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Clinical and nutritional biomarkers - tools to verify effects of personal *APOE* gene risk status information and health guidance intervention

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Background

The apolipoprotein E (*APOE*) gene has three alleles ε2, ε3 and ε4. *APOE* ε4 increases the risk of cardiovascular disease (CVD) and Alzheimer's disease (AD) (Minihane et al., 2013). Also genetic variations of brain derived neurotrophic factor (BDNF) have a potential role in AD (Adamczuk et al., 2013). Healthy diets and lifestyle can lower risk factors for CVD and AD and lifestyle diseases in general, and thus are safe as an intervention.

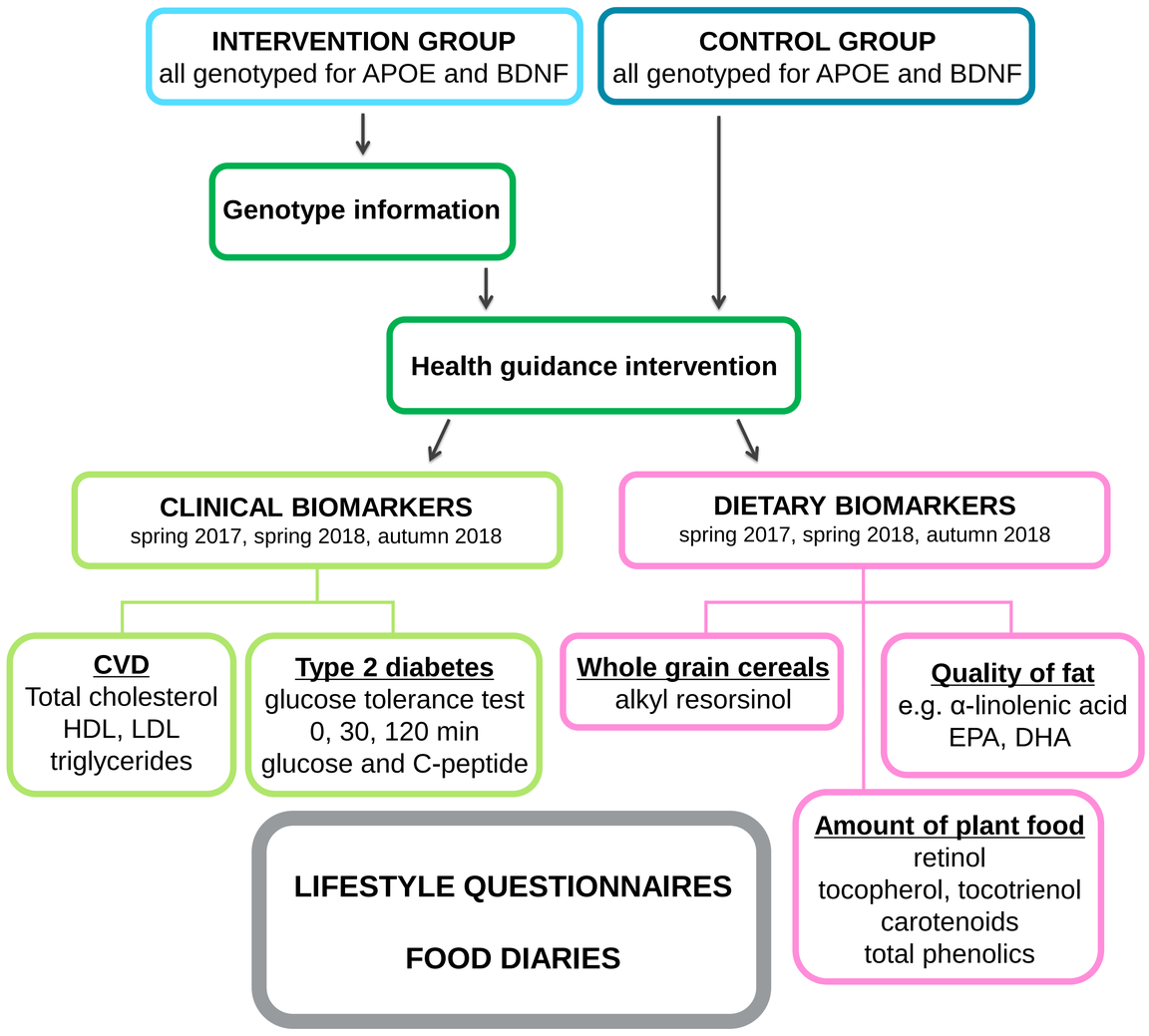
This study is part of the project "Effects of ApoE4 genotype information and intervention intensity on the fulfillment of lifestyle changes and sensory preferences" (APOE4mot). The project is a follow-up to a pilot study, TERVAS, in which the personal genetic information based on *APOE* had positive effects on cardiovascular risk markers such as improvement in triglyceride values (Hietaranta-Luoma et al., 2015).

Study design

211 participants were recruited of which 12 were excluded from the study in the beginning. Alanine aminotransferase, alkaline phosphatase, haptoglobin and thyroid stimulating hormone, which are biomarkers for liver and thyroid gland functions, were used as exclusion factors.

The *APOE* genotype frequencies among the 211 participants were following: 1 (0.5 %) ε2/ε2, 19 (9.0 %) ε2/ε3, 4 (1.9 %) ε2/ε4, 115 (54.5 %) ε3/ε3, 64 (30.3 %) ε3/ε4 and 8 (3.8 %) *ε4/ε4*. To study long-term effects of *APOE* genotype information, 70 participants were selected to the follow-up group from the pilot study TERVAS.

APOE and *BDNF* genotypes and different biomarkers were analysed from blood (**Scheme 1**). Analysed biomarkers reflect the possible effects of genotype and are associated with healthy lifestyle (nutrition, physical activity). Other analysed biomarkers were blood count (leukocytes, red blood cell indices, haemoglobin, thrombocytes), creatinine, hs-CRP and lipid peroxidation. Also the amounts of APOE and BDNF proteins were analysed to study the effects of genotype and lifestyle changes on the protein production.



Scheme 1. Study design of the APOE4mot project related to the clinical and nutritional biomarkers (excluding follow-up participants from a pilot study TERVAS).

Objectives

The aim is to study the effect of motivation and achieved lifestyle changes on clinical and nutritional biomarkers of study participants receiving only health information (control group) or health intervention and *APOE* ε4 risk status information (intervention group). Motivation, attitudes and preferences will be studied by lifestyle questionnaires and risk factors of CVD and AD (diet, alcohol, physical activity and health and taste) and food diaries depicting the starting point before the intervention and changes in lifestyle and food habits during and after the intervention. The diet questionnaires are translated to healthy eating index.

The self-reported changes are verified by analysing clinical markers of lipid metabolism, general phenotype markers and profiles of nutritional markers in blood. Correlations between healthy eating index and plasma nutritional biomarkers will be calculated.

The calculation and interpretation of the results are under process.

Research group

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