Topics: Elderly frailty, omega-3 fatty acids, docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA), long chain polyunsaturated fatty acids (LC-PUFAs), fish, fish oil

Relevance to: Efalex Active 50+/Active Memory


Objective: To examine whether habitual dietary intake of marine-origin n-3 polyunsaturated fatty acids (MOPUFA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), are associated with functional mobility in the community-dwelling oldest old, 85 years or older, who are at high risk for physical disability.

Background: Frailty is common among older adults and includes weight loss, poor hand grip strength, low endurance, low reported physical activity and slow walking speed. The most common method used to assess functional mobility among elderly individuals to evaluate physical performance is the Timed Up and Go test (TUG) which has been recommended by the American Geriatrics Society and British Geriatrics Society guidelines. Studies have shown that in older adults, strength, walking speed, overall physical performance, frailty phenotype and longevity are associated with inflammatory biomarkers such as C-reactive protein (CRP), interleukin-6 (IL-6) and tumor necrosis factor-α (TNF-α). Omega-3 LC-PUFAs are known to reduce inflammation and so may be a dietary means of preventing this major health concern.

Method: This cross-sectional study included four hundred seventeen (189 men, 228 women) out of 542 participants in the baseline examination of the Tokyo Oldest Old Survey on Total Health, a community-based ongoing longitudinal study among the oldest old living in the center of Japan.

Exclusion criteria: Excessive energy intake (more than 3750 Kcal/day for men and more than 3000 Kcal/day for women), intake of drugs containing purified EPA, ingestion of dietary supplements.

The following assessments were completed:
1. Habitual dietary intake of marine origin LC-PUFAs was assessed by the brief-type self-administered diet history questionnaire (BDHQ)
2. Functional mobility was assessed by the Timed Up and Go test (TUG) - a common method of assessing functional mobility among elderly individuals. Participants were first seated upright in an armchair and were then timed when standing up, walking three meters, turning, returning to the chair and sitting down. Participants were instructed to walk at their usual pace and were allowed to use walking aids if necessary.
3. Plasma inflammatory biomarkers [C-reactive protein, IL-6 and TNF-α] were measured.
4. RBC phospholipid fatty acid composition
5. A face-to-face interview determined sociodemographic status, habits, functionality, history of falls in the previous six months, activities of daily living (ADL) assessed by the Barthel Index, cognitive function assessed by mini-mental state examination (MMSE) and comorbidities.

The cross-sectional association between habitual intake of marine origin LC-PUFAs and functional mobility using multivariate logistic regression analysis was determined. Prior to the analysis, validation of BDHQ was confirmed among 190 participants (96 men, 94 women) based on the EPA and DHA concentrations in the RBC phospholipids as reference.
Findings: There was no significant difference between men and women for either dietary intake of EPA + DHA or their RBC concentration of these two fatty acids. There was a moderate direct correlation between estimated dietary intake of EPA/DHA and concentration of EPA/DHA in the RBC phospholipids (Spearman's r=0.29-0.58, p<0.01). A lower habitual intake of EPA+DHA was significantly associated with poor functional mobility in men but not in women (OR (95%CI) per 1 SD increase of EPA+DHA intake; 0.55 (0.33-0.91), 0.88 (0.59-1.32), men and women respectively). There was also a modest positive correlation between IL-6 and TUG in both men and women, indicating that poor mobility was partly the result of inflammation. Similarly, there was a modest negative correlation between IL-6 and omega-3 LC-PUFA intake in men, but not women.

Conclusion: Increased habitual intake of marine origin LC-PUFAs (EPA + DHA) is associated with improved functional mobility in community-dwelling old men.

Objective: To identify relationships and evaluate effects of fish oil supplementation on bone turnover markers and frailty and physical performance.

Method: This randomized, double blind, placebo controlled pilot study included 126 postmenopausal women over age 65 years who took either 2 fish oil (720 mg EPA + 480 mg DHA) or 2 placebo (olive oil) capsules per day for 6 months. All participants received calcium and vitamin D supplements throughout the study.

Inclusion criteria: Free of bone, cancer or liver disease; reporting no use of bisphosphonates, hormonal therapies, or long-term corticosteroids; without a hip or vertebral fracture in the past year; no medical or herbal supplement use with anticoagulation or anti-platelet activity; and no seafood allergies.

Assessments - completed at baseline and following 6 months treatment:
1. Frailty using the frailty phenotype of Fried and colleagues. Characteristics included self-reported weight loss (>10 lbs in previous year), hand grip strength, sense of exhaustion using the Centre of Epidemiologic Studies Depression Scale, walking speed, reported physical activity using the Physical Activity Scale in the Elderly, repeated chair rises, height and weight measurements of Body Mass Index (BMI), health history questionnaire, self-reported co-morbidities and 2 day food record for nutrient analysis.
2. Plasma inflammatory biomarkers - [C-reactive protein, IL-6 and TNF-α]
3. RBC Fatty Acid Analysis
The percent change in frailty measurements, fatty acids and inflammatory markers were calculated from baseline to 6 months taking into consideration age, frailty phenotype, percent change in TNFα, and osteoarthritis in the knee because of its impact on walking speed.

Findings: At baseline, those with greater RBC DHA and DHA/arachidonic acid (AA) presented with less frailty (p=0.007 and p=0.004, respectively). Fish oil supplementation resulted in higher RBC DHA and lower AA compared to baseline and placebo (p<0.001) and improved walking speed compared to placebo (3.0±16 vs. -3.5±14, p=0.038). Age, antioxidant intake (selenium and vitamin C), osteoarthritis, frailty phenotype, and TNFα explained 13.6% of the variance in the change in walking speed. Change in DHA/AA (p=0.01) and TNFα (p=0.039), and selenium intake (p=0.031) had the greatest contribution to change in walking speed.

Conclusion: Physical performance, measured by change in walking speed, was significantly improved by fish oil supplementation. Dietary intake of antioxidants (selenium and vitamin C) and changes in TNFα also contributed to change in walking speed suggesting LCPUFA may interact with antioxidants and inflammatory response to impact physical performance.
Fish oil supplementation improves mobility in the elderly.

Two independent research groups from either side of the globe have just reported that dietary intake of omega-3 long chain polyunsaturated fatty acids (LC-PUFAs) including eicosapentaeonoic acid (EPA) and docosahexaenoic acid (DHA) found in fish oil are important to ensure functional mobility in aging adults possibly by reducing inflammation12.

One collaborative study among the Keio University School of Medicine, Tokyo; the University of Tokyo; the Health Care Centre, Shoko Chukin Bank, Tokyo; and the Shimane University Faculty of Medicine, Shimane, Japan included 189 men and 228 women out of 542 participants in the baseline examination of the Tokyo Oldest Old Survey on Total Health, a community-based ongoing study of the oldest old people living in the center of Japan1. They determined their habitual dietary intake of EPA and DHA, functional mobility, plasma inflammatory biomarkers [C-reactive protein, Interleukin -6 (IL-6) and tumor necrosis factor – α (TNF-α) and red blood cell (RBC) fatty acids. In addition, a face-to-face interview determined sociodemographic status, habits, functionality, history of falls in the previous six months, activities of daily living (ADL), cognitive function assessed by mini-mental state examination (MMSE) and comorbidities.

The results showed that the men and women ate the same amount of EPA and DHA, that their RBC concentration of these two fatty acids was also the same and that it increased with increase in dietary intake. A lower habitual dietary intake of EPA+DHA was significantly associated with poor functional mobility in men but not in women. However, in both men and women high functional mobility was found in those with lower IL-6 indicating that poor mobility was partly the result of inflammation. In addition, in men, IL-6 concentration was lower in those with higher omega-3 LC-PUFA intake indicating that consumption of fish oil products may reduce inflammation and in doing so improve mobility in the aged.

The second collaborative study among the University of Connecticut Health Centre, Farmington, CT; Vital Nutrients, Middletown, CT and the Louisiana State University, Baton Rouge, LV, USA, was a randomized, double blind, placebo controlled pilot study included 126 postmenopausal women over 65 years old who took either 2 fish oil capsules providing 720 mg EPA + 480 mg DHA or 2 olive oil placebo capsules per day for 6 months2. Before and after treatment, the participants were tested for frailty, plasma inflammatory biomarkers including C-reactive protein, IL-6 and TNF-α, and RBC fatty acids.

At baseline, those with greater RBC DHA and DHA/arachidonic acid (AA) were less frail than those with lower DHA. Fish oil supplementation increased RBC DHA and lowered AA compared to baseline and placebo and significantly improved walking speed compared to placebo. Age, antioxidant intake (selenium and vitamin C), osteoarthritis, frailty phenotype, and TNFα was responsible for 13.6% of the variance in the change in walking speed with change in DHA/AA, TNFα and selenium intake having the greatest contribution to change in walking speed. These results imply that the omega-3 LC-PUFAs may be exerting their improving effects on mobility through their anti-inflammatory action.

These two studies add to the growing body of recent evidence showing the benefits of omega-3 LC-PUFAs on frailty in older adults. Previous studies have shown that high fatty fish intake in community dwelling older adults (aged 59-73 years) in the United Kingdom was associated with better hand grip strength3, that higher self-reported intake of omega-3 LC-PUFAs was associated with better extremity function in older people residing in the community or an assisted living facility in the United States4, and that Italian participants in the InCHIANTI trial with low physical performance ability had lower plasma total PUFAs, omega-3 LC-PUFAs and omega-6 LC-PUFAs while a higher ratio of omega-6/omega-3 LC-PUFAs was associated with a longer walking time during a 7 meter walk test5. These results are consistent with those reported in the latest two studies and highlight the growing awareness of the importance of omega-3 LC-PUFA dietary supplementation to reduce disability and frailty in the elderly and its economic burden on society.

References: