

Publication

Composite Measures of Physical Fitness to Discriminate Between Healthy Aging and Heart Failure: The COMplete Study.

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Author(s) Wagner, Jonathan; Knaier, Raphael; Königstein, Karsten; Klenk, Christopher; Carrard, Justin; Lichtenstein, Eric; Scharnagl, Hubert; März, Winfried; Hanssen, Henner; Hinrichs, Timo; Schmidt-Trucksäss, Arno; Arbeev, Konstantin

Author(s) at UniBasel [Schmidt-Trucksäss, Arno](#) ;

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Aging and changing age demographics represent critical problems of our time. Physiological functions decline with age, often ending in a systemic process that contributes to numerous impairments and age-related diseases including heart failure (HF). We aimed to analyze whether differences in composite measures of physiological function [health distance (HD)], specifically physical fitness, between healthy individuals and patients with HF, can be observed.; The COMplete Project is a cross-sectional study of 526 healthy participants aged 20-91 years and 79 patients with stable HF. Fifty-nine biomarkers characterizing fitness (cardiovascular endurance, muscle strength, and neuromuscular coordination) and general health were assessed. We computed HDs as the Mahalanobis distance for vectors of biomarkers (all and domain-specific subsets) that quantified deviations of individuals' biomarker profiles from "optimums" in the "reference population" (healthy participants aged <40 years). We fitted linear regressions with HD outcomes and disease status (HF/Healthy) and relevant covariates as predictors and logistic regressions for the disease outcome and sex, age, and age²; as covariates in the base model and the same covariates plus combinations of one or two HDs.; Nine out of 10 calculated HDs showed evidence for group differences between Healthy and HF ($p \leq 0.002$) and most models presented a negative estimate of the interaction term age by group ($p < 0.05$ for eight HDs). The predictive performance of the base model for HF cases significantly increased by adding HD; General health; or HD; Fitness; [areas under the receiver operating characteristic (ROC) curve (AUCs) 0.63, 0.89, and 0.84, respectively]. HD; Cardiovascular endurance; alone reached an AUC of 0.88. Further, there is evidence that the combination of HDs; Cardiovascular endurance; and; General health; shows superior predictive power compared to single HDs.; HD composed of physical fitness biomarkers differed between healthy individuals and patients with HF, and differences between groups diminished with increasing age. HDs can successfully predict HF cases, and HD; Cardiovascular endurance; can significantly increase the predictive power beyond classic clinical biomarkers. Applications of HD could strengthen a comprehensive assessment of physical fitness and may present an optimal target for interventions to slow the decline of physical fitness with aging and, therefore, to increase health span.

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