Attenuation of the Effect of the MTHFR and NOS3 Polymorphism on Blood Pressure by Physical Activity in European Adolescents. The HELENA Study.

A. C. F. de Moraes, PhD\textsuperscript{1,2}, J. M. Fernandez-Alvira, PhD\textsuperscript{2}, H. B. Carvalho, PhD\textsuperscript{1}, A. Meirhaeghe-Hurez, PhD\textsuperscript{3}, J. Dallongeville, PhD\textsuperscript{3}, A. Kafatos, PhD\textsuperscript{4}, D. Molnar, PhD\textsuperscript{5}, Y. Manios, PhD\textsuperscript{6}, I. Labayen, PhD\textsuperscript{7}, J. R. Ruiz, PhD\textsuperscript{8}, K. Widhalm, PhD\textsuperscript{9}, C. Breidenassel, PhD\textsuperscript{10}, and L. A. Moreno, PhD\textsuperscript{1,2}

\textsuperscript{1}School of Medicine of the University of Sao Paulo, Sao Paulo, Brazil, \textsuperscript{2}Faculty of Health Sciences of the University of Zaragoza, Zaragoza, Spain, \textsuperscript{3}Univ Lille Nord de France, Lille, France, \textsuperscript{4}School of Medicine of the University of Crete, Heraklion, Greece, \textsuperscript{5}Medical Faculty—University of Pecs, Pecs, Hungary, \textsuperscript{6}Harokopio University, Athens, Greece, \textsuperscript{7}University of the Basque Country, Vitoria, Spain, \textsuperscript{8}School of Sport Sciences, University of Granada, Granada, Spain, \textsuperscript{9}Medical University of Vienna, Vienna, Austria, \textsuperscript{10}University of Bonn, Bonn, Germany, \textsuperscript{11}Faculty of Physical Activity and Sport-INEF of the Technical University of Madrid, Madrid, Spain

INTRODUCTION: Blood pressure is influenced by genetic, environmental and lifestyle factors and by the existence of interactions between these components. We hypothesized that there are interactions between the four SNPs selected two genes known to increase the levels of blood pressure (BP): rs1801131 and rs1537516 in MTHFR (Methylenetetrahydrofolate reductase) and rs1800779 and rsc3918227 in NOS3 (Nitric Oxide Synthase 3) with physical activity (PA) levels; and we tested this hypothesis in a sample of European adolescents participating in the HELENA study.

METHODS: Adolescents were issued from the Healthy Lifestyle in Europe by Nutrition in Adolescence cross-sectional study (n = 1,009; 12.5–17.5 yr; 532 girls). Multilevel linear regression with mixed intercept models were used to estimate systolic (SBP) and diastolic blood pressure (DBP) means adjusted for potential confounders. Physical activity (PA) was measured by accelerometry, and classified as active when...
they accumulated at least 60 min/d of moderate-to-vigorous PA. Six polymorphisms in two genes (MTHFR and NOS3) were genotyped.

RESULTS: A significant interaction between the NOS3 rs3918227 polymorphism, PA (<60 min/d) and DBP was detected ($P = 0.034$). The minor allele of rs3918227 was associated with higher SBP values in adolescents being inactive (<60 min/d) than in active (≥60 min/d) adolescents (+5.6 mmHg vs +0.9 mmHg, $P = 0.026$, respectively).

CONCLUSIONS: Meeting current PA recommendations (at least 1 h per day of PA) attenuates the deleterious effect of the NOS3 rs3918227 polymorphism on SBP in European adolescents.