# High intensity training and the heart

***Sir,***

The paper by Dr Hugh Montgomery and Dr David Woods on High intensity training and the heart (Vol 60(3), 1999, p 187) is of considerable interest, and their reviews of the relationship between exercise and inflammation, the renin–angiotensin system and coronary disease are most helpful. However, they have unfortunately not sufficiently addressed the question raised in their opening paragraphs, which is to define the optimum intensity of exercise.

Terminology and definitions are the main problem. The terms which appear in their article include very high intensity exercise, optimum intensity, intense exercise, adequate exercise, a single period of intense exercise, a six metabolic equivalent workload, exercise (intensity not specified) less than once each week or more than five times each week, and exercise at moderate levels of intensity. I imagine these terms are all defined in the papers to which they refer, but for those of us who use your excellent journal as a way of gaining information outside our own speciality it is essential for the definitions to be in this paper. Even the two numerical quantifications are unclear — 2500 kcal per week is quoted as the nadir of the U-shaped curve, but such a figure could be produced by a lot of low intensity exercise, such as walking, or a small amount of high intensity, like squash. The six metabolic equivalent workload should surely have a time span allotted to it, unless running flat out for a few seconds to catch a bus carries the same risk as a more prolonged task. Furthermore, a very wide range of increased risk of acute myocardial infarction after such exercise is quoted, between those who exercise less than once each week and those who exercise more than five times, and these categories need further definition. 'Less than once a week' could indicate anything from a couch potato to an avid hill walker who can only get away every other weekend.

My understanding, from previous reading, was that the jury was still out on whether coronary protection could be afforded by regular, normal walking, or whether a near maximum tachycardia was needed. Montgomery and Woods' last sentence is extremely pleasing, but still does not 'define the optimum intensity of exercise', which their opening paragraph lead the reader to expect. Could they please clarify?

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***Sir,***

We thank Dr Legg for his interest and his helpful comments. Dr Legg is quite right to question what 'optimal' exercise is, and also what defines low, moderate and high intensity exercise. His confusion is well justified: there is actually no adequate universal definition at all. Some have classified it in relation to perceived work or to calories burned/hour, others by comparing heart rate to the maximum predicted, and still others in relation to anaerobic threshold. Numerous other definitions and assessments abound. Furthermore, the papers quoted often failed to identify the duration of exercise, or even how intensity was assessed.

Our article tried to address the main data published, and we must apologise if this gave many slightly different definitions and terminology. It is a shame, as ever, that lack of space prevented our including all the published definitions in this field, and prevented a detailed critique of each and every paper. Scope will, necessarily, limit depth.

With regards to the request for clarification of 'optimum intensity'. It is clear that even modest exercise is highly beneficial. Taking aerobic exercise three times a week (optimal timing is probably 36–48 hours apart) for 40 minutes to a level which raises heart rate to approximately 70% maximum (or a level which produces breathlessness but allows conversation) seems to be beneficial.

It also seems that such a regimen produces benefits in the overweight, even in the absence of weight loss. Finally, it is clear that many of the benefits of regular exercise begin at such low levels of intensity — there is a law of diminishing returns with increasing calories burned. The data of Blair et al (1989; *Figure 1*) also support this suggestion. Indeed, the original studies of occupational health showed improved cardiovascular mortality and morbidity in bus conductors even compared to bus drivers.

It is our view that exercise should be aerobic, should be regular (ideally every 36–48 hours), should last a minimum of 40 minutes, should not stimulate a powerful inflammatory reaction (therefore should not involve significant heat stress, dehydration or muscle injury), should be low impact (to preserve musculoskeletal health), and should involve exercise which produces breathlessness but the ability to converse (or up to 70% of maximum predicted heart rate).

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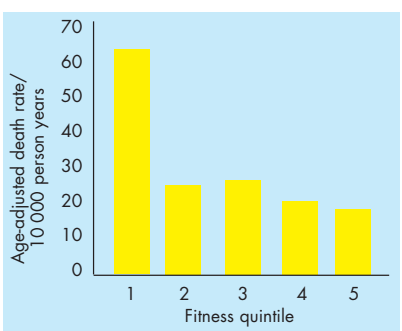


***Figure 1. Benefits of exercise with increasing fitness. From Blair et al (1989).***

# Origin of the word 'stent'

***Sir,***

I read with interest the review by Nicholson (Vol 60(8), 1999, p. 571) on stents. Once again Nicholson, as Morgan and Osborn (1996), O'Brien and Sparkman (1997) and Sterioff (1997), attributed the somewhat nebulous origin of the word 'stent' to Charles Thomas Stent (1807–85), the London dentist who sold a malleable mass under his name. Unfortunately, Mr Charles Stent is not the originator of the ubiquitous word stent.

Actually, the word stent has been in existence since the 14th century when it was used in the north of England to designate a device used to stretch out fishing nets upon a river (Sigwart, 1997a,b). It was Charles Dotter (1920–85) who introduced the term stent in interventional radiology when he and associates (Dotter et al, 1983) wrote 'stent grafting' in 1983, although Dotter's original description of intravascular stents was published 14 years earlier (Dotter, 1969).

Dotter's innovation attracted more interest in Europe than in the USA, and European radiologists referred to percutaneous angioplasty as 'Dottering' (Friedman, 1989). Sadly, unlike the recognition accorded Wilheim Konrad Roentgen from whom the term 'roentgenology' is derived, no authority confirmed the new word 'Dottering', which is perhaps more relevant than the word stent (Hedin, 1997).

The word stent is nowadays the most popular word in interventional cardiology. It refers to a device to correct a stenosis, which derives from the Greek stenos, 'narrow'. 'The word is monosyllabic, emphatic in its expression with internally alliterative, hard-sounding consonants, and has no other modern cognates. It does not have Hellenic or Latin complexity and has a new, high technology connotation. If an historical basis had not existed for the derivation of stent, a better word could not have been invented' (Sterioff, 1997).

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