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High intensity interval training: – Four key studies needed to bridge the gap from laboratory to public health policy.

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HIIT: From Lab to Policy

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The World Health Organisation and a number of national bodies recommend adults undertake at least 150min/week of moderate intensity physical activity, or 75min/week of vigorous intensity physical activity. However, a large proportion of the population do not achieve these targets. Lack of time is often cited as a primary barrier (1), and many researchers have suggested that high intensity interval training (HIIT), with interval durations from 10s to 4min and intensities ranging from 85% maximal heart rate (HRmax) to "all out" efforts, may provide a time-efficient solution to improve public health (4).

A wealth of evidence has demonstrated that HIIT can elicit a range health benefits such as improved cardiorespiratory fitness, insulin sensitivity and vascular function, with these benefits being of at least a similar magnitude to those seen with standard moderate intensity physical activity interventions (2, 3). These data are clear and convincing. However, they largely emanate from relatively short-term studies performed using expensive exercise equipment under controlled laboratory conditions. Such evidence is necessary, but not sufficient, for HIIT to become widely recommended to the general population and those at high risk of or with chronic disease conditions. Here we highlight where the evidence-base around HIIT is lacking and indicate the four key studies needed to bridge the translational gap from the laboratory to public health policy.

Four key studies needed

1) **'Real-world' effectiveness studies:** Evidence from short-term lab-based HIIT studies provide proof-of-concept of efficacy (2). However, outside the laboratory compliance with lifestyle interventions is variable and diminishes over time. Thus, RCTs of HIIT carried out in home, workplace and community settings with intention-to-treat data analyses are

needed to determine whether HIIT in the real world is effective in changing clinically relevant outcomes. Adherence and drop-out rates should be key outcome measures. One short-term study (10 weeks supervised gym-based HIIT) reported greater adherence to HIIT, compared to moderate intensity training (83% vs 61% session attendance respectively) (4). However, further investigation is needed to determine whether these findings extend outside the gym, in different populations and over longer time frames.

2) **Longer-term studies:** To alter clinical and public health practice, long-term studies with clinically relevant endpoints are needed. For example, when assessing the effectiveness of lifestyle interventions for obesity, cardiovascular disease and diabetes prevention, bodies such as the Scottish Intercollegiate Guidelines Network (SIGN) and National Institute for Health and Care Excellence (NICE) will typically focus on randomised controlled trials with at least 12 months of follow-up. There are no trials of HIIT of this duration. A 5 year trial comparing HIIT (40min sessions at 85-95% HRmax twice weekly), with moderate intensity and control groups, in people aged 70-76 at baseline recently begun (5). The findings of this trial will be eagerly awaited but other such trials in a wider age range and population types are urgently needed.

3) **More safety data:** While physical activity is generally safe, there is a small increase in risk of adverse cardiovascular events (compared with rest) during vigorous intensity exercise, particularly in those who do not habitually undertake regular physical activity (6). The evidence base for the safety of HIIT is limited. One study reported a cardiovascular event rate of 1 per 23,182h of HIIT vs 1 per 129,456h of moderate intensity exercise in

patients undertaking cardiac rehabilitation (7). This exercise programme comprised 4-minute intervals at 85-95% of HRmax, substantially lower than many HIIT programmes involving "all-out" efforts. More data on the safety of such interval programmes are needed before they can be recommended for unscreened and unmonitored members of the general population.

4) **Low cost, easily accessible HIIT protocols:** The majority of HIIT programmes are laboratory or gym-based and utilise specialised equipment. The cost of a gym membership is a barrier for many people and many people dislike gyms. Effective public health interventions require widespread reach, thus accessible effective HIIT protocols that enable individuals to safely achieve the required exercise intensities, with no supervision and with little or no equipment and in a location of their choosing (e.g. home or work) need to be developed.

We, therefore, urge exercise scientists, behavioural psychologists and clinicians to work together to move beyond the laboratory and gym. We appreciate our call to action and the studies we propose are not a simple undertaking but they are essential to determine whether or not HIIT merits a place at the table in public health physical activity recommendations for the prevention and management of chronic disease.

Competing Interests

None declared.

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