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EDITORIAL

Preventing Heart Failure With Habitual Physical Activity: Dependence on Heart Failure Phenotype and Concomitant Cardiovascular Disease

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Heart failure (HF) is increasing in prevalence and is associated with significant morbidity, mortality, and healthcare cost.[1,2] Over the past 3 decades, 2 distinct phenotypes of HF have been recognized: HF with reduced ejection fraction (HFrEF) and HF with preserved ejection fraction (HFpEF).[2,3] While the incidence of HFrEF has declined in the community, the incidence of HFpEF continues to increase. In contrast to HFrEF, there are no proven drug-therapies for HFpEF. These factors highlight the need for novel effective approaches to prevention of HF.[1]

See Article by Florido et al.

Recent studies have identified physical inactivity and low cardiorespiratory fitness (CRF) as independent, modifiable risk factors for HF.[4–6] However, the mechanisms through which physical inactivity and low CRF may predispose to development of HF are not well established. A commonly accepted mechanism through which physical activity and exercise may indirectly reduce the risk of HF is by lowering the burden of traditional cardiovascular risk factors such as hypertension, obesity, diabetes mellitus, and atherosclerotic cardiovascular disease (ASCVD).

However, it remains unclear whether the protective associations between higher levels of physical activity and lower risk of HF are sustained among higher-risk individuals with prevalent cardiovascular risk factors and ASCVD. In this issue of the *Journal of the American Heart Association* (*JAHA*), Florido et al[7] addressed this knowledge gap by evaluating the association between physical activity levels and risk of HF among subgroups of participants from the Atherosclerosis Risk in Communities Study who had prevalent cardiovascular risk factors and ASCVD and thus, were at higher risk of HF. The authors observed that higher levels of physical activity were significantly associated with lower risk of HF in participants with prevalent cardiovascular risk factors such as hypertension, obesity, diabetes mellitus, and metabolic syndrome. However, prevalent or incident ASCVD modified the association between physical activity and risk of HF, with a significant inverse association observed only among individuals without ASCVD. In contrast, among individuals with prevalent ASCVD at baseline or incident coronary heart disease event on follow-up, physical activity was not associated with risk of HF.

The findings by Florido et al[7] provide important insights into the mechanisms through which physical activity, CRF, and exercise may modify the risk of HF. First, the association between higher physical activity and lower risk of HF in patients with prevalent HF

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risk factors suggests that physical activity may modify risk of HF through more direct mechanisms independent of the future development of traditional HF risk factors. Consistent with this notion, prior studies have demonstrated that higher levels of physical activity and CRF are associated with favorable cardiac remodeling patterns, lower myocardial stiffness, and better left ventricular function.[8,9] Furthermore, improvement in physical activity and CRF levels have also been associated with better systolic and diastolic left ventricular function.[10,11] These favorable direct effects of physical activity and exercise on cardiac structure and function may be blunted in individuals with ASCVD and associated adverse cardiac remodeling, which may explain the observed lack of association between physical activity and risk of HF in these participants.

The effect modification by presence of ASCVD on the association between physical activity and HF has important biological implications regarding the subtype of HF associated with physical inactivity and low CRF. Prevalent ASCVD, particularly coronary heart disease, is more strongly associated with downstream development of HFrEF.[12,13] In contrast, HFpEF is more commonly observed in individuals without prior ischemic heart disease.[12] The lack of association between physical activity levels and risk of HF among individuals with prevalent or incident ASCVD suggests that phenotype of HF more strongly associated with physical inactivity is likely HFpEF and not HFrEF. This notion is also supported by prior studies, which have demonstrated a significant inverse association between higher levels of physical activity and CRF with risk of HFpEF but not HFrEF.[5,6]

Impaired exercise tolerance is a key manifestation of HFpEF.[14,15] The findings by Florido et al[7] and others suggest that higher physical activity levels and regular exercise may have important preventive and therapeutic implications for HF, particularly HFpEF.[5,16] Maintenance of higher levels of exercise throughout the lifetime has been associated with blunted age-related decline in CRF, better left ventricular compliance, and lower risk of HFpEF.[5,8] Furthermore, exercise training in patients with HFpEF has been shown to significantly improve CRF, and appears to do so predominantly through favorable effects on skeletal muscle oxygen utilization.[16,17] In contrast, consistent with the lack of association between physical activity and risk of HFrEF, the effects of exercise training in improving exercise capacity in older patients with HFrEF are also blunted.[18]

The findings observed by Florido et al[7] also add to the emerging evidence for personalizing exercise prescription for prevention of HF among individuals based on their baseline risk factor burden.[19] The current guideline-recommended doses of physical activity may be sufficient to lower the risk of HF in patients with traditional cardiovascular risk factors, but not among those with established ASCVD. Combining physical activity recommendations with other preventive therapies may be needed to lower the risk of HF in individuals with ASCVD.

ARTICLE INFORMATION

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