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Abstract

Ultra-Processed Food Consumption and Biological Aging in Italian Adults from the Moli-Sani Study Cohort †

Simona Esposito [1], Alessandro Gialluisi [2], Augusto Di Castelnuovo [3], Simona Costanzo [1], Emilia Ruggiero [1], Licia Iacoviello [1,2,*] and Marialaura Bonaccio [1]

[1] Department of Epidemiology and Prevention, IRCCS Neuromed, 86077 Pozzilli, Italy; simona.esposito@moli-sani.org (S.E.); simona.costanzo@moli-sani.org (S.C.); emilia.ruggiero@moli-sani.org (E.R.); marialaura.bonaccio@moli-sani.org (M.B.)
[2] Department of Medicine and Surgery, LUM University "Giuseppe Degennaro", Casamassima, 70010 Bari, Italy; alessandro.gialluisi@moli-sani.org
[3] Mediterranea Cardiocentro, 80122 Napoli, Italy; dicastel@ngi.it
* Correspondence: licia.iacoviello@moli-sani.org
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Abstract: Background and objectives: Chronological age (CA) may not accurately reflect the health status of an individual. Rather, biological age (BA) or hypothetical underlying "functional" age has been proposed as a relevant indicator of healthy aging. Diets high in polyphenol-rich foods, such as the Mediterranean diet, were inversely associated with biological aging in several cohorts. However, the nutritional content is only one aspect of overall food health potential, and increasing attention should be paid to non-nutrient food characteristics, such as food processing. Ultra-processed foods (UPFs) are mostly industrial formulations designed to maximize palatability and consumption through a combination of calorie-dense ingredients and chemical additives, and have been consistently associated with the increased risk of premature mortality and diseases. We therefore examined the association of UPF with biological aging. Methods: A cross-sectional analysis of a sub-cohort of 4510 subjects (aged ≥35 years; 52.0% women) enrolled in the Moli-sani Study (2005–2010). Food intake was assessed using a 188-item food frequency questionnaire. UPF was defined according to the Nova classification and calculated as the ratio (%) of UPF (g/d) to total food consumed (g/d), and categorized into sex-specific quintiles. Diet quality was assessed using the Food Standards Agency Nutrient Profiling System (FSAm-NPS) dietary index. A Deep Neural Network approach based on 36 circulating biomarkers was used to compute BA, and the resulting difference (Δage = BA−CA) was tested as a dependent variable in multivariable linear regression analyses including known risk factors. Results: The mean CA (SD) was 55.6 y (±11.6 years), BA 54.8 y (±8.6 years), and Δage −0.77 (±7.7). In multivariable-adjusted analyses also including the FSAm-NPS dietary index, a higher intake of UPF consumption was directly associated with accelerated biological aging (β = 0.61; 95%CI 0.05 to 1.17 for Q5 vs. Q1). Discussion: High UPF consumption was directly associated with a blood-markers-based measure of biological aging, independent of overall diet quality. These findings suggest that biological aging could be influenced by non-nutrient food characteristics (e.g., altered food matrix, contact materials and neoformed compounds). Longitudinal studies are warranted to examine whether accelerated biological aging could fall on the pathway between UPF consumption and chronic disease onset.

Keywords: ultra-processed foods; biological age; diet quality

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Conflicts of Interest: The authors declare no conflict of interest.