Vitamina D en el manejo de la Sarcopenia



X Curso ALMA

7 julio de 2011, Cancún

Tutor: Dr José Francisco Parodi

Dra Clara Perret

Hospital Alemán - Buenos Aires, Argentina

FUNCIONES DE LA VITAMINA D





- Hueso: aumenta longevidad de osteoblastos por un efecto anti-apoptótico.
- Músculo: mantiene función de fibras tipo II-a, reclutadas en actividades de alta intensidad y corta duración.
- Neuronas (SNC y P): regula metabolismo de neurotransmisores y factores de crecimiento. Mantiene velocidad de conducción nerviosa. Neuroprotección a través de inmunomodulación.

Annweiler C, Montero-Odasso M, Schott A et al. Fall prevention and vitamin D in the elderly: an overview of the key role of the non-bone effects. Journal of NeuroEngineering and Rehabilitation 2010, 7:50

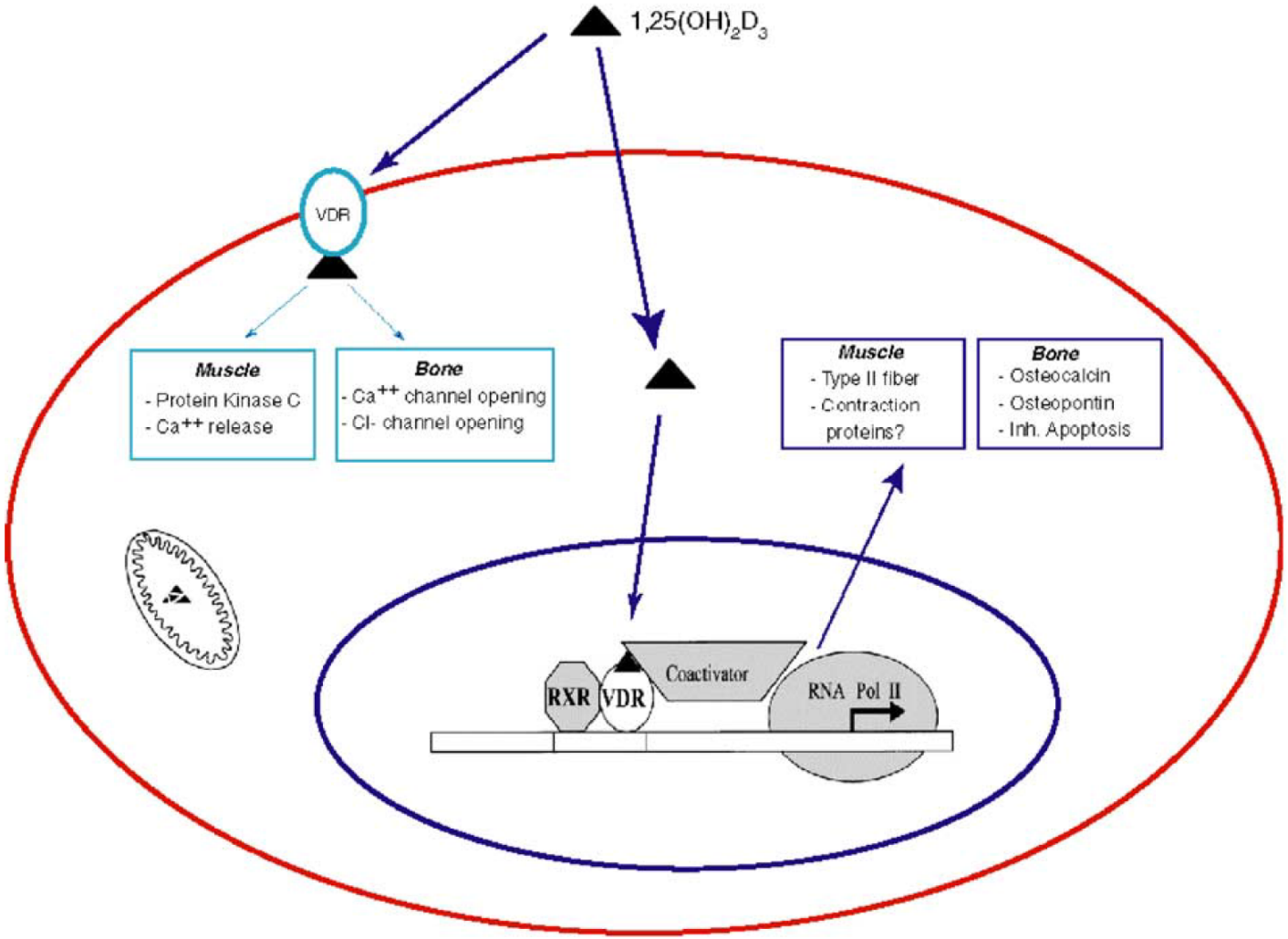


Fig. 1. Physiological process activated after vitamin D–VDR interaction. Genomic effects are initiated by the binding $1,25(OH)_2D_3$ (▲) to its nuclear receptor which results in changes in the gene transcription of mRNA and subsequent de novo protein synthesis. By contrast, non-genomic effects of vitamin D are rapid and mediated through a membrane-bound VDR. The figure shows the genomic and non-genomic effects of this interaction on bone and muscle cell.

Montero-Odasso M, Duque G. Vitamin D in the aging musculoskeletal system: An authentic strength preserving hormone. Molecular Aspects of Medicine 26 (2005) 203–219

- Elamin MB et al. Vitamin D and **Cardiovascular Outcomes**: A Systematic Review and Meta-Analysis. J Clin Endocrinol Metab. 2011 Jun 15.
- Annweiler et al. Vitamin D and cognitive performance in adults: a systematic review. [illegible]9.
- Kriegel MA et al. Vitamin D and risk of developing **autoimmune disease**?: a systematic review. [illegible]2011 Jun;40(6): 512-531.e8.
- Yin L et al. Meta-analysis: serum vitamin D and **colorectal adenoma risk**. Prev Med [illegible]
- Pittas AG et al. Vitamin D and **type 2 diabetes**. A systematic review. [illegible]Metab. 2007 Jun;92(6):201[illegible]
- Lappe M et al. Vitamin D and calcium supplementation reduces **cancer** risk: results of a randomized trial. Am J Clin Nutr 2007;85:1586–91.
- Herr C et al. The role of vitamin D in **pulmonary disease**: COPD, asthma, infection, and cancer. Respir Res 2011 Mar 18;12:31

La vitamina D reduce el riesgo de:

- Inflamación?
- Infección?
- Cáncer ?
- Autoinmunidad?

HIPOVITAMINOSIS D EN EL ANCIANO

Prevalencia: 50-80%

- Menor exposición al sol
- Dieta con bajo contenido en vitamina D
- Disminución del 7-dehidrocolesterol en la piel
- Menor activación de vitamina D en hígado y riñón
- Menor expresión de VDR (receptor vitamina D)

Dirks-Naylora A, Lennon-Edwards S. The effects of vitamin D on skeletal muscle function and cellular signaling. J Ster Bioch & Mol Biol 125 (2011) 159–168.

- *¿Qué evidencia existe acerca de la asociación entre hipovitaminosis D y sarcopenia?*

VITAMIN D-RELATED CHANGES IN PHYSICAL PERFORMANCE: A SYSTEMATIC REVIEW

C. ANNWEILER[1], A.-M. SCHOTT[2], G. BERRUT[3], B. FANTINO[4], O. BEAUCHET[1]

Summary of the main characteristics of the eight observational studies included in the systematic review which objective was to examine the association between 25OHD or 1,25OHD concentrations and physical performance

Reference	Design	Setting / Population	Serum vitamin D measure	Physical performance measures / Fractures	Significant positive association?
Bischoff-Ferrari et al., 2004 (11)	– Cross-sectional study	– Community-dwelling – N = 4100 , 49% women – Mean age: 71.4±7.9	– 25OHD	– Gait – Sit-to-stand	– Yes – Yes
Dukas et al., 2005 (12)					
Gerdhem et al., 2005 (13)					
Boxer et al., 2008 (14)					
Houston et al., 2007 (15)		– N = 976, 55.4% women – Mean age: 74.8		battery – Upper muscle strength	– Yes
Kwon et al., 2007 (16)	– Cross-sectional study	– Community-dwelling – N = 1094, 58% women – Mean age: 77.7±4.0	– 25OHD	– Balance – Upper and lower muscle strength	– Yes – Yes
Annweiler et al., 2009a (17)	– Cross-sectional study	–Community-dwelling –N = 440, 100% women –Mean age: 80.1±3.5	– 25OHD	– Upper and lower muscle strength	– No
Annweiler et al., 2009b (18)	– Cross-sectional study	– Community-dwelling – N = 554, 100% women – Mean age: 79.8±3.1	– 25OHD	– Lower muscle strength	– No

DE 8 ESTUDIOS QUE EVALUARON LA ASOCIACIÓN ENTRE LAS CONCENTRACIONES DE VITAMINA D Y LA PERFORMANCE FÍSICA

5 (62%) DEMOSTRARON UNA ASOCIACIÓN POSITIVA

J Nutr H Ageing 2009, 13 (10): 893-898.

EFFECT OF VITAMIN D NUTRITIONAL STATUS ON MUSCLE FUNCTION AND STRENGTH IN HEALTHY WOMEN AGED OVER SIXTY-FIVE YEARS

S.R. MASTAGLIA[1,3], M. SEIJO[1], D. MUZIO[1], J. SOMOZA[1], M. NUÑEZ[2], B. OLIVERI[1,3]

1. Sección Osteopatías Médicas, Hospital de Clínicas, Universidad de Buenos Aires, Argentina; 2. Cátedra de Matemática, Facultad de Farmacia y Bioquímica, Universidad de Buenos Aires, Argentina; 3. Researcher of the National Council for Scientific and Technologic Research (CONICET). Correspondence: Silvina R. Mastaglia, Av. Córdoba 2351(1120), Tel/Fax: 541159508972, Buenos Aires- Argentina, Silvinamastaglia@hotmail.com

- 29 pac. con 25 OH vit D <20 ng/ml y 25 pac. >20 ng/ml
  - **Masa muscular:** sin diferencias significativas.
  - **Fuerza muscular:** diferencias significativas en músculos abductores y flexores de la cadera, y en músculos extensores de la rodilla.
  - **Rendimiento físico:** diferencias significativas en velocidad de la marcha y test ¨sit to stand¨.

J Nutr Health Ageing 2011, 15(5).

- *¿Qué evidencia existe sobre la eficacia de la vitamina D para el tratamiento de la sarcopenia?*

VITAMIN D-RELATED CHANGES IN PHYSICAL PERFORMANCE: A SYSTEMATIC REVIEW

C. ANNWEILER[1], A.-M. SCHOTT[2], G. BERRUT[3], B. FANTINO[4], O. BEAUCHET[1]

determine the effect of vitamin D supplementation on physical performance

Reference	Design	Setting / Population / Follow-up	Intervention	Physical performance measures / Fall / Fractures used as outcomes	Significant improvement related to supplementation?
Dhesi et al., 2004 (19)	– Randomised, double-blind, placebo-controlled study	– Community-dwelling – Subjects with a history of falls – N = 139, above 75% women – Two groups: • Intervention group (n=70; mean age 76.6±6.1 years; 80% women) • Placebo group (n=69; mean age	– Single intramuscular injection of 600,000 IU ergocalciferol	– Balance – Lower muscle strength – Falls – No	– Yes – No – No
		(n=24, mean age 77±4 years) • Training group with Vitamin D and calcium (n=24, mean age 78± 4 years) • Training group with calcium only (n=24, mean age 76±6 years) – Follow-up: 9 months			
Swanenburg et al., 2007 (25)	– Randomized clinical trial	– Community-dwelling – N = 24,100% women – > Aged 65 years – Two groups, both with calcium and vitamin D supplements: • Intervention • Control – Follow-up: 12 months	– Vitamin D (400-800 UI per day) and Calcium (500-1000mg per day) oral supplementation – Exercise including training of muscular strength, coordination, balance and endurance, and protein	– Balance – Muscle strength – Activity level – Falls	– No – Yes – Yes – Yes
Bruner et al., 2008 (26)	– Randomised double-blind, placebo-controlled study	– Community-dwelling – N = 33067, 100% women – Age range: 50–79 years – Two groups: • Intervention • Control (placebo)	– 1000 mg calcium carbonate plus 400 IU vitamin D	– Sit-to-stand – Gait – Upper muscle strength	– No – No – No

ESTUDIOS: 6 RANDOMIZADOS CONTROLADOS, 1 RANDOMIZADO NO CONTROLADO, 1 COHORTE

SEGUIMIENTO 3 MESES A 4 AÑOS

-4/7 -> EFECTO SIGNIFICATIVO EN FUERZA MUSCULAR

-1/5 -> EFECTO SIGNIFICATIVO EN EQUILIBRIO

-1/3 -> EFECTO SIGNIFICATIVO EN MARCHA

Annweiler C, Schott A-M, Berrut G, Fantino B, Beauchet O. Vitamin D-related changes in physical performance: a systematic review. J Nutr H Ageing 2009, 10.

J Nutr H Ageing 2009, 13 (10): 893-898.

Effect of vitamin D supplementation on muscle strength: a systematic review and meta-analysis

K. A. Stockton · K. Mengersen · J. D. Paratz · D. Kandiah · K. L. Bennell

- Incluyeron estudios randomizados controlados.

➢ En pacientes con **25OH vit D basal >25 nmol/L NO** hubo efecto significativo en la **fuerza de puño** (7 estudios) ni en la **fuerza proximal de miembros inferiores** (11 estudios)

➢ En pacientes con **25OH vit D basal <25 nmol/L** hubo **efecto significativo en la fuerza muscular de cadera** (2 estudios, SMD 3.52, 95%CI 2.18, 4.85).

Osteoporosis Int 2011, 22: 859-871

A Randomized Controlled Trial of the Effects of Vitamin D on Muscle Strength and Mobility in Older Women with Vitamin D Insufficiency

Kun Zhu, PhD,[*†] *Nicole Austin, PhD,*[*] *Amanda Devine, PhD,*[‡] *David Bruce, MD,*[*] *and Richard L. Prince, MD*[*†]

Table 2 Vitamin D Status, Mobility, and Muscle Strength at Baseline and 1 Year

	Mean ± Standard Deviation			
	Vitamin D+Calcium (n = 129)		Placebo+Calcium (n = 132)	
Factor	Baseline	1 year	Baseline	1 year
Serum 25-hydroxyvitamin D, ng/mL	18.1 ± 5.0	24.0 ± 5.6*	17.7 ± 5.2	18.0 ± 5.4
Timed Up and Go Test, seconds	11.0 ± 5.3	8.1 ± 3.9*	10.8 ± 4.6	9.0 ± 7.0*
Lower limb muscle strength, kg				
Ankle dorsiflexion	11.6 ± 4.4	10.9 ± 3.7*	11.8 ± 4.2	10.9 ± 4.0*
Knee flexor	11.8 ± 3.6	12.9 ± 3.5*	11.9 ± 3.7	13.0 ± 3.9*
Knee extensor	18.3 ± 6.4	18.0 ± 5.0	18.8 ± 7.3	18.3 ± 5.5
Hip extensor	14.6 ± 5.7	17.2 ± 5.2*	14.4 ± 5.3	16.9 ± 6.2*
Hip abductor	12.3 ± 4.2	14.5 ± 4.1*	12.2 ± 5.0	14.1 ± 4.9*
Hip flexor	14.5 ± 5.0	15.4 ± 4.2*	14.5 ± 5.7	15.4 ± 4.8*
Hip adductor	14.4 ± 4.7	16.4 ± 4.4*	14.7 ± 5.0	16.3 ± 5.2*

* Significantly different from baseline, $P < .05$.

J Am Geriatr Soc 58:2063–2068, 2010.

Table 3 Change in Hip Extensor and Adductor Strength According to Baseline Tertile Values

Tertile of Strength (kg)	Mean (Standard Error)		
	Absolute Change (kg)		% Difference in Change
	Vitamin D	Placebo	(Vitamin D–Placebo)
Hip extensor			
Lowest (≤11)	5.2 (0.7)	3.1 (0.8)	22.6 (9.5)*
Middle (12–15)	3.5 (0.6)	4.3 (0.7)	− 3.8 (5.9)
Highest (≥16)	0.1 (0.7)	0.7 (0.8)	− 1.1 (5.1)
Hip adductor			
Lowest (≤12)	3.4 (0.5)	2.1 (0.6)	13.5 (6.7)*
Middle (13–16)	2.2 (0.5)	3.2 (0.5)	− 6.8 (4.5)
Highest (≥17)	− 0.4 (0.6)	− 0.3 (0.6)	− 0.2 (4.2)

*The increase in strength was significantly greater in the vitamin D group than in the placebo group in the same tertile, $P < .05$.

Zhu K, Austin N, Devine A, Bruce D, Prince R. A randomized controlled trial of the effects of vitamin D on muscle srength and mobility in older women with vitamin D insufficiency. J Am Geriatr Soc 58:2063–2068, 2010.

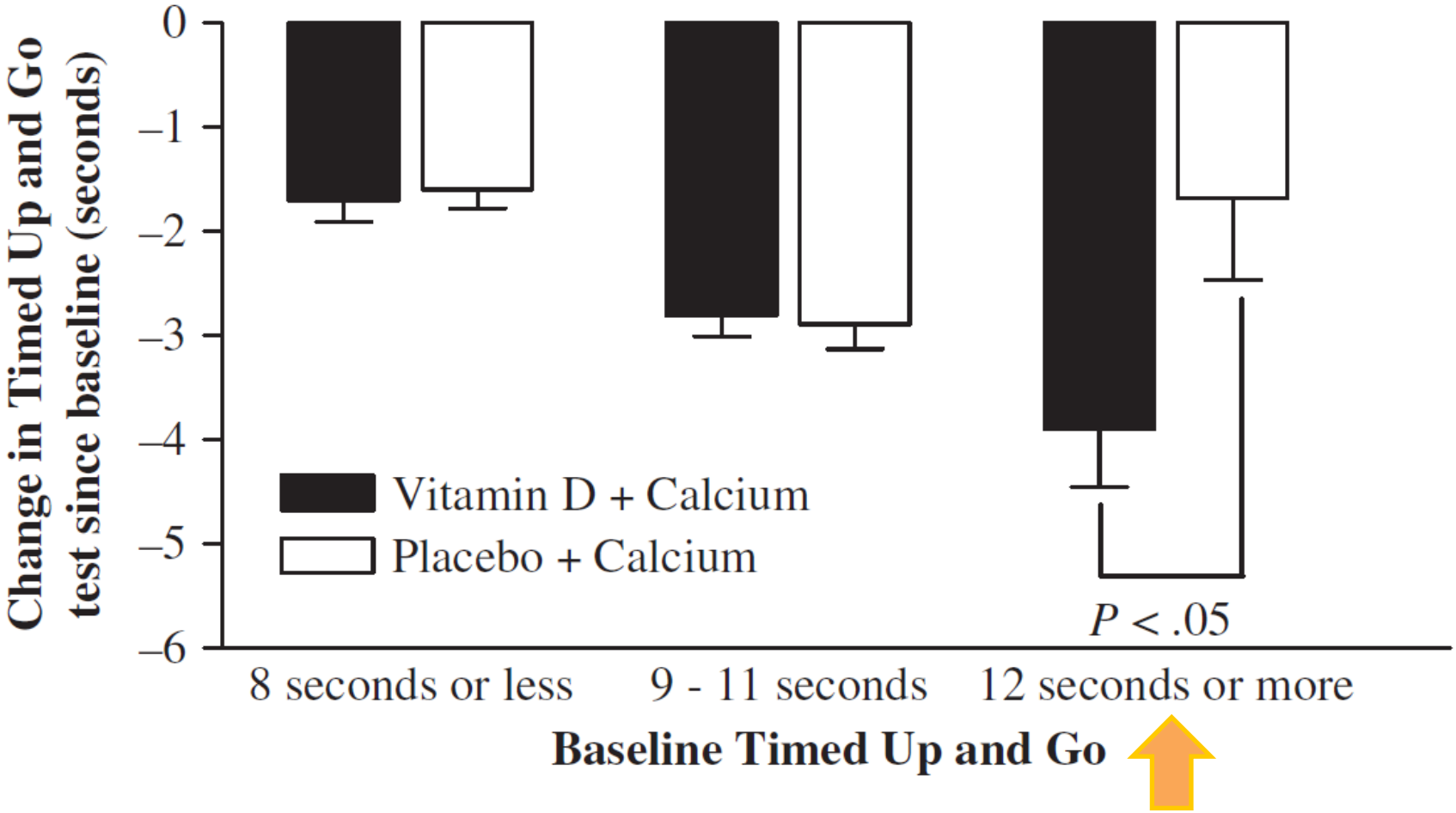
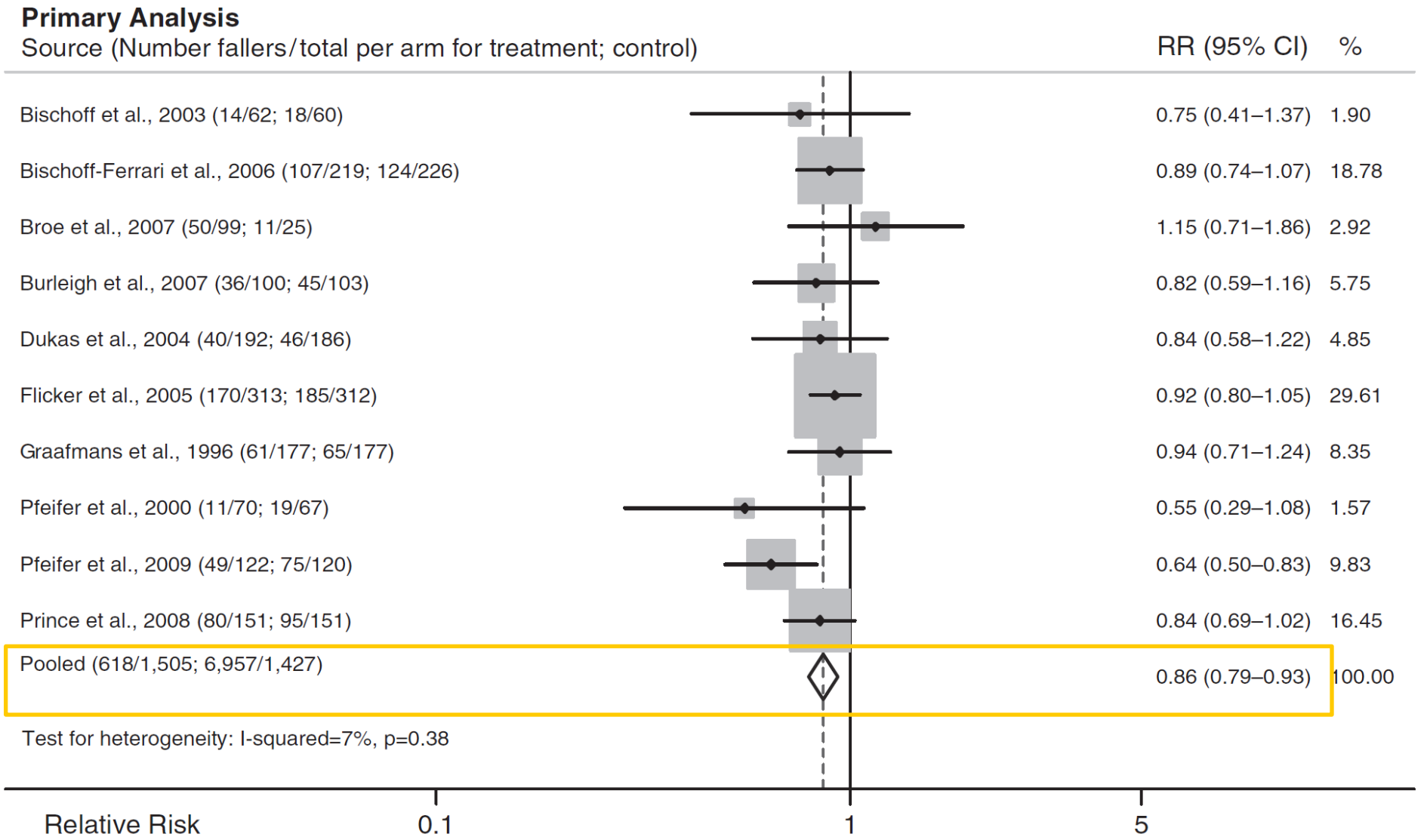


Figure 2. Change in Timed Up and Go Test over 12 months according to baseline tertile. Error bars represent standard errors.

Zhu K, Austin N, Devine A, Bruce D, Prince R. A randomized controlled trial of the effects of vitamin D on muscle srength and mobility in older women with vitamin D insufficiency. J Am Geriatr Soc 58:2063–2068, 2010.

Vitamin D Treatment for the Prevention of Falls in Older Adults: Systematic Review and Meta-Analysis

Rita Rastogi Kalyani, MD, MHS, Brady Stein, MD, MHS,† Ritu Valiyil, MD, MHS,‡ Rebecca Manno, MD, MHS,‡ Janet W. Maynard, MD, MHS,‡ and Deidra C. Crews, MD, ScM§*



J Am Geriatr Soc 2010, 58: 1299-1310

Table 3. Subgroup Analyses for Vitamin D Treatment and Prevention of Falls

Subgroup	Studies, n	Participants, n		Relative Risk of Falling (95% Confidence Interval)	I^2, %	*P* Value*
		Treatment	Control			
Studies included in primary analysis						
Adjunctive calcium therapy†						
Yes[18,...]	7	1,037	1,039	0.83 (0.75–0.92)	22	.51
No[33,38,40]	3	468	388	0.94 (0.77–1.15)	0	
Type of vitamin D						
Ergocalciferol[34,38,39]	3	512	488	0.89 (0.80–1.00)	0	Ref
Cholecalciferol[18,...,41]	6	750	753	0.80 (0.69–0.93)	24	.34‡
Alfacalcidol[40]	1	192	186	0.84 (0.58–1.22)	—	.80‡
Participant dwelling and age§						
Community-dwelling, aged <80[18,...]	5	754	750	0.79 (0.69–0.92)	29	.20
Hospitalized or institutionalized, aged ≥80[33,34,36–38]	5	751	677	0.90 (0.80–1.01)	0	
History of fracture or fall (in majority of participants) if reported						
Yes[36–39]	4	412	339	0.84 (0.72–0.98)	0	.68
No[18,34,35,40]	4	697	685	0.77 (0.62–0.97)	59	
Duration of vitamin D treatment						
≤6 months[18,36–38]	4	331	255	0.79 (0.62–1.01)	0	.89
>6 months[33,...]	6	1,174	1,172	0.86 (0.78–0.94)	21	
Dose of oral vitamin D, IU						
<800[33,38,41]	3	472	478	1.01 (0.85–1.20)	21	.06
≥800[18,...]	7	841	838	0.80 (0.70–0.91)	31	

Rastogi K, Stein B, Valiyil R et al. Vitamin D treatment for the prevention of falls in older adults: systematic review and meta-analysis. J Am Geriatr Soc 2010, 58: 1299-1310

- Avenell A et al. Vitamin D and vitamin D analogues for preventing fractures associated with involutional and post-menopausal **osteoporosis.** *Cochrane Database of Systematic Reviews* 2009, Issue 2.
  - Vitamina D + calcio ↓ riesgo de fractura de cadera (RR 0.84, IC 95% 0.73- 0.96).
  - La vitamina D ↑ riesgo de hipercalcemia (RR 2.35, IC 95% 1.59- 3.47), síntomas gastrointestinales (RR 1.04, IC 95% 1.00- 1.08) y enfermedad renal (RR 1.16, IC 95% 1.02- 1.33).

- Bjelakovic G, Gluud LL, Nikolova D, Whitfield K, Wetterslev J, Simonetti RG, Bjelakovic M, Gluud C. Vitamin D supplementation for prevention of **mortality** in adults. *Cochrane Database of Systematic Reviews* 2011, Issue 7.
  - La vitamina D3 ↓ la mortalidad (RR 0.94, IC 95% 0.91 - 0.98).

CONCLUSIONES

- Podría existir asociación entre los niveles de vitamina D y la fuerza muscular y el rendimiento físico.

- La reposición con vitamina D podría mejorar la fuerza muscular y el rendimiento físico en pacientes con déficit de vitamina D, especialmente en aquellos con peores niveles basales de fuerza muscular o rendimiento físico.

- La reposición con vitamina D podría prevenir caídas, en especial con colecalciferol, >800 UI/d, + calcio, > 6 meses, en pacientes <80 años que viven en la comunidad, si historia de fracturas o caídas.

MUCHAS GRACIAS POR SU ATENCIÓN


Leche
5 litros
Yema de huevo
9 yemas
Mantequilla
250 g
Alimentos ricos en vitamina D
y cantidades individuales que necesitaríamos para obtener la dosis diaria recomendada de vitamina D con cada uno de ellos
Ostras
10 kg
Hígado
2 kg
Pescados grasos
50 g de salmón ahumado
40 g de atún fresco o en lata
25 g de sardinas en lata