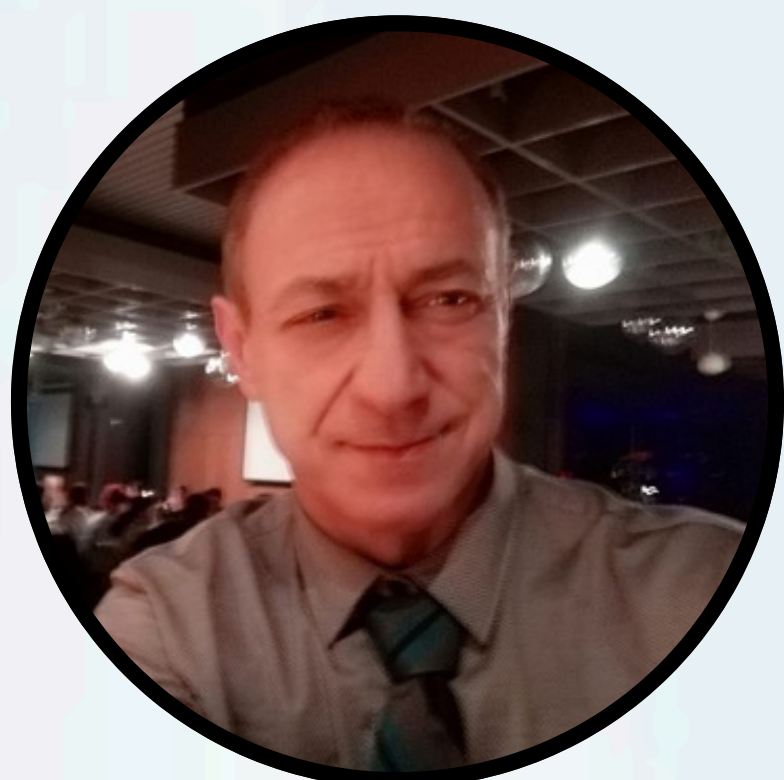


3rd World Conference on *Ageing and Gerontology*

July 09-10, 2026 | Frankfurt, Germany



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The Hidden Hierarchy of Functional Aging: Neuromuscular Decline, Predictive Movement Systems, and the Overlooked Role of Motor Units in Longevity

Clinical annotations for the actionable pharmacogenetic variants affecting the efficacy of cardiovascular drugs have been collected, yet their impacts on elderly patients with coronary artery disease (CAD) undergoing polypharmacy remain uncertain. We consecutively enrolled 892 elderly patients (mean age 80.7 ± 5.2) with CAD and polypharmacy. All the included patients underwent genotyping for 13 variants in 10 pharmacogenes (CYP2C19, CYP2C9, CYP4F2, CYP2D6, VKORC1, SLCO1B1, APOE, ACE, ADRB1, and MTHFR), which have the clinical annotations for 12 drugs that are commonly prescribed for patients with CAD. We found that 80.3% of the elderly CAD patients had at least one drug-gene pair associated with a therapeutical drug change. After adjusting for covariates, the number of drug-gene pairs was independently associated with a decreased risk of both major cardiovascular events (MACEs) (adjusted hazard ratio [HR]: 0.803, 95% confidence interval [CI]: 0.683–0.945, $p = 0.008$) and all-cause mortality (adjusted HR: 0.848, 95% CI: 0.722–0.996, $p = 0.045$), but also with an increased risk of adverse drug reactions (ADRs) (adjusted HR: 1.170, 95% CI: 1.030–1.329, $p = 0.016$). The Kaplan–Meier survival curves showed that compared to patients without a drug-gene pair, a significantly lower risk of MACEs could be observed in patients with a drug-gene pair during a 4-year follow-up (HR: 0.556, 95% CI: 0.325–0.951, $p = 0.013$). In conclusion, the carrier status of the actionable drug-gene pair is predictive for the clinical outcomes in elderly patients with CAD and polypharmacy. Implementing early or preemptive pharmacogenetic panel-guided polypharmacy holds the potential to enhance clinical outcomes for these patients.

Particular attention will be given to:

- cerebellar predictive processing and internal movement models,
- rapid force production and the first milliseconds of neuromuscular activation,
- age-related suppression of firing rates and motor unit recruitment,
- decline in movement adaptability and coordination,
- and the distinction between muscle mass preservation and functional neuromuscular preservation.

The presentation also explores the possibility that conventional biological age assessments may insufficiently capture real-time neuromuscular performance, movement prediction, and dynamic functional capacity.

In addition to theoretical discussion, the presentation will include practical demonstrations illustrating aspects of explosive movement, coordination, and functional neuromuscular performance as they relate to aging and longevity.

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The goal is not to replace existing hallmarks-of-aging frameworks, but to propose that functional neural systems and motor-unit-related decline may represent an important and underappreciated dimension of the aging process deserving greater attention in longevity science.

Biography

Tony Ruggia is a longevity advocate, educator, and movement-focused health professional dedicated to uncovering the real science of aging. Through his platform, I Am Longevity, he explores evidence-based approaches to extending healthspan by emphasizing the essential roles of physical power, strength, and functional movement throughout life.

His work challenges conventional views of aging by promoting movement as a cornerstone of long-term health, independence, and resilience. Tony combines scientific research with practical strategies to help individuals build stronger bodies, improve physical performance, and adopt sustainable habits that support healthy aging.

Passionate about translating complex longevity research into actionable insights, Tony educates audiences on the connections between exercise, muscle health, metabolic fitness, and overall well-being. His mission is to empower people to take control of the aging process through informed lifestyle choices, enabling them to maintain vitality, mobility, and quality of life for years to come.

Through educational content, speaking engagements, and community outreach, Tony Ruggia continues to inspire individuals to embrace strength, movement, and evidence-based health practices as the foundation for living longer, healthier, and more active lives.