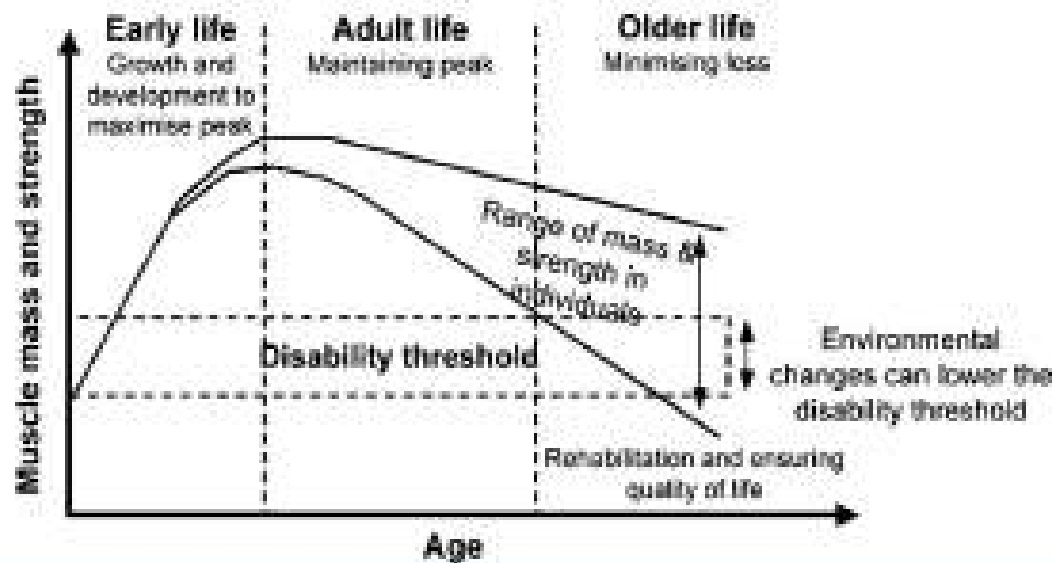


Figure 1. Sarcopenic progression from early life to older life. Adapted from Sayer et al. (88).

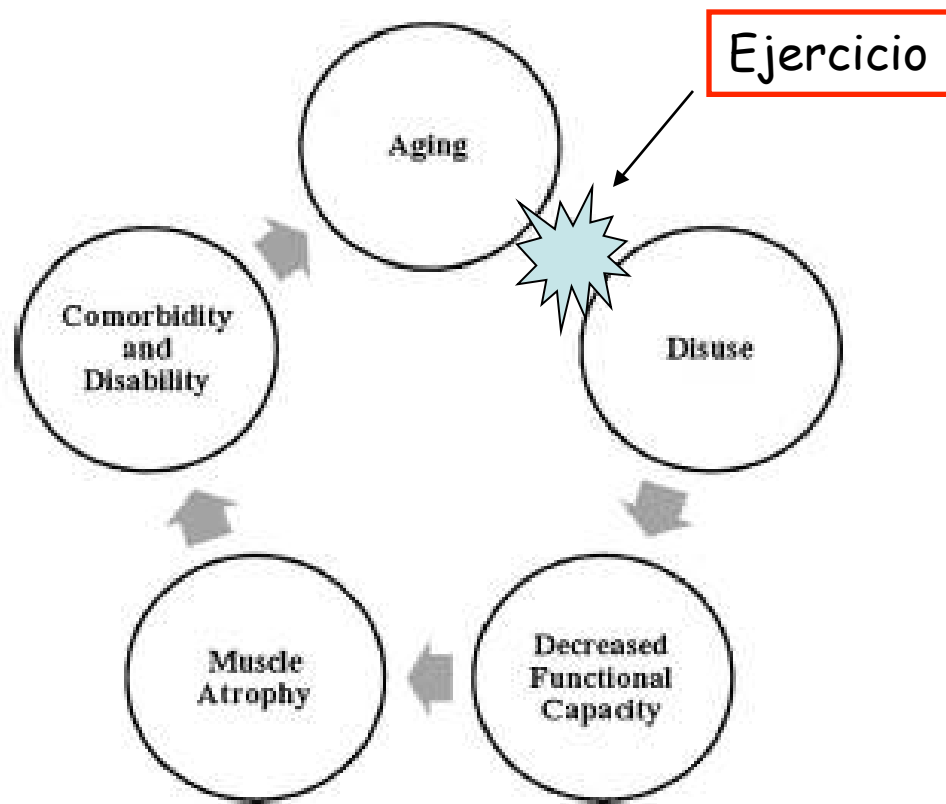
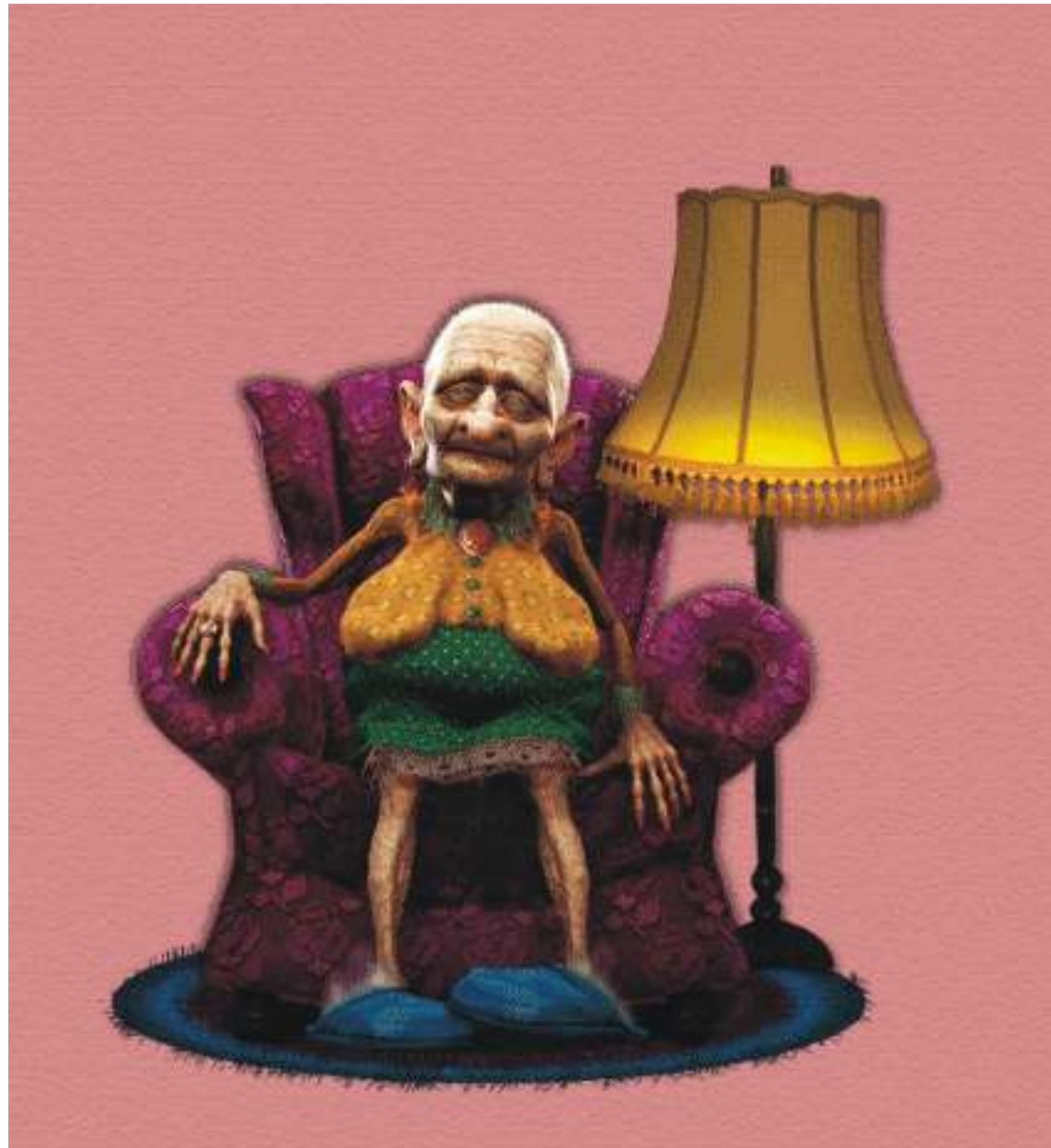


Figure 2. Circular cause and consequence of aging, sarcopenia, comorbidity, and disability.





Cocina	
Elementos de cocina accesibles	
Disponibilidad de escalera con baranda para alcanzar objetos	
Baño	
Barandas adecuadas en duchas y sanitarios	
Silla para baño disponible	
Agua a temperatura adecuada	
Dificultad accesible para ingreso y salida de la ducha	

Dormitorio
Cama a altura adecuada
Espacios para transitar libres
Disponibilidad de teléfono para usar sin alejarse de la cama
Posibilidad de encender una luz sin alejarse de la cama
Presencia de luz de noche entre el dormitorio y el baño.
Exterior
La luz exterior funciona
Escaleras en buen estado
Las escaleras tienen barandas
Hay rampa (si es necesaria)
Rampa en buen estado
Escalones sin superficies deslizantes
Cuerdas para tender ropa a altura adecuada
Otros
Detectores de humo
Aireación adecuada
Sistema para medicación diaria
Sillas de ruedas, andadores, bastones en buen estado

1. Párese y manténgase derecho, agárrarse de un objeto para mantener el equilibrio.
2. Despacio flexione una rodilla hacia el tórax, sin doblar la cintura o cadera.
3. Mantenga la rodilla flexionada.
4. Despacio extienda la rodilla flexionada.
5. Repita el movimiento con la otra rodilla.



1. Párese a unos 40 cm de la silla.
2. Flexione la cadera; manteniéndose hacia la silla.
3. Despacio levante un miembro inferior hacia atrás.
4. Mantenga levantado el miembro inferior.
5. Despacio bájelo.
6. Repita con el otro miembro inferior



1. Párese derecho; manténgase en equilibrio agarrado de la silla.
2. Despacio flexiona la rodilla lo más posible levantando el pie por detrás suyo.
3. Mantenga la posición.
4. Despacio descienda el pie.
5. Repita con el otro miembro inferior.



1. Siéntese en la silla.
2. Despacio extienda un miembro inferior lo más posible.
3. Mantenga dicha posición y flexione el pie llevándolo hacia delante.
4. Despacio baje la pierna.
5. Repita el movimiento con la otra pierna.



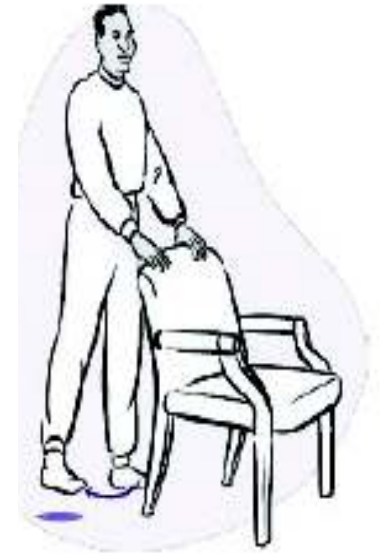
1. Sentarse en el medio de la silla.
2. Sentarse derecho.
3. Inclinar suavemente hacia delante.
4. Pararse despacio utilizando las manos lo menos posible.
5. Sentarse despacio.
6. Mantener la espalda y los hombros derechos durante el ejercicio



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1. Pararse derecho manteniendo el equilibrio agarrándose de una silla.
 2. Despacio póngase en punta de pie, lo más posible.
 3. Mantener esa posición.
 4. Vuelva despacio a la posición normal.



1. Agarrarse de la silla.
2. Levantar una pierna hacia el costado unos 30-40 cm.
3. Mantener la posición.
4. Bajar la pierna despacio.
5. Pararse derecho detrás de la silla.
6. Repetir con la otra pierna.



Efecto post intervención del ejercicio

- Physical exercise is a factor that is well known for increasing muscle mass.
- No pharmacological or behavioral intervention to reverse sarcopenia has proven to be as efficacious as resistance training
- That maintaining the benefits from resistance training is possible with as little as one exercise program per week. Taaffe, D.R., et al., Once-weekly resistance exercise improves muscle strength and neuromuscular performance in older adults. J Am Geriatr Soc, 1999. 47(10): p. 1208-14.

Efecto post intervención del ejercicio

- Table 1, short-term training studies, typically of 10- to 12-wk duration, with training two or three times per week have consistently resulted in significant strength gains in elderly men and women

Invited Review: Aging and sarcopenia

Timothy J. Doherty

J Appl Physiol 95:1717-1727, 2003. doi:10.1152/jappphysiol.00347.2003

Table 2. *Strength gains of the knee extensors after resistance training interventions in older adults*

Study	Gender	Age, yr	Duration, wk	Strength Gain, %
Frontera et al. (46)	M	60-72	12	1 RM: 107 MVC: 7
Charette et al. (24)	F	64-86	12	1 RM: 28
Grimby et al. (50)	M	74-84	8	Con: 10 Ecc: 19
Fiaterone et al. (42)	M + F	72-98	10	1 RM: 113
Lexell et al. (75)	M + F	70-77	11	1 RM: 152
McCartney et al. (79)	M + F	60-80	84	1 RM: 32
Hakkinen et al. (53)	M + F	$X = 70$	26	1 RM: 26
Hunter et al. (57)	M + F	64-79	12	1 RM: 39
Tracy et al. (126)	M + F	65-75	9	1 RM: 28
Yarasheski et al. (137)	M + F	76-92	12	1 RM: 41
Hagerman et al. (52)	M	$X = 64$	16	1 RM: 50
Hortobagyi et al. (55)	M + F	66-83	10	1 RM: 35
Brose et al. (12)	M + F	$X = 68$	14	1 RM: 49
Ferrir et al. (41)	M	65-81	16	1 RM: 30

1 RM, maximum weight that could be lifted once; MVC, maximal voluntary contraction; con, concentric contraction; ecc, eccentric contraction. X , mean.

Tabla III
Efectos del ejercicio físico de alta resistencia sobre la fuerza muscular en el anciano

Referencia	Tipo de estudio	Sexo	Edad media	Tipo de entrenamiento	Duración	Efectos observados
Brose	ERC, comunidad	M/F	69	3xsem, 80% CM	14 sem	36% ↑ fuerza muslo
Cornell	ERC, residencia	M/F	82	3xsem, 2-5 kg peso	12 sem	10-15% ↑ fuerza muslo
Charette	ERC, comunidad	F	69	3xsem, 65-75% CM	12 sem	28-115% ↑ fuerza muslo, 7% ↑ área fibras tipo 1, 20% ↑ área fibras tipo 2
Bannan	ERC, sanos	M/F	69	3xsem, 80% CM	25 sem	82% ↑ fuerza muslo
Connelly	ERC, comunidad	M/F	76	3xsem, dorsiflexión tobillo al 100% CM	2 sem	15% ↑ fuerza tobillo
Vincent	ERC, comunidad sedentarios	M/F	68	3xsem, 50% CM	24 sem	16% ↑ fuerza muslo
				3xsem, 80% CM	24 sem	20% ↑ fuerza muslo
Perry	No grupo control. Sanos y activos	M	68	3xsem, 80% CM	16 sem	27% ↑ fuerza muslo
Prontera	No grupo control. Sanos y sedentarios	M	60-72	3xsem, 80% CM	12 sem	107% ↑ fuerza muslo
Prontera	ERC, sedentarios	F	74	3xsem, 85% CM	12 sem	36% ↑ fuerza muslo
Pitarone	No grupo control, residencia	M/F	90	3xsem, 80% CM	8 sem	174% ↑ fuerza muslo
Pitarone	ERC, residencia	M/F	87	3xsem, 80% CM	10 sem	37-175% ↑ fuerza muslo
Lexell	ERC, comunidad	M/F	70-77	3xsem, 85% CM	11 sem	163% ↑ fuerza muslo
Roth	ERC, comunidad, sedentarios	M/F	69	3xsem, 100% CM	13 sem	5% ↑ volumen muscular muslo

ERC: ensayo clínico randomizado y controlado.

CM: capacidad física máxima.

↑: incremento.

SYSTEMATIC REVIEW

Interventions for sarcopenia and muscle weakness in older people

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strength obtained from high-intensity resistance training in the elderly

Reference	Study type	Sex	Age (years)	Type of training	Duration	Effects observed
Harman [63]	RCT, healthy	M/F	mean 69 mean 66	3x/week @ 80% 1-RM 3x/week @ 80% 1-RM	25 weeks 25 weeks	82% ↑ in 1-RM leg strength 58% ↑ in 1-RM leg strength
Braze [62]	RCT, healthy, community-dwelling subjects	M/F	mean 69 mean 70	3x/week @ 80% 1-RM 3x/week @ 80% 1-RM	14 weeks 14 weeks	36% ↑ in 1-RM leg strength 66% ↑ in 1-RM leg strength
Carroll [67]	RCT, ambulatory nursing home residents	M/F	mean 82	3x/week, 2-5 kg free weights	12 weeks	10-15% ↑ in isokinetic leg strength
Chattop [66]	RCT, healthy, community-dwelling subjects	F	mean 69	3x/week @ 65-75% 1-RM	12 weeks	28-115% ↑ in 1-RM leg strength, 7% ↑ in area of type I fibres, 20% ↑ in area of type II fibres
Corrally [73]	RCT, healthy, community-dwelling subjects	M/F	mean 76	3x/week concentric/ eccentric isokinetic ankle dorsiflexion @ max effort	2 weeks	15% ↑ in isokinetic ankle strength
Ferris [67]	no control group, healthy, physically active subjects	M	mean 68	3x/week @ 80% 1-RM	16 wk	27% ↑ in 1-RM leg strength 11% ↑ in isokinetic leg strength
Frontera [68]	no control group, healthy, sedentary subjects	M	60-72	3x/week @ 80% 1-RM	12 weeks	107% ↑ in 1-RM leg strength 11-15% ↑ in isokinetic leg strength
Frontera [68]	RCT, healthy, sedentary, community-dwelling subjects	F	mean 74	3x/week @ 85% 1-RM	12 weeks	39% ↑ in 1-RM leg strength 0% ↑ in isokinetic leg strength
Fitzmaurice [61]	no control group, ambulatory nursing home residents	M/F	mean 90	3x/week @ 80% 1-RM	8 weeks	174% ↑ in 1-RM leg strength
Fitzmaurice [64]	RCT, ambulatory nursing home residents	M/F	mean 87	3x/week @ 80% 1-RM	10 weeks	37-178% ↑ in 1-RM leg strength
Leibel [62]	RCT, healthy, community-dwelling subjects	M/F	70-77	3x/week @ 85% 1-RM	11 weeks	163% ↑ in 1-RM leg strength
Roth [67]	RCT, healthy, sedentary community-dwelling subjects	M/F M/F	mean 25 mean 69	3x/week @ 100% 5-RM 3x/week @ 100% 15-RM	1st 13 weeks 2nd 13 weeks	5.9% ↑ in thigh muscle volume 5.0% ↑ in thigh muscle volume
Vincent [72]	RCT, healthy, sedentary community-dwelling subjects	M/F M/F	mean 68 mean 67	3x/week @ 50% 1-RM 3x/week @ 80% 1-RM	24 weeks 24 weeks	16% ↑ in 1-RM leg strength 20% ↑ in 1-RM leg strength

RCT = randomized controlled trial.

Efecto post intervención del ejercicio

- Increased strength and muscle mass with resistance exercise has been achieved even for the frail elderly 90 yr old (Fiatarone MA, Marks EC, Ryan ND, Meredith CN, Lipsitz LA, and Evans WJ. High-intensity strength training in nonagenarians. Effects on skeletal muscle. *JAMA* 263: 3029–3034, 1990.)
- Strength gains were variable across studies, which reflects multiple factors, including the study population, intensity, and duration of the training and the outcome measured.

Conclusiones

- The optimal exercise modality, duration, and intensity for healthy older men and women to maintain muscle mass remain in question
- The benefits of resistance or other forms of exercise for specific targeted populations of at-risk elderly patients have not been adequately addressed.

Conclusiones

- Resistance exercise increases muscle CSA as well as type 2 (fast twitch) muscle fibers, which leads to overall improvement in muscle power and the ability to improve physical functioning.
- As a result, this can lead to enhanced ability to perform activities of daily living, preventing functional decline and disability.