EXERCISE AS PERSONALIZED MEDICINE
FAR-REACHING IMPLICATIONS FOR SPORTS MEDICINE AND PUBLIC HEALTH

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This paper presents a multidisciplinary review of advances in multiomics science, deep data with machine learning, geroscience and wearable medtech, in revolutionizing the use of physical exercise as personalized medicine. Indeed, the American Medical Association (AMA) and the American College of Sports Medicine (ACSM) co-launched the Exercise is Medicine (EIM) initiative in the US in 2007, and there are currently 43 national centers worldwide, including Singapore.

For the first time in the history of mankind, this could achieve for chronic diseases in the 21st century by the same magnitude and deep impact, how public health projects of the 20th century transformed the prevention and treatment of infectious diseases, which dramatically extended human life expectancy, one of humanity's greatest achievements. Indeed, the WHO identifies physical inactivity as the fourth leading risk factor for mortality, and the American Heart Association projects that by 2030, 40% of US adults will have at least one form of CVD.

However, transforming this to a public health revolution requires a multi-stakeholder collaboration far beyond the healthcare industry. Indeed, a paper on precision medicine by the Wharton School, the University of Pennsylvania, unequivocally stressed that “health and disease management will become a consumer-driven business and will require completely new Standard Operating Procedures (SOPs), logistics as well as ICT/AI data analytics capabilities.” Are clinicians and hospitals prepared for this massive change of mindset?

This paper identifies, based on the front end of innovation (FEI) and user experience design (UXD), highly non-trivial bottlenecks for this revolution to succeed, drawing from the Apple iPhone and the Iceland model of tobacco reduction as examples of massive success.

It also provides examples of recent inventions, including deep data for heart rate variability, the democratization of VO_2max and pulse wave velocity measurements, novel high-throughput technologies in personal multiomics, and data-driven endurance training.