



Reply: muscle strength, cardiorespiratory fitness and cardiovascular disease

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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.

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