A meta-analysis of the effect of dietary omega-3 fatty acid supplementation on walking speed and inflammatory markers in older healthy adults

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Background

A major public health concern for our ever ageing population is to remain independent. An important element of maintaining independence in older adults is the preservation of mobility along with muscle mass and strength.

A key concept linked to musculoskeletal ageing is frailty. The commonly acknowledged characteristics include unintentional weight loss, self-reported exhaustion, weakness (grip strength), slow walking speed, and low physical activity.

Weight loss | Exhaustion | Slow Walking | Weakness | Low Activity

Muscle mass decline is one of the hallmarks of ageing with an annual decline in functional capacity of up to 3% per year after age 60.

Dietary supplementation of fish derived omega-3 polyunsaturated fatty acids (PUFAs), have shown to have a beneficial effect on skeletal muscle mass and strength.

PUFAs are of particular interest in the context of frailty, given their well-known anti-inflammatory role and the consensus of an inflammatory contribution to frailty, with differences in the levels of pro-inflammatory cytokines between frail and non-frail elderly reported.

Objective

To examine the effect of dietary omega-3 supplementation on frailty traits and associated biomarkers in medically stable older adults.

References

1. **Boit M, et al**. *Am J Clin Nutr* 2017; 105(1):[151-8 pp.]. **2. Ciubotaru I, et al**. *J Nutr Biochem*. 2003;14(9):513-21. **3. Grieger JA, et al**. *Food and Nutrition Research*. 2014;58 (20369).**4. Hutchins-Wiese H, et al**. *J Nutr Health Aging* 2013; 17(1):[76-80 pp.]. **5. Kamolrat T, et al.** *Proc Nutr Soc*. 2013;72:E97.
6. **Krzyminska-Siemaszko R, et al.**. *Int J Environ Res Public Health*. 2015;12(9):10558-74. **7. Mesa MD, et al.** *Oxid Med Cell Longev*. 2015;2015:5709312.
8. **Pipingas A, et al.** *Journal of Functional Foods*. 2015;19:949-57.**9.Smith G, et al**. *Am J Clin Nutr* 2011; 93(2):[402-12 pp.]. **10. Strike SC, et al.** *J Gerontol A Biol Sci Med Sci*. 2016;71(2):236-42.**11.Tartibian B, et al.** *Nutr Metab (Lond)*. 2011;8:71.

Method

A meta-analysis of randomised controlled trials published up to October 2017 in 5 databases was carried out.

- **Participants**: Medically stable postmenopausal or older people with the majority of participants over 60 years of age.
- **Intervention**: Omega-3 PUFA supplementation
- **Comparator:** Placebo-controlled groups
- **Outcome:** One or more inflammatory biomarkers or frailty traits.

The results were pooled using a random-effects meta-analysis with standardised mean differences.

PROSPERO registration number: CRD42017080240

Results

13 studies met the inclusion/exclusion criteria but not all frailty traits or associated biomarkers were measured in all studies.

In 5 studies that analysed 261 patients, omega-3 fatty acid supplementation was associated with a significant improvement in walking speed with a pooled effect size of 0.27 (95% CI, 0.02, 0.52; P= 0.04: *Figure 1*)

A significant lowering effect was observed for C-reactive protein (CRP) levels in 5 trials of 310 patients with a pooled effect size of -0.62 (95% CI,-1.14, -0.10; P = 0.02: *Figure 2*).

The pooled effect sizes for the inflammatory cytokines TNF-α (5 trials; n=168), was -0.36 (95% CI, -1.09, 0.36; P=0.33; *Figure 3*) and for IL-6 (6 trials; n= 199), was -0.06 (95% CI, -0.55, 0.43; P=0.80; *Figure 4*) and were not found to be significant.
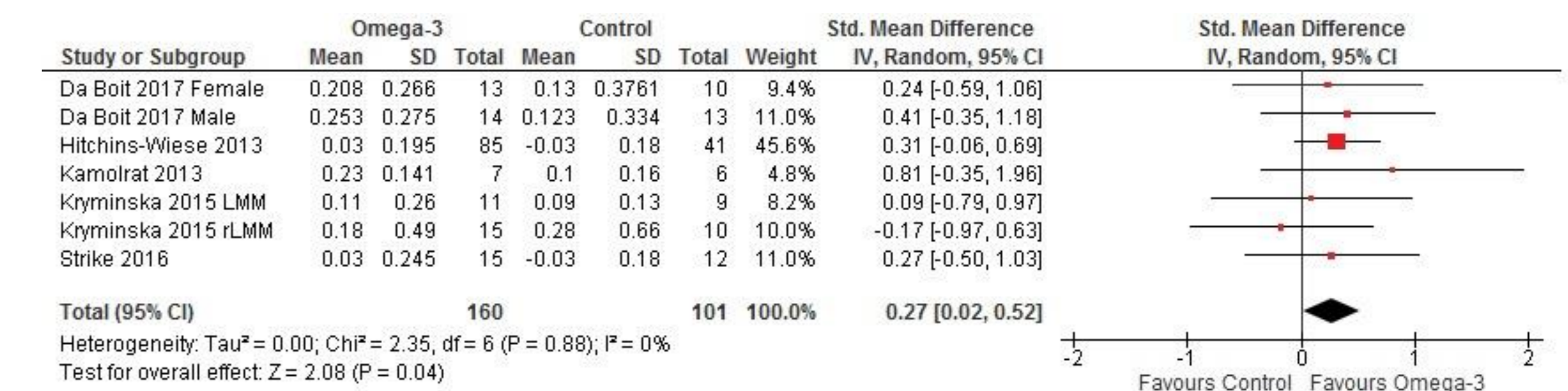

Figure 1 Omega-3 supplementation versus control. Outcome: Walking Speed m/s.
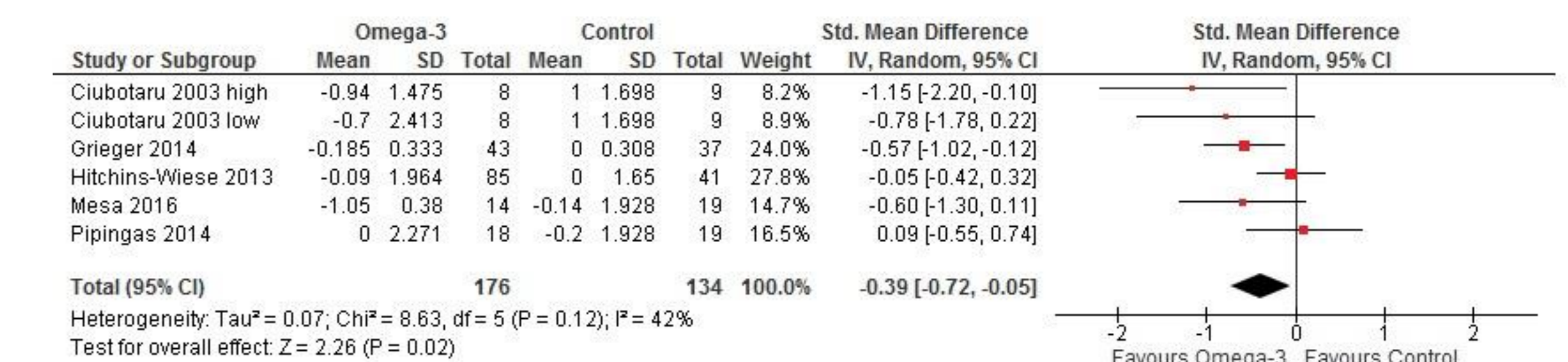*LMM= Low Muscle Mass; rLMM= risk of Low Muscle Mass*

Figure 3 Omega-3 supplementation versus control. Outcome: CRP (mg/L)
CRP= C-reactive protein. High and low fish oil concentrations presented for Ciubotaru 2013
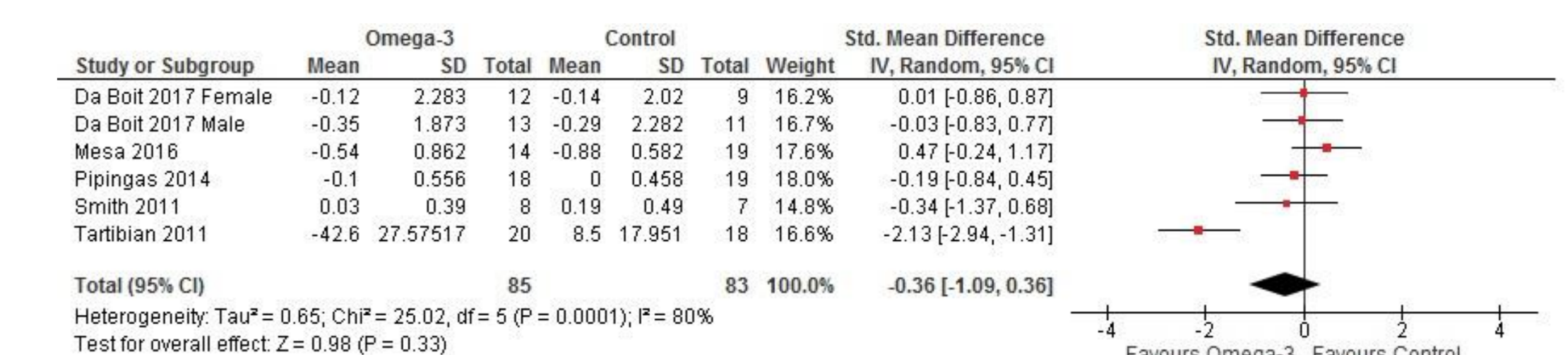

Figure 3 Omega-3 supplementation versus control. Outcome: TNFα (pg/ml)
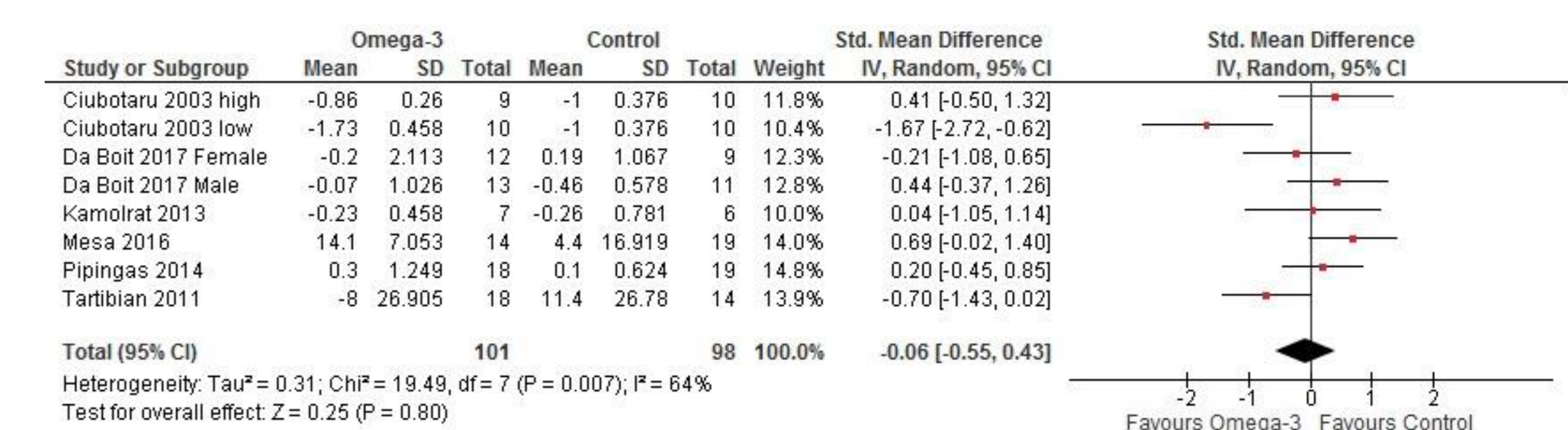*TNFα = Tumour Necrosis Factor alpha*

Figure 4 Omega-3 supplementation versus control. Outcome: IL-6 (pg/ml).
IL-6= Interleukin-6. High and low fish oil concentrations presented for Ciubotaru 2013

Conclusion

These results suggest that dietary omega-3 supplementation may have a beneficial effect on medically stable older people by improving walking speed and reducing some markers of systemic chronic inflammation.

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