Genetic factors associated with sarcopenia and frailty in the Lithuanian elderly

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Introduction

Sarcopenia and frailty are closely linked geriatric syndromes, characterized by a decline in physical capacity and skeletal muscle mass [1]. Growing evidence suggests that both genetic and environmental factors play a crucial role in their development [2]. Despite increasing research in this area, the specific genetic determinants contributing to these conditions remain unclear. This study aimed to evaluate and identify genetic variants associated with sarcopenia and frailty in the Lithuanian elderly through a large-scale whole genome association analysis.

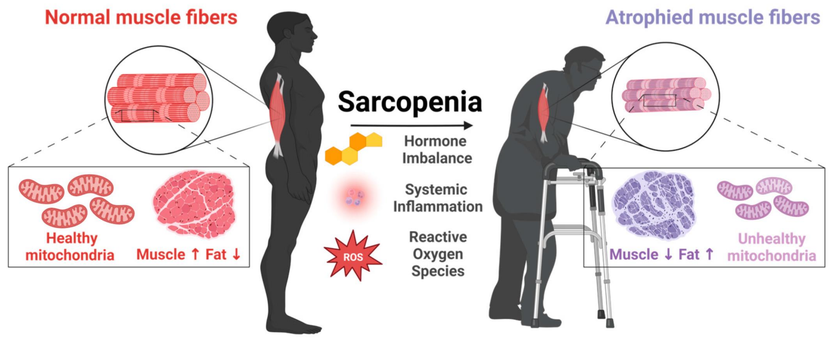
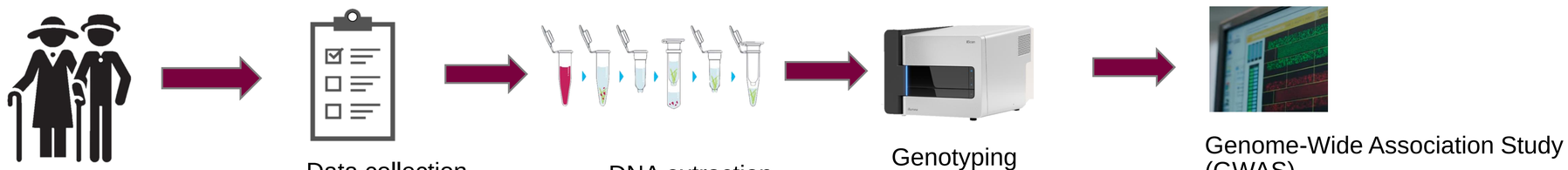


Figure 1. Aging-related changes in skeletal muscle structure and function [3]

Methods



192 Lithuanian older adults
(82.2±7.6 years)

Data collection
(questionnaires and functional testing)

DNA extraction
from blood leukocytes

Genotyping
700,000 SNPs per participant

Genome-Wide Association Study (GWAS)
S & F status, lean mass, grip strength and walking pace

Results

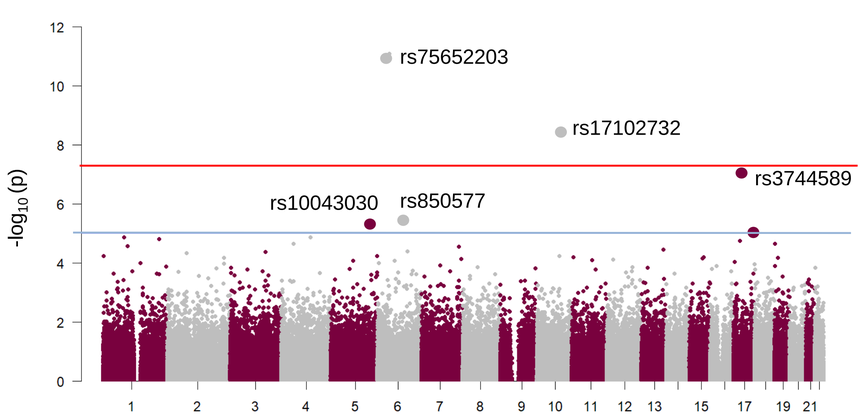


Figure 2: Manhattan plot showing SNP association with grip strength. The red line signifies p value threshold of 5×10^{-8}, the blue line – p value 1.0×10^{-5}. Select SNPs rs numbers are indicated in the plot.

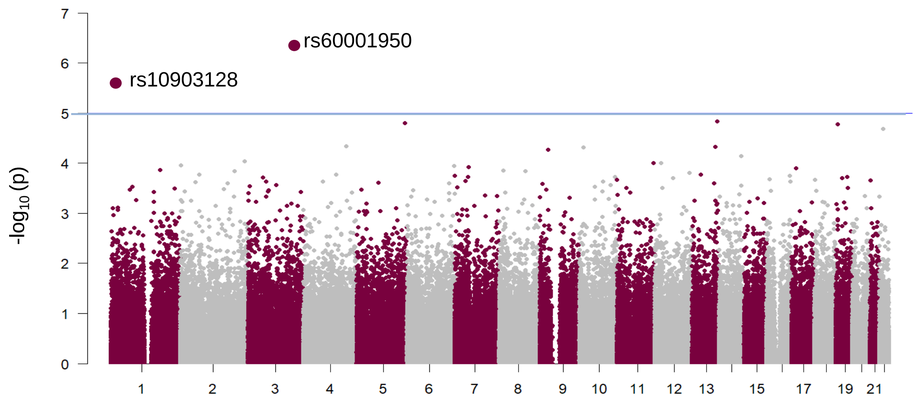


Figure 3: Manhattan plot showing SNP association with walking pace. The blue line signifies p value threshold of 1.0×10^{-5}. Select SNPs rs numbers are indicated in the plot.

CHR	SNP	p value	GC	BONF	Genomic context
Associated with grip strength					
6	rs75652203	8.13E-12	1.39E-11	1.42E-06	ENSR00001362624
10	rs17102732	3.37E-09	5.12E-09	0.000587	*intergenic*
17	rs3744589	7.97E-08	1.13E-06	0.01388	*ACACA*
6	rs850577	4.07E-06	5.32E-06	0.7077	*RN7SL509P* (upstream)
5	rs2850114	5.35E-6	6.96E-06	0.9313	*intergenic*
7	rs8066532	9.89E-06	1.27E-05	1	ENSR00001599387
Associated with walking pace					
3	rs60001950	4.26E-07	4.75E-07	0.07408	*intergenic*
1	rs10903128	2.54E-06	2.79E-06	0.4418	ENSR00000250793

Table 1: SNPs associated with grip strength and walking pace. GC – p value after genomic correction, BONF – p value after Bonferroni correction

Conclusions

In conclusion, we found significant association of two SNPs (rs75652203, rs17102732) with grip strength in patients with sarcopenia and frailty. Additionally, four SNPs were suggestively associated with grip strength, and two SNPs - with walking pace.

References

[1] Dodds, R., & Sayer, A. A. (2016). Sarcopenia and frailty: new challenges for clinical practice. Clinical medicine (London, England), 16(5), 455–458
[2] Aslam, M. A., Ma, E. B., & Huh, J. Y. (2023). Pathophysiology of sarcopenia: Genetic factors and their interplay with environmental factors.
Metabolism, 149, 155711
[3] Kim, H.-J., Jung, D.-W., & Williams, D. R. (2023). Age Is Just a Number: Progress and Obstacles in the Discovery of New Candidate Drugs for Sarcopenia. Cells, 12(22), 2608.

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