# Cod Liver/Fish Oil supplements assessed using repeated measures are prospectively and cross-sectionally associated with Cognitive Performance tests in a population based cohort

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Dementia is a condition mainly affecting older people. Non-modifiable risk factors include age and genetic factors; however, lifelong, modifiable -and largely behavioural- risk factors may be associated with cognitive function and dementia risk[1]. Changes in these risk factors may occur during a person's life course. There has been much interest in fish consumption in relation to dementia[2] as well as cardiovascular disease risk[3], suggesting a potential biological pathway for omega-3 polyunsaturated fatty acids (n-3 PUFA). Fish intake has been below SACN recommendations in the UK[4]; whereas cod liver oil (CLO) is the most popular supplement consumed and contributes 50 % to overall n-3 PUFA intake[5]. We studied cross-sectional as well as prospective associations between n-3 PUFA containing supplements and performance on cognitive tests in the European Prospective Investigation into Cancer, based in Norfolk (UK).
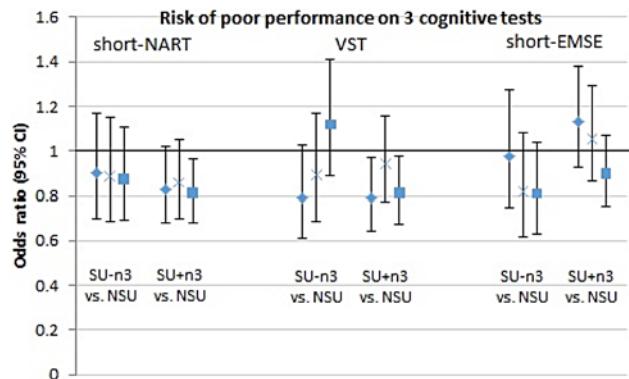
EPIC-Norfolk recruited men and women, aged 39–79 y (N = 25,639). Anthropometry was measured at health visits. Participants completed three questionnaires (Q1: 1993–1998; Q2: 2002–2004; Q3: 2004–2011) that assessed diet and supplement use in the past week. Participants were grouped (for each Q) into three mutually exclusive groups: non-supplement users (NSU), supplement users with n-3 PUFA supplements [or combined with any other] (SU+n3) and supplement users without n-3 PUFA (SU-n3). Questionnaires also ascertained following Q-specific characteristics: age, marital status, smoking, physical activity and alcohol consumption; sex, social class and education were ascertained at Q1. Cognitive tests (taken at study time Q3 [N varying 7028–8483]) covered a variety of cognitive domains as well as the shortened Extended Mental State Examination (EMSE)[6]. Adjusted (as listed) logistic regression was used to study associations between supplement use (Q1 ◆, Q2 **X**, Q3 ■) and risk of being among the 10 % worst performers in seven cognitive performance tests.

The use of n-3 PUFA containing supplements increased from Q1 to Q3, with a substantial amount of within-person variation over time. For the EMSE, no association with any type of supplement at any time point was observed. For the Visual Sensitivity Test (VST) and the shortened National Adult Reading Test (NART) we observed a 20 % lower risk of poor performance (at Q3) and for the VST only, also at time of Q1. Only for the NART at Q1, was a 39 % (11–58 %) lower risk observed for every 80 g/d of oily fish consumed (regardless of supplement consumption), which persisted after further adjustment for meat, vegetables and fruit.

N-3 PUFA containing supplements were weakly, and fish consumption was strongly associated with lower risk of poor performance in two out of the seven tests studied. Though in line with existing literature[2], attrition bias, inconsistency of results among cognitive tests, temporality of exposure/outcome, and residual/unmeasured confounding warrant further study into which behavioural factors may influence cognitive health.

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