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ABSTRACT N. 063

ELSEVIER SYMPOSIUM ON BIOLOGY OF AGING UNPACKED: IMPLICATIONS FOR GEROSCIENCE AND HEALTHSPAN

## MULTIFREQUENCY PHASE ANGLE AS A CLINICAL TOOL FOR HEALTHSPAN INTERVENTIONS: TOWARDS SEX-INDEPENDENT SCREENING

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Effective healthspan interventions require accessible biomarkers for early detection and monitoring (1). Phase angle (PhA) from bioelectrical impedance analysis offers a non-invasive, bedside marker of cellular health, but current sex-specific thresholds complicate clinical implementation (2,3). We evaluated whether multifrequency PhA assessment could provide a practical clinical tool for identifying individuals who would benefit from targeted interventions. Cross-sectional analysis of 83 community-dwelling adults (20-85 years) from the Balearic Islands Study of Aging (BILSA) cohort. PhA was measured at 5, 50, and 250 kHz using segmental BIA (InBody 770). We assessed: (1) which measurement protocol best identifies age-related decline; (2) frequency-specific associations with modifiable risk factors (muscle mass, visceral fat); and (3) whether sex-independent thresholds are achievable. Lower limb PhA emerged as the most sensitive early

marker of biological aging ( $r=-0.57$  vs  $r=-0.46$  for whole body). Critically, 50 kHz and 250 kHz provide complementary clinical information: 50 kHz best predicts muscle mass ( $R^2=0.59$ ), guiding exercise interventions, while 250 kHz best predicts visceral fat ( $R^2=0.36$ ), guiding metabolic interventions. Most importantly for clinical implementation, sex differences disappear at 250 kHz (Cohen's  $d=0.40$ ,  $p=0.07$ ), enabling potential universal screening thresholds. Prevalence of low PhA increased from 4% in young adults to 50% in elderly, identifying a substantial population for preventive intervention. In conclusion, Multifrequency PhA assessment provides an actionable clinical framework: leg PhA for early detection, 50 kHz for muscle-targeted interventions, and 250 kHz for metabolic interventions with sex-independent thresholds. This accessible approach could facilitate implementation of precision health span interventions in routine clinical practice.

**Keywords:** *healthspan, phase angle, bioelectrical impedance, sarcopenia prevention, clinical screening.*