



# Reply: muscle strength, cardiorespiratory fitness and cardiovascular disease

Helen Hashemi<sup>1</sup>, Peter A. McCullough<sup>1,2,3</sup>

<sup>1</sup>Baylor University Medical Center, Dallas, TX, USA; <sup>2</sup>Baylor Heart and Vascular Institute, Dallas, TX, USA; <sup>3</sup>Baylor Jack and Jane Hamilton Heart and Vascular Hospital, Dallas, TX, USA

Correspondence to: Peter A. McCullough, MD, MPH, FACC, FACP, FAHA, FCCP, FNKF, FNLA, FCRSA. Baylor Heart and Vascular Institute, 621 N, Dallas, TX, USA. Email: peteramccullough@gmail.com.

Response to: Laukkanen JA, Khan H, Kunutsor S. Cardiorespiratory fitness, muscle strength and risk of cardiovascular outcomes. *J Public Health Emerg* 2017;1:60.

Received: 15 January 2018; Accepted: 28 January 2018; Published: 09 February 2018.

doi: 10.21037/jphe.2018.01.03

View this article at: <http://dx.doi.org/10.21037/jphe.2018.01.03>

We enjoyed the editorial article entitled “Cardiorespiratory fitness, muscle strength and risk of cardiovascular outcomes” by Dr. Laukkanen and his colleagues that was published in *Journal of Public Health and Emergency* (2017;1:60) (1). We would like to thank the authors for their views on the role of cardiorespiratory fitness in cardiovascular outcomes relating to the data published in “Cardiorespiratory fitness and muscle strength in late adolescence and long-term risk of early heart failure (HF) in Swedish men.” by Lindgren *et al.* (2).

The protective effect of physical activity on the well-being of cardiovascular system has been broadly described in a prior issue of *Journal of Public Health and Emergency* (3). Exercise not only improves the cardiopulmonary fitness but also increases the muscle strength and muscle strength itself can have a protective function in the health of cardiovascular system. While aerobic fitness and muscle strength are correlated, some effects may be independent of cardiorespiratory fitness. Timpka *et al.* reported potential role of muscle fitness in the prevention of cardiovascular disease (CVD) (4), and Harada and his colleagues demonstrated a salient effect of strength training among patients with CVD as a part of cardiac rehabilitation (5).

Strength training may play an important role in the prevention and recovery from sarcopenia, particularly in HF (6). Patients with CVD with identified sarcopenia have a higher prevalence of symptomatic chronic HF and chronic kidney disease (5). Exercise training can improve these outcomes. A recently published animal study reported

resistance training alone or in combination with continuous aerobic training increased the strength in animals with HF and was related to the improvement of ventricular structure and function (7). Thus, strength training while not only complementing aerobic fitness, uniquely stabilizes the effects of sarcopenic forces in chronic illness and may mediate beneficial outcome via this mechanism (8).

In summary, we agree that strength training has complementary and independent effects on cardiovascular health. The mechanism by which both forms of fitness reduce cardiovascular death may be that they confer greater survivability of intercurrent events such as cardiovascular hospitalization. As a result, both aerobic and strength training should be undertaken both for the prevention and for the active treatment of cardiovascular disease.

## Acknowledgments

*Funding:* None.

## Footnote

*Provenance and Peer Review:* This article was commissioned by the editorial office, *Journal of Public Health and Emergency*. The article did not undergo external peer review.

*Conflicts of Interest:* Both authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi>.

[org/10.21037/jphe.2018.01.03](https://doi.org/10.21037/jphe.2018.01.03)). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

*Open Access Statement:* This is an Open Access article distributed in accordance with the Creative Commons Attribution-NonCommercial-NoDerivs 4.0 International License (CC BY-NC-ND 4.0), which permits the non-commercial replication and distribution of the article with the strict proviso that no changes or edits are made and the original work is properly cited (including links to both the formal publication through the relevant DOI and the license). See: <https://creativecommons.org/licenses/by-nc-nd/4.0/>.

## References

1. Laukkanen JA, Khan H, Kunutsor S. Cardiorespiratory fitness, muscle strength and risk of cardiovascular outcomes. *J Public Health Emerg* 2017;1:60.
2. Lindgren M, Åberg M, Schaufelberger M, et al. Cardiorespiratory fitness and muscle strength in late adolescence and long-term risk of early heart failure in Swedish men. *Eur J Prev Cardiol* 2017;24:876-84.
3. Jazi HH, McCullough PA. Fitness and strength in young adulthood and protection from future heart failure. *J Public Health Emerg* 2017;1:48.
4. Timpka S, Petersson IF, Zhou C, et al. Muscle strength in adolescent men and risk of cardiovascular disease events and mortality in middle age: a prospective cohort study. *BMC Med* 2014;12:62.
5. Harada H, Kai H, Niiyama H, et al. Effectiveness of cardiac rehabilitation for prevention and treatment of sarcopenia in patients with cardiovascular disease - a retrospective cross-sectional analysis. *J Nutr Health Aging* 2017;21:449-56.
6. Saitoh M, Ishida J, Doehner W, et al. Sarcopenia, cachexia, and muscle performance in heart failure: Review update 2016. *Int J Cardiol* 2017;238:5-11.
7. Alves JP, Nunes RB, Ferreira DDC, et al. High-intensity resistance training alone or combined with aerobic training improves strength, heart function and collagen in rats with heart failure. *Am J Transl Res* 2017;9:5432-41.
8. Fleg JL. Exercise therapy for older heart failure patients. *Heart Fail Clin* 2017;13:607-17.

doi: 10.21037/jphe.2018.01.03

**Cite this article as:** Hashemi H, McCullough PA. Reply: muscle strength, cardiorespiratory fitness and cardiovascular disease. *J Public Health Emerg* 2018;2:5.