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Dietary Patterns

Does Sex Matter in the Link Between Self-Efficacy and Mediterranean Diet Adherence in Adolescents? Insights from the EHDLA Study

José Adrián Montenegro-Espinosa, José Francisco López-Gil. *Nutrients* 28 Feb 2025, 17(5), 880; doi.org/10.3390/nu17050880. [Article link](#)

Background/Purpose: To our knowledge, no previous study has analyzed the associations between self-efficacy and adherence to the Mediterranean diet (MedDiet) in adolescents, nor have sex-based differences in this relationship been examined. The aim of the current study was to examine the relationship between self-efficacy and MedDiet adherence in Spanish adolescents. **Methods:** This research was cross-sectional and involved 619 adolescents (56.5% girls) who were part of the Eating Habits and Activities of Daily Living (EHDLA) project. Self-efficacy was assessed using a 10-item scale (general self-efficacy scale), which yielded scores ranging from 20 to 100 points. The Mediterranean Diet Quality Index for Children and Adolescents (KIDMED), which consists of a 16-item questionnaire with scores ranging from -4 to 12, was used to evaluate adherence to the MedDiet. Unhealthy behaviors related to the MedDiet were assigned a score of -1, whereas healthy behaviors received a score of +1. **Results:** Overall, for each 20-point increase in self-efficacy, boys had a greater non-significant likelihood of having optimal MedDiet adherence (1.33%, 95% confidence interval [CI] -5.15 to 7.82, $p = 0.687$). Conversely, girls had a greater significant likelihood of having optimal MedDiet adherence per further point in self-efficacy (7.40%, 95% CI 2.28 to 12.53, $p = 0.005$). Individually, among boys, a 20-point increase in self-efficacy was associated with a 4.8% higher probability of having a dairy product for breakfast (95% CI 0.2 to 9.4, $p = 0.042$). Among girls, the same increase in self-efficacy was linked to a greater probability of consuming fruit or fruit juice daily (6.8%, 95% CI 2.2 to 11.4, $p = 0.004$), eating a second fruit every day (8.6%, 95% CI 3.4 to 13.8, $p = 0.001$), consuming fish regularly (6.2%, 95% CI 1.1 to 11.2, $p = 0.017$), enjoying pulses and eating them more than once a week (4.5%, 95% CI 0.3 to 8.8, $p = 0.035$), having cereals or grains for breakfast (5.4%, 95% CI 0.4 to 10.5, $p = 0.035$), and regularly consuming nuts (5.2%, 95% CI 0.2 to 10.2, $p = 0.041$). Additionally, increases in self-efficacy was associated with a 5.0% lower probability of skipping breakfast (95% CI -8.8 to -1.1, $p = 0.012$). **Conclusions:** Our results revealed a significant association between self-efficacy and MedDiet adherence among girls, whereas the relationship between self-efficacy and the MedDiet in boys was not significant. These results suggest that interventions aimed at improving adolescent dietary patterns should consider incorporating strategies to increase self-efficacy, potentially with sex-specific approaches.

Individual and Additive Effects of Vitamin D, Omega-3 and Exercise on DNA Methylation Clocks of Biological Aging in Older Adults from the DO-HEALTH Trial

Heike A. Bischoff-Ferrari, Stephanie Gängler, Maud Wiczorek, Daniel W. Belsky, Joanne Ryan, Reto W. Kressig, Hannes B. Stähelin, et. al. *Nature Aging*. 3 Feb 2025. doi.org/10.1038/s43587-024-00793-y. [Article link](#)

While observational studies and small pilot trials suggest that vitamin D, omega-3 and exercise may slow biological aging, larger clinical trials testing these treatments individually or in combination are lacking. Here, we report the results of a post hoc analysis among 777 participants of the DO-HEALTH trial on the effect of vitamin D (2,000 IU per day) and/or omega-3 (1 g per day) and/or a home exercise program on four next-generation DNA methylation (DNAm) measures of biological aging (PhenoAge, GrimAge, GrimAge2 and DunedinPACE) over 3 years. Omega-3 alone slowed the DNAm clocks PhenoAge, GrimAge2 and DunedinPACE, and all three treatments had additive benefits on PhenoAge. Overall, from baseline to year 3, standardized effects ranged from 0.16 to 0.32 units (2.9–3.8 months). In summary, our trial indicates a small protective effect of omega-3 treatment on slowing biological aging over 3 years across several clocks, with an additive protective effect of omega-3, vitamin D and exercise based on PhenoAge.

Carbohydrates

Continuous Glucose Monitor Overestimates Glycemia, with the Magnitude of Bias Varying by Postprandial Test and Individual – A Randomized Crossover Trial

Katie M. Hutchins, James A. Betts, Dylan Thompson, Aaron Hengist, Javier T. Gonzalez. *AJCN*, Feb 2025, Vol. 121, Issue 2. DOI: 10.1016/j.ajcnut.2025.02.024. [Article link](#)

Background: Continuous glucose monitors (CGM) are used to characterize postprandial glycemia, yet no study has directly tested how different test foods/beverages alter CGM accuracy. **Objective:** Assess glyceic responses to test foods/drinks using CGM versus capillary sampling (criterion). **Methods:** Fifteen healthy females(n=9) and males(n=6) completed 7 laboratory visits in a randomized crossover design with ≥ 48 h washout between visits. During each visit, participants consumed an oral carbohydrate challenge comprising either 50g glucose (CONTROL), or equivalent carbohydrate as whole-fruits (WHOLE), blended-fruits (BLEND), commercial fruit smoothie (PRODUCT), commercial smoothie ingested over 30 ± 4 min (SLOW), commercial smoothie with 5g inulin(FIBER), commercial smoothie providing 30g carbohydrate (DOSE). Glycemia was recorded from both CGM and capillary samples every 15min for 120min and expressed as incremental areas under the curve (iAUC). Glycemic index (GI) was calculated relative to CONTROL where appropriate. Exploratory analyses examined 1) inter-individual heterogeneity of CGM bias versus criterion; and 2) whether CGM bias could be improved with adjustment for baseline differences. **Results:** CGM-estimated fasting and postprandial glucose concentrations were (mean \pm SD) 0.9 ± 0.6 and 0.9 ± 0.5 mmol/L higher than capillary estimates, respectively (both, $p < 0.001$). CGM bias varied by postprandial test such that GI for PRODUCT was higher with CGM (69, 95%CI: 48, 99) versus capillary (53, 95%CI: 40,69; $P=0.05$). Furthermore, differences in CGM versus capillary fasting glucose concentrations varied by participant ($p=0.001$). Unadjusted, CGM overestimated time >7.8 mmol/L by ~ 4 -fold, and adjustment for baseline differences reduced this overestimate to ~ 2 -fold (both $p < 0.01$). **Conclusions:** CGM overestimated glyceic responses in numerous contexts. At times this can mischaracterize the GI. In addition, there is inter-individual heterogeneity of the accuracy of CGM to estimate fasting glucose concentrations. Correction for this difference reduces, but does not eliminate, postprandial overestimate of glycemia by CGM. Caution should be applied when inferring absolute or relative glyceic responses to foods using CGM, and capillary sampling should be prioritised for accurate quantification of glyceic response.

Protein

Systematic Review of Protein Quality and n-6 and n-3 Lipid Profile of Alternative Ingredients for Ready-to-Use Therapeutic Foods (RUTF)

Sarah Pletts, Maria Alejandra Latorre Prieto, Durga Khatiwada, Alison Fleet, Gerard Bryan Gonzales. *Trends in Food Science & Technology*, Vol. 156, Feb 2025, doi.org/10.1016/j.tifs.2025.104883. [Article link](#)

Background: Ready-to-Use Therapeutic Food (RUTF) is a lipid-based food used for the treatment of children with severe wasting. Due to its current high cost, formulations using alternative ingredients have been proposed. However, guidance on alternative ingredients for RUTF, especially to meet Codex regulations, is missing in the literature. Hence, this paper aims to provide a guide on the nutritional value of alternative RUTF ingredients, focusing on protein quality and n-6/n-3 fatty acid ratio. **Scope and Approach:** This study used three approaches. First, we systematically reviewed the literature and public tenders from the United Nations Children's Fund on new RUTF formulations. Then, a compilation of alternative ingredients used in these formulations were made and analysed. Second, we estimated the protein quality – using the protein digestibility-corrected amino acid score (PDCAAS) – and n-6 and n-3 fatty acid profiles of the alternative ingredients using national databases and data from the literature. The content of typical antinutritional factors in these ingredients were also reported. Third, we estimated the PDCAAS, protein content from dairy sources, added sugar content, and n-6/n-3 fatty acid ratio of sample RUTF formulations using alternative ingredients. **Key Findings and Conclusions:** Using alternative ingredients in RUTF have varying effects on the PDCAAS and fatty acid profile of the final RUTF product. The data presented in this paper will help guide manufacturers and developers of modified RUTF formulations on the use of alternative ingredients and their effect on the nutritional properties of the resulting RUTF product to comply with the 2022 Codex guidelines.

Food Classification

Special Issue of Journal of Food Science on Ultra-Processed Foods

Mario Estevez, et. al. *Jrnl of Food Sci*, 17 Feb 2025. Special Issue: Ultra-Processed Foods, doi.org/10.1111/1750-3841.70052. [Journal link](#)

The role played by foods and dietary patterns in human well-being goes beyond the mere nutritional contribution since they influence our physical and mental health, evoke hedonic sensations, and even influence our mood. Health authorities and consumers (and society as a whole) are increasingly concerned about the relationship between the consumption of processed foods (PF) and ultra-processed foods (UPF) on the onset of chronic diseases such as diabetes (type 2 diabetes [T2D] in obese individuals) or some types of cancer.

Low- and No-Calorie Sweeteners

Sweetener Aspartame Aggravates Atherosclerosis through Insulin-Triggered Inflammation

Weijie Wu, Wenhai Sui, Sizhe Chen, Ziheng Guo, Xu Jing, Xiaolu Wang, Qun Wang, et. al. *Cell Metabolism*, 19 Feb 2025. doi.org/10.1016/j.cmet.2025.01.006. [Article link](#)

Consumption of artificial sweeteners (ASWs) in various foods and beverages has been linked to an increased risk of cardiovascular diseases (CVDs). However, molecular mechanisms underlying ASW-associated CVD remain unknown. Here, we show that consumption of 0.15% aspartame (APM) markedly increased insulin secretion in mice and monkeys. Bilateral subdiaphragmatic vagotomy (SDV) obliterated APM-elevated blood insulin levels, demonstrating crucial roles of parasympathetic activation in regulation of insulin secretion. Incessant APM feeding of ApoE^{-/-} mice aggravated atherosclerotic plaque formation and growth via an insulin-dependent mechanism. Implantation of an insulin-slow-release pump in ApoE^{-/-} mice exacerbated atherosclerosis. Whole-genome expression profiling discovered that CX3CL1 chemokine was the most upregulated gene in the insulin-stimulated arterial endothelial cells. Specific deletion of a CX3CL1 receptor, Cx3cr1 gene, in monocytes/macrophages completely abrogated the APM-exacerbated atherosclerosis. Our findings uncover a novel mechanism of APM-associated atherosclerosis and therapeutic targeting of the endothelial CX3CL1-macrophage CX3CR1 signaling axis provides an approach for treating atherosclerotic CVD.

Cognitive Health

Association of a Novel Nutritional Index with Cognitive Impairment in Middle-Aged and Elderly Chinese Adults: A Cross-Sectional Analysis from the China Health and Retirement Longitudinal Study

Guotao Liu, Guotao Liu, Jianyuan Zhang. *Front in Nutr*. 02 February 2025, Vol. 12. doi.org/10.3389/fnut.2025.1486917. [Article link](#)

Purpose: The triglyceride-cholesterol-body weight index (TCBI), a novel and easily computable nutritional index, incorporates serum triglyceride (TG), total cholesterol (TC), and body weight (BW). This study explored the association between TCBI and cognitive impairment in middle-aged and elderly Chinese populations. **Patients and Methods:** This cross-sectional study employed data from the China Health and Retirement Longitudinal Study (CHARLS) baseline survey, including 7,145 participants. TCBI was calculated as $TG \text{ (mg/dL)} \times TC \text{ (mg/dL)} \times BW \text{ (kg)} / 1,000$. Cognitive function was assessed based on mental status and episodic memory, with a total score below 11 indicating cognitive impairment. The relationship between TCBI and cognitive impairment was examined using multiple logistic regression, smooth curve-fitting, and subgroup analyses. **Results:** After full adjustment, each 1-unit increase in log-transformed TCBI (Lg TCBI) was associated with a 29.7% reduction in cognitive impairment risk [odds ratio (OR) = 0.703, 95% confidence interval (CI): 0.529–0.933; $p = 0.015$]. When Lg TCBI was categorized into quartiles, the Q2, Q3, and Q4 groups exhibited a reduced risk of cognitive impairment by 19.9, 16.3, and 22.9%, respectively (p for trend = 0.043), compared to the Q1 group. Smooth curve fitting revealed a consistent decrease in cognitive impairment risk with higher Lg TCBI levels. Subgroup analysis indicated that the association was stronger among participants aged ≥ 60 years (OR = 0.655, 95% CI: 0.438–0.979), non-current drinkers (OR = 0.643, 95% CI: 0.451–0.917), and those who engaged in socializing (OR = 0.568, 95% CI: 0.371–0.871). **Conclusion:** TCBI was significantly and negatively associated with cognitive impairment in Chinese middle-aged and elderly individuals, with the effect more pronounced in those aged ≥ 60 years, non-current drinkers, and socially active participants.

Lipids

Biomarkers of Dietary PUFA Intake in Childhood and Adolescence in Relation to Cardiometabolic Risk Factors in Young Adulthood: A Prospective Cohort Study in Sweden

Annachiara Malin, Sandra Ekström, Niklas Andersson, Inger Kull, Ulf Risérus, Anna Bergström, et. al. *AJCN*, Vol. 121, Issue 3, p558-566, 7 Feb 2025. DOI: 10.1016/j.ajcnut.2024.11.029. [Article link](#)

Background: PUFAs, especially from vegetable fat sources, have been suggested to contribute to weight regulation and be protective to cardiometabolic health. However, a few longitudinal studies on childhood exposure are available, with short follow-up time and conflicting results. **Objectives:** To study the relationship between plasma proportions of PUFA in childhood and adolescence and cardiometabolic risk factors in young adulthood, such as obesity, body composition, blood pressure (BP), and blood lipids in a prospective cohort study. **Methods:** We included $n = 688$ participants of the BAMSE (Barn, Allergi, Miljö, Stockholm, Epidemiologi) cohort in Stockholm, Sweden, with data on plasma phospholipid proportions of n-3 and n-6 fatty acids [α -linolenic acid (ALA), EPA, docosapentaenoic acid, DHA, linoleic acid (LA), and arachidonic acid (AA)] at 8 and 16 y and body mass index (BMI), waist circumference, fat mass %, BP, and blood lipids at 24 y. Associations between PUFAs and cardiometabolic health outcomes were assessed with sex-stratified multivariable-adjusted linear and logistic regression models. **Results:** In females, LA and ALA at 16 y were inversely associated with BMI [B: -0.35 ($-0.54, -0.17$) and B: -6.1 ($-11, -1.5$), respectively], and similarly with waist circumference and fat mass at 24 y. Also in females, LA was inversely associated with BP, triglycerides, LDL-cholesterol, and total cholesterol (e.g., B -0.044 [$-0.079, -0.0099$] for LA at 16 y and LDL-cholesterol), whereas ALA was only inversely associated with LDL-cholesterol. No associations were found between long chain n-3 fatty acids or AA and any of the studied outcomes. **Conclusions:** Plasma phospholipid proportions of LA and ALA, biomarkers of vegetable oil intake, during childhood and adolescence were inversely associated with measures of obesity and cardiometabolic health in young adulthood, with a potential sex difference. These findings accord with short-term feeding trials suggesting a possible preventive role of LA on body fat accumulation.

Human Subcutaneous and Visceral Adipocyte Atlases Uncover Classical and Nonclassical Adipocytes and Depot-Specific Patterns

Or Lazarescu, Maya Ziv-Agam, Yulia Haim, Idan Hekselman, Juman Jubran, Ariel Shneyour, Habib Muallem, et. al. *Nature Genetics*, 2025. doi.org/10.1038/s41588-024-02048-3. [Article link](#)

Human adipose depots are functionally distinct. Yet, recent single-nucleus RNA sequencing (snRNA-seq) analyses largely uncovered overlapping or similar cell-type landscapes. We hypothesized that adipocyte subtypes, differentiation trajectories and/or intercellular communication patterns could illuminate this depot similarity–difference gap. For this, we performed snRNA-seq of human subcutaneous or visceral adipose tissues (five or ten samples, respectively). Of 27,665 adipocyte nuclei in both depots, most were ‘classical’, namely enriched in lipid metabolism pathways. However, we also observed ‘nonclassical’ adipocyte subtypes, enriched in immune-related, extracellular matrix deposition (fibrosis), vascularization or angiogenesis or ribosomal and mitochondrial processes. Pseudo-temporal analysis showed a developmental trajectory from adipose progenitor cells to classical adipocytes via nonclassical adipocytes, suggesting that the classical state stems from loss, rather than gain, of specialized functions. Last, intercellular communication routes were consistent with the different inflammatory tone of the two depots. Jointly, these findings provide a high-resolution view into the contribution of cellular composition, differentiation and intercellular communication patterns to human fat depot differences.

Sodium

Dietary Sodium Consumption and 3-Year Progression of Subclinical Arterial Damage in Adults with Cardiovascular Risk Factors

Eirini D. Basdeki, Kalliopi Karatzi, Yannis Manios, Petros P. Sfrikakis, Antonios A. Argyris, Athanase D. Protogerou. *Nutrients* 2025, 17(5), 808; 26 Feb 2025. doi.org/10.3390/nu17050808. [Article link](#)

Background/Objectives: Available data regarding associations between sodium (Na) intake and biomarkers of subclinical

arterial damage (SAD) are scarce. This study aimed to investigate the possible associations between Na intake and the 3-year progression of SAD in subjects with cardiovascular disease (CVD) risk factors. **Methods:** Participants underwent CVD risk assessment, vascular assessment [arterial stiffness by pulse wave velocity (PWV), and atheromatosis, as the existence of carotid and/or femoral plaques], anthropometric measurements [at baseline and 3-year follow-up (FU)], and dietary assessment at FU. **Results:** A total of 675 adults (47.9% males, 55.02 ± 13.79 years) were included. Na daily consumption quartiles (Qs) ranged from very low consumption in Q1 (811.72 ± 241.81 mg) up to twice the recommendations in Q4 (3487.92 ± 1025.92 mg). No statistically significant associations were observed between Na intake and changes in SAD biomarkers, after adjustment for age, sex, presence of hypertension, presence of dyslipidemia, smoking, mean arterial pressure, BMI, chronic inflammatory diseases, and energy intake. The results remained the same, even after the assessment of misreporting and the correction of Na intake. **Conclusions:** Dietary Na intake was not significantly associated with changes in PWV and carotid or femoral plaques, even in the high Q that was twice as high as the recommended intake. Research in different additional adult cohorts is needed to further investigate whether Na consumption independently affects vascular health.

Gut Health

The Relationship between a High-Fat Diet, Gut Microbiome and Systemic Chronic Inflammation: Insights from Integrated Multiomics Analysis

Zhiwei Du, Xuxu Liu, Zhihong Xie, Heming Wang, Dongbo Xue, Yingmei Zhang, et. al. *AJCN*, Vol. 121, Issue 3, p643-653, 2025. DOI: 10.1016/j.ajcnut.2024.12.026. [Article link](#)

Background: The detrimental effects of a high-fat diet (HFD) extend beyond metabolic consequences and include systemic chronic inflammation (SCI), immune dysregulation, and gut health disruption. **Objectives:** In this study, we used Mendelian randomization (MR) to investigate the relationship between HFD, gut microbiota, and SCI. **Methods:** Genetic variants associated with dietary fat were utilized to explore causal relationships. Genome-wide association study data for the analyses of the gut microbiota, inflammatory cytokines, immune cell characteristics, and serum metabolites were obtained from European individuals. Mediation analysis was used to reveal potential mediating factors. The GMrepo database was used to analyze the bacterial composition in different groups. Transcriptomic and single-cell sequencing analyses explored inflammation and barrier function in colonic tissue. **Results:** HFD consumption was linked to changes in the abundance of 3 bacterial families and 11 bacterial genera. Combined with the GMrepo database, the increased abundance of the genus *Lachnospiraceae_FCS020group* and the decreased abundance of genus *Bacteroides* and genus *Barnesiella* are consistent with the MR results. Transcriptomic and single-cell sequencing analyses revealed intestinal inflammation and mucosal barrier dysfunction in HFD-fed mice. MR revealed a link between HFD consumption and increased levels of interleukin (IL)-18 [odds ratio (OR): 3.64, 95%CI: 1.24, 10.69, P = 0.02], MIG (OR = 3.14, 95%CI: 1.17, 8.47, P = 0.02), IL-13 [OR = 3.21, 95% confidence interval (CI): 1.08, -9.52, P = 0.04], and IL-2RA (OR = 2.93, 95%CI: 1.01, 8.53, P = 0.049). Twenty-nine immune cell signatures, including altered monocyte and T-cell subsets, were affected by HFD consumption. Twenty-six serum metabolites that are linked to HFD consumption, particularly lipid and amino acid metabolites, were identified. The positive gut microbiota exhibit extensive associations with inflammatory cytokines. In particular, *Lachnospiraceae_FCS020 group* (OR: 1.93, 95% CI: 1.11, 3.37, P = 0.02) may play a mediating role in HFD-induced increases in IL-2RA concentrations. **Conclusions:** Microbial dysbiosis appears to be an important mechanism for HFD-induced SCI. The *Lachnospiraceae_FCS020 group* may act as a key genus in HFD-mediated elevation of IL-2RA.

Emerging Science Areas

Emerging Areas :Nutrition

A Broader Perspective on Nutrition Research: The Rationale for Integrating the Entire Continuum of Human Nutrition

Andrew A Bremer, Shannon N Zenk, Stefan M Pasiakos, Helene M Langevin. *AJCN* Vol. 121, Issue 2, p203-206, February 2025. DOI: 10.1016/j.ajcnut.2024.12.008. [Article link](#)

A prevailing view of health, and our health care system, is built from the notion that the human body is a compilation of organs and systems. This framework is deeply embedded in our society. Grade school children are taught the basics of

the digestive, circulatory, and musculoskeletal systems, and so on. Conventional medical education and care also follow this same paradigm: training physicians to specialize in the treatment of body systems and organizing care delivery accordingly. Yet, we know that human health is more than the combined health of individual body parts—the full meaning of human health is the health of the whole person. Furthermore, “whole person health” does not simply reside in the biological domain. It also reflects a complex interplay of biology with behavior and the person’s social, physical, and built environments. These environments change constantly over the course of days, years, and generations. A whole person health conceptual framework recognizes this intricate web of connected systems—not just within the human body but importantly, also with its surroundings and across the lifespan. In other words, this ecological view of health does not stop at the individual and includes the relationship of individuals to each other and their environment.

Engage with IAFNS

Workshop on Science-Based Principles for Food Classification Focused on Processing and Formulation to Support Public Health

April 15, 2025. Washington DC and Virtual

The IAFNS Working Group on Food Classification has initiated a project focused on the development of Science-Based Principles for Classifying Foods Based on Processing and Formulation to Support Public Health. The goal of this effort is to deliver statements (Principles) which researchers can agree are representative of the evidence required to classify foods based on processing and formulation.

- We are pleased to offer an opportunity for an expanded audience to participate in the Workshop by supporting remote attendee/online attendee options.

- <https://iafns.org/event/workshop-on-science-based-principles-for-food-classification/>

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