

The Fitness Fortress - All Are Welcome, But Far Too Few Choose to Enter and Stay.

The Merriam-Webster dictionary defines a *fortress* as “a large and permanent fortification sometimes including a town”.¹ Imagine if you will, cardiorespiratory fitness (CRF) and physical activity (PA) act both separately and, more importantly, in combination, to create a *fortress of health* – those who choose to live in the fortress town, the only requirement for living in this town is striving toward improvement/maintenance of CRF and participating in PA, the latter of which more appropriately defined as *moving more and sitting less throughout the day*.² You do not need to be an elite athlete or maintain ideal PA goals to live within the fortress town – residency only requires that you give your best effort to lead a healthier lifestyle in the context of physical movement. Citizens of the town do not compete with one another, everyone who *moves more and sits less* are supported and encouraged for their efforts, regardless of age, sex, race, socioeconomic status, body habitus, etc. In fact, the biggest celebrations in the town square are held for new residents who first move in and go from a completely sedentary lifestyle to moving more and sitting less at any level, for example, going for a twenty-minute walk twice a week is cause for an enthusiastic celebration. Celebrations are also held in honor of CRF improvements at 1 metabolic equivalent (MET) increments.³ All who commit to this lifestyle are afforded sanctuary within the CRF-PA fortress town. The benefits of living in the CRF-PA fortress town are of considerable positive significance and include: 1) Protection in the form of reduced risk of developing chronic disease^{3,4} and now, we have recently learned, protection from severity of illness in those with a viral infection⁵⁻⁸; 2) A higher functional capacity and quality of life^{9,10}; and 3) An increased probability of a longer lifespan, and more importantly, health span.^{3,11} These and other benefits can be found in the fortress town chamber of commerce office.

The current global population now exceeds 8 billion¹², which, interestingly enough, is the residency capacity of the CRF-PA fortress town and, as the population grows, so too will the town's capacity to accommodate all who want to live there. And yet, the town is nowhere near full occupancy, a fact we have sadly been aware of for decades.^{13,14} More disconcerting is the fact that, since the coronavirus disease 2019 (COVID-19) pandemic, more individuals appear to be deciding to move out of the fortress town and engage in a sedentary lifestyle that compromises CRF and health- it is unknown whether those that left during the pandemic will choose to return.¹⁵⁻¹⁷ Living outside the walls of the CRF-PA fortress is wrought with peril.¹⁸ The watchman, comprised of advocates for CRF and PA from multiple sectors (e.g., public health, academics, government agencies, health care, etc.) often carry a heavy heart as they look upon the world outside the protective fortress walls. A high prevalence of chronic disease, low quality of life, increased risk of severe complications with viral infection, and premature mortality all run rampant. Moreover, the financial burdens imposed on the world outside of the fortress due to low CRF and physical inactivity are overwhelming. The World Health Organization estimates that 500 million new global cases of chronic disease will occur from 2020 – 2030 due to physical inactivity, costing a total of \$300 billion (U.S. dollars).¹⁸

So herein, as CRF and PA advocates and stakeholders, including the authors of this commentary, have stated numerous times in the past, using a continually growing body of evidence to support our view, we reiterate the following statement of fact: optimizing CRF and PA patterns are two of the most important goals for improving health trajectory from an individual to population level. The evidence to support CRF as a vital sign and PA as an essential medicine is indisputable, which is why CRF is in fact now considered a vital sign and exercise is considered medicine. Unfortunately, there is a gross misalignment between scientific

evidence and application, the latter of which has a detrimental impact on global health. Specifically, assessment of CRF is far too infrequent and, when conducted, the data is often underutilized in risk stratification and guiding treatment decisions. Physical activity levels are also alarmingly low on a global scale and seem to have worsened during the COVID-19 pandemic, which has important detrimental considerations for CRF. Imagine if the world *ignored* clinical guidelines for pharmacologic agents to manage high blood pressure, cholesterol, or diabetes. Such disregard for pharmacologic evidence-based practice would not be tolerated, and yet, the same cannot be said for overlooking CRF and PA.

In the current edition of *Progress in Cardiovascular Diseases*, a series of papers are provided that bring readers an up-to-date perspective on various important topics related to CRF and PA. The edition begins with updates to landmark American Heart Association statements on the call for a national CRF registry, published in 2013¹⁹, and the initial designation of CRF as a vital sign, published in 2016³. Updates on the global status of CRF and PA are also provided, continuing to sound the alarm for disconcerting trends that we are continuing to observe. Novel papers addressing important topics related to CRF and PA are also provided and include: 1) Causal systems mapping approaches to understanding population level CRF and PA patterns; 2) Public policy update on efforts to include PA assessment in the electronic health record; 3) CRF and PA disparities in the context of social justice; and 4) The impact of the COVID-19 pandemic and long COVID on both CRF and PA. An assortment of other relevant reviews and commentaries are also included. We hope that these papers collectively achieve the following:

- 1) Further advance and reinforce the understanding of the value of CRF and PA from a population to individual level;
- 2) Provide a current *state of the union* related to CRF and PA

statistics, clinical applications, and public policy initiatives; and 3) Provide novel aspects to consider for the future of CRF and PA promotion.

The CRF-PA fortress town obviously exists – it has since humans have walked this earth. The town’s population was historically much larger, partly as a function of humans needing to move more to survive, perform daily tasks, travel, work, etc. The world has changed – in many ways this has been positive, but these changes have also made it possible for people to *move far less and sit far more* while still being able to achieve activities needed for daily living at home, school, work and in the community. Advancements that have reduced the need for physical exertion is a highly negative consequence and the world continues to pay a steep price, in the form of increased chronic disease, reduced life expectancy and quality of life, and increased health care costs. Hope does, however, spring eternal. The CRF-PA fortress town is always open and free to live in – all a person needs to do is *start moving more and sitting less²* every day. If you adopt these positive lifestyle habits, no matter where you live in the world, you will immediately find yourself within the confines of the CRF-PA fortress. The starting point does not require a herculean effort – start today – walk to the grocery store instead of driving, take the stairs instead of the elevator, go for a bike ride with a friend. The protection provided by the fortress is well worth the effort, all are welcome.

Ross Arena, PhD, PT¹⁻³, Deepika Laddu, PhD^{1,2,4}, Mark A Faghy, PhD¹⁻³

¹Department of Physical Therapy, College of Applied Science, University of Illinois, Chicago, IL

²Healthy Living for Pandemic Event Protection (HL – PIVOT) Network, Chicago, IL

³School of Human Sciences, University of Derby, Derby, UK

⁴ Arbor Research Collaborative for Health, Ann Arbor, MI

Key Words: Cardiorespiratory fitness, prognosis, quality of life, health span

Address for correspondence:

Ross Arena, PhD, PT, FAHA, FRSM, FESC, FACSM
Professor and Head
Department of Physical Therapy
College of Applied Health Sciences
University of Illinois Chicago
1919 W. Taylor Street (MC 898)
Chicago, IL 60612
Office: (312) 355-3338
raarena@uic.edu

References

1. Webster M. Merriam Webster Dictionary - Definition of Fortress. <https://www.merriam-webster.com/dictionary/fortress>. 2023. Accessed 9/14/2023.
2. Arena R, McNeil A, Street S, Bond S, Laddu DR, Lavie CJ, Hills AP. Let Us Talk About Moving: Reframing the Exercise and Physical Activity Discussion. *Curr Probl Cardiol*. 2018;43:154-179. doi: 10.1016/j.cpcardiol.2017.06.002
3. Ross R, Blair SN, Arena R, Church TS, Després J-P, Franklin BA, Haskell WL, Kaminsky LA, Levine BD, Lavie CJ, et al. Importance of Assessing Cardiorespiratory Fitness in Clinical Practice: A Case for Fitness as a Clinical Vital Sign: A Scientific Statement From the American Heart Association. *Circulation*. 2016;134:e653-e699. doi: 10.1161/CIR.0000000000000461
4. Lee DC, Pate RR, Lavie CJ, Sui X, Church TS, Blair SN. Leisure-time running reduces all-cause and cardiovascular mortality risk. *J Am Coll Cardiol*. 2014;64:472-481. doi: 10.1016/j.jacc.2014.04.058
5. Christensen RAG, Arneja J, St Cyr K, Sturrock SL, Brooks JD. The association of estimated cardiorespiratory fitness with COVID-19 incidence and mortality: A cohort study. *PLoS One*. 2021;16:e0250508. doi: 10.1371/journal.pone.0250508
6. Brawner CA, Ehrman JK, Bole S, Kerrigan DJ, Parikh SS, Lewis BK, Gindi RM, Keteyian C, Abdul-Nour K, Keteyian SJ. Inverse Relationship of Maximal Exercise Capacity to Hospitalization Secondary to Coronavirus Disease 2019. *Mayo Clin Proc*. 2021;96:32-39. doi: 10.1016/j.mayocp.2020.10.003
7. Arena R, Pronk NP, Laddu D, Whitsel LP, Sallis JF, Lavie CJ. Mapping One Million COVID-19 Deaths and Unhealthy Lifestyle Behaviors in the United States: Recognizing the Syndemic Pattern and Taking Action. *Am J Med*. 2022;135:1288-1295. doi: 10.1016/j.amjmed.2022.06.006
8. CDC. Brief Summary of Findings on the Association Between Physical Inactivity and Severe COVID-19 Outcomes. <https://www.cdc.gov/coronavirus/2019-ncov/downloads/clinical-care/E-Physical-Inactivity-Review.pdf>. 2022. Accessed 3/31/2022.
9. Sagner M, McNeil A, Puska P, Auffray C, Price ND, Hood L, Lavie CJ, Han ZG, Chen Z, Brahmachari SK, et al. The P4 Health Spectrum - A Predictive, Preventive, Personalized and

Participatory Continuum for Promoting Healthspan. *Prog Cardiovasc Dis*. 2017;59:506-521. doi: 10.1016/j.pcad.2016.08.002

10. Xiao Y, Wang H, Zhang T, Ren X. Psychosocial predictors of physical activity and health-related quality of life among Shanghai working adults. *Health Qual Life Outcomes*. 2019;17:72. doi: 10.1186/s12955-019-1145-6

11. Arena R, McNeil A, Sagner M, Lavie CJ. Healthy Living: The Universal and Timeless Medicine for Healthspan. *Prog Cardiovasc Dis*. 2017;59:419-421. doi: 10.1016/j.pcad.2017.01.007

12. Nations U. United Nations - Global Issues: Population. <https://www.un.org/en/global-issues/population>. 2023. Accessed 9/14/2023.

13. Andersen LB, Mota J, Di Pietro L. Update on the global pandemic of physical inactivity. *Lancet*. 2016;388:1255-1256. doi: 10.1016/s0140-6736(16)30960-6

14. Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants. *Lancet Glob Health*. 2018;6:e1077-e1086. doi: 10.1016/s2214-109x(18)30357-7

15. Arena R, Hall G, Laddu DR, Phillips SA, Bhatt T, Faghy M, Lavie CJ. A tale of one pandemic outliving another: Are even lower physical activity patterns following the COVID-19 pandemic the new norm?-A commentary. *Prog Cardiovasc Dis*. 2023. doi: 10.1016/j.pcad.2023.03.005

16. Arena R, Hall G, Laddu DR, Phillips SA, Lavie CJ. A tale of two pandemics revisited: Physical inactivity, sedentary behavior and poor COVID-19 outcomes reside in the same Syndemic City. *Prog Cardiovasc Dis*. 2022;71:69-71. doi: 10.1016/j.pcad.2021.11.012

17. Hall G, Laddu DR, Phillips SA, Lavie CJ, Arena R. A tale of two pandemics: How will COVID-19 and global trends in physical inactivity and sedentary behavior affect one another? *Prog Cardiovasc Dis*. 2021;64:108-110. doi: 10.1016/j.pcad.2020.04.005

18. WHO. Global Status Report on Physical Activity 2022. In: Geneva World Health Organization 2022.

19. Kaminsky LA, Arena R, Beckie TM, Brubaker PH, Church TS, Forman DE, Franklin BA, Gulati M, Lavie CJ, Myers J, et al. The importance of cardiorespiratory fitness in the United

States: the need for a national registry: a policy statement from the American Heart Association.
Circulation. 2013;127:652-662. doi: 10.1161/CIR.0b013e31827ee100