Omega 3 fatty acid supplementation improves physical performance: a systematic review and meta-analysis of RCTs

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Background: Omega 3 polyunsaturated fatty acids (n-3, PUFA) show promise for improving muscle mass, strength and measures of physical performance that may ameliorate sarcopenia.

Purpose: To perform an updated meta-analysis of n-3 interventions with detailed subgroup analysis on physical performance/strength and muscle mass, with sub-group analysis on duration, age, BMI, sex, and location, amongst others.

Methods: We followed The Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA –checklist for systematic reviews and meta-analysis. Literature was searched (ISI, Scopus and PubMed databases up to October 2021) with terms related to n-3 (alpha linolenic acid, docosahexaenoic acid, eicosapentaenoic acid, fish oil etc.) muscle mass, strength and physical performance (using the 30 s Chair Stand Test [30CST] for muscle strength and endurance and the Timed Up and Go Test [TUG] for physical performance; both are useful and simple tools that can be used to assess sarcopenia). Human n-3 randomised controlled trials (RCTs) were included and assessed for methodological quality (Cochrane quality assessment tool). Weighted mean differences (WMDs) with 95% confidence intervals (CIs) and random-effect model analysis, and I-squared (I²) statistic were used to assess outcomes and heterogeneity respectively. Subgroup and sensitivity analysis were performed, and Begg’s and Egger’s tests evaluated publication bias. Statistical analysis used STATA 11 software and a p-value of <0.05 was considered statistically significant.

Results: The primary meta-analyses for functional performance (TUG, 7 RCTs, 8 interventions, n=259) and strength (30CST, 5 RCTs, 6 interventions, n=180), favoured n-3 PUFA (p<0.001). TUG (weighted mean change (WMD): −0.35 s; 95% CI: −0.53, −0.18; I²=0.0%) (Figure 1A) and 30CST (WMD: 2.23 repetitions; 95% CI: 1.34, 3.32; I²=67.6%) (Figure 1B). Subgroup analysis for TUG was significant for female sex (WMD: 2.92 reps; 95% CI: 2.37, 3.46; I²=33.1%), BMI ≥25 kg/m² (WMD: −0.36 s; 95% CI: −0.58, −0.17; I²=16.9%), and for 30CST by duration ≥16 weeks (WMD: 2.60 reps; 95% CI: 1.37, 3.83; I²=0.0%) (all p<0.001). There were no significant effects on muscle mass and handgrip strength, and subgroup analysis showed negligible influence. Publication bias was minimal and sensitivity analysis did not influence findings.

Conclusions: We showed novel favourable effects of n-3 PUFA on specific measures of strength and physical performance in some populations but not on measures of muscle mass and other strength tests. The beneficial effects of n-3 on these measures may be due to various mechanisms that regulate muscle quality (rather than quantity). Further studies are needed to elucidate the dose, duration and other influential variables.

Figure 1. Meta-analysis forest plots.