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Letter to the Editor

HIIT for post-COVID patients within cardiac rehabilitation: Response to letter to the editor

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To the Editor:

We thank Li and colleagues for their comments regarding our recent research into the benefits of incorporating high-intensity interval training (HIIT) into cardiac rehabilitation for patients with coronary artery disease (CAD) [1]. In recent years, HIIT has proven popular in the general community and has been studied across a wide array of cardiovascular (CV)-related disorders, such as hypertension [2,3], stroke [4,5], type II diabetes [6] and non-alcoholic fatty liver disease [7]. This is due to compounding, compelling evidence of the efficacy of HIIT on CV outcomes such as reduced blood pressure, lowered body fat, improved lipid profile, less arterial stiffness, improved myocardial function (lower rate pressure product), and improved insulin resistance/glucose control [8–10], in addition to the cardiac-specific adaptations that Li and colleagues outlined in their letter.

While the CV benefits of HIIT are now quite clear, following the large volume of research on the topic in the last decade or so, the efficacy of HIIT specifically for respiratory and pulmonary function – the main outcome that would be desired in those who have suffered hospitalisation from COVID-19 infection – is less known. It is well-established that HIIT induces improvements in maximal ventilation, associated with improved cardiorespiratory fitness (CRF). HIIT has consistently demonstrated greater improvements in CRF than traditional moderate-intensity continuous training in both healthy and chronic illness populations [11,12]. Improved ventilation interacts with improved cardiac output to provide the working muscle with more oxygen, equating to higher CRF. Our data noted an 11% increase in maximal minute ventilation (litres of air breathed per minute), corresponding with an 11% increase in CRF, after 6 weeks of HIIT in our cardiac patients [1].

Improved CRF following HIIT does not just have exercise performance benefits – it has been well-documented the positive effect of higher CRF on CV-related mortality risk [13] largely via the improved CV outcomes outlined earlier, and it plausibly can at least partly explain improved cognitive function and mental health in those with illness-induced deficits [14,15] via improved cerebrovascular blood-flow. Improved CRF also directly influences daily function – an improved ability to undertake tasks of daily living leading to improved quality of life, an important practical consideration during the post-COVID recovery.

Other than improved maximal ventilation and the associated improved CRF, HIIT might help COVID survivors in other ways. Persistent symptoms of dyspnoea and fatigue following recovery from COVID have been frequently observed [16], somewhat akin at this stage to a post-viral fatigue syndrome. The intermittent nature inherent to interval training may be advantageous for these patients by reducing the ventilatory demand associated with exercise, which may serve to reduce dyspnoea and the sense of breathing effort as compared with traditional continuous aerobic exercise [17]. Thoughtfully applied work and recovery intervals within a HIIT program for these patients, such as applying shorter bursts and longer rests, are key to tolerability and not exacerbating the fatigue symptom, and therefore promoting longer-term adherence. In addition, the higher exercise intensity also may generate improvements in inspiratory and expiratory muscle strength, again leading to lower sense of breathing effort generally. Specific inspiratory muscle resistance training may prove a better method to address this, or may be an adjunct to HIIT as applied recently in patients with heart failure [18].

Lastly, would HIIT be safe for patients with severe respiratory or pulmonary dysfunction following COVID? HIIT has so far been seen to be relatively safe when applied within cardiac rehabilitation services for patients with CAD and heart failure [19,20]. We can also take some direction from recent small-sample studies involving patients with chronic obstructive pulmonary disease, cystic fibrosis, asthma, interstitial lung diseases and lung cancer, which have invariably shown supervised, thoughtfully-designed HIIT to be feasible to-date (see Sawyer et al. for a comprehensive review [17]). A contraindicating factor for application of HIIT however may be in the minority of patients with myocarditis, and subsequent acute cardiovascular syndrome, induced by the COVID infection [21]. These patients appear to range in severity of effects, from mild cases characterised by asymptomatic elevation of the troponin level right through to fulminant life-threatening heart failure, and the time-course of resolution and the longer-term impacts are still unknown.

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Ultimately, HIIT presents multiple theoretical benefits and further careful examination is required to fully understand its role in the optimal rehabilitation of patients following COVID-19 recovery.

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