

Title: ATLAS Study: Design, Athletic Performance, and Sex-Specific Regression Models for Muscle Strength in the Greek Population



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Abstract

Human performance is a multifaceted trait influenced by both extrinsic factors, such as training load, nutrition, and lifestyle, and intrinsic factors, such as anatomical characteristics and genetics. The ATLAS study is a cross-sectional study investigating environmental and genetic determinants of athletic performance in healthy Greek competitive athletes (CA), exercisers, and physically inactive individuals (PI). This project focuses on the relationship between demographics, body composition, fitness status, and injury history with muscle strength performance (MSP) while also introducing predictive models for MSP in the adult Greek population.

Muscle maximal, speed, and explosive strength (MMS/MSS/MES) were evaluated at unilateral maximal concentric flexion and extension contraction (FC/EC) using the Biodex System 3 PRO™, a gold standard method for MSP evaluation, while additional performance metrics were measured through field ergometric testing. Participants provided data on lifestyle, dietary habits, physical activity, injury, and medical history. Body composition was evaluated using bioelectrical impedance, while gDNA was extracted from biochemical samples and subsequently genotyped.

Results showed that both body composition and anthropometric measurements have a relationship with MSP, which is influenced by fitness status and demographics ($p < 0.05$). Among CA, females outperformed males in accuracy ($p < 0.001$), whereas males excelled in anaerobic power, MSP, speed, and endurance ($p < 0.001$). Across fitness groups, adult CA demonstrated superior MMS, MSS, and MES compared to exercisers and PI ($p < 0.05$). Multiple linear regression models incorporating predictors such as age, fat-free mass (FFM), body extremity, and training load accounted for up to 88.9% of variation in MMS, up to

78.4% in MSS, and up to 68.4% in MES at their EC, FC, and their mean ($p < 0.001$).

These findings underline the importance of tailoring muscle-strengthening strategies to an individual's fitness status, body composition, demographic, and anthropometric characteristics. Such an approach paves the way for the effective personalization and optimization of rehabilitation and skill-specific training strategies.

Biography

Natia Pogosova is a nutritionist-dietitian and early-career researcher specializing in molecular nutrition and genetics. She holds a Master's degree in Applied Dietetics and Nutrition with a focus on Molecular Nutrition from Harokopio University. During her Master's studies, she conducted research on the relationship between genetic scores, lifestyle, and their impact on athletic performance contributing to a project directed by Prof. George V. Dedoussis. She has contributed to chapters in book translations in the fields of nutrigenetics and nutrigenomics, scientific publications, conference presentations, and participated in research projects. With experience in a genome analysis spin-off of Harokopio University and clinical nutrition, she has delivered personalized nutritional interventions, conducted educational seminars, and promoted the health benefits of the Mediterranean diet in diverse settings.

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