The Journal of Physiology

TRANSLATIONAL PERSPECTIVES

Standing up for exercise: should deconditioning be medicalized?

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In this issue of *The Journal of Physiology*, Shibata and colleagues (2012) from the Levine lab demonstrate that 3 months of exercise training can reverse or improve many of the signs and symptoms of a type of orthostatic intolerance known as the postural orthostatic tachycardia syndrome (POTS). This syndrome is marked by an excessive heart rate response to standing, a high heart rate response to a given level of exercise, and (among other things) reduced exercise capacity. While a number of pathophysiological explanations for POTS exist, over the last 5–10 years several labs have noted that the pathophysiology of POTS bears a striking resemblance to extreme forms of deconditioning such as prolonged bed rest (Joyner & Masuki, 2008).

With prolonged bed rest there is an excessive rise in heart rate during orthostatic stress, cardiac atrophy, reduced exercise capacity, low blood volume, muscle atrophy, and many other wide ranging structural and metabolic changes (Joyner & Masuki, 2008). Given the parallels between POTS and deconditioning, investigators from the Levine lab have systematically studied the influence of exercise training on patients with POTS. Because the patients are so deconditioned, they have used a graded programme and shown impressive results (Shibata *et al.* 2012, Fu *et al.* 2010). These results include reductions in the excessive heart rate responses to standing and exercise (the primary symptoms). They also include increases or improvements in exercise capacity, blood volume, stroke volume, heart rate recovery following exercise, and a number of structural changes in the heart that would tend to both improve exercise capacity and orthostatic tolerance. In general, these responses are similar to those seen when intentionally deconditioned humans resume exercise (Saltin *et al.* 1968).

POTS is a syndrome that is diagnosed far more frequently in young and middle-aged women than men, and by the time of definitive diagnosis patients have typically spent several years seeking expert medical opinion for their symptoms. Frequently, these individuals report a distant flu-like syndrome followed by a period of inactivity, followed by more inactivity in response to the unpleasant sensations they have while standing or doing mild physical activity. Thus, a downward spiral of inactivity and deconditioning occurs. This downward spiral can be made worse by related perceptual issues including somatic hypervigilance and fatigue that can be improved with exercise training (Benrud-Larson *et al.* 2003; O'Connor & Puetz, 2005). However, when these individuals seek medical advice their responses are seen as abnormal and frequently pharmacological treatments are prescribed (Joyner & Masuki, 2008).

This is not surprising. Physicians are presented with symptoms and use tools they are most familiar with (often drugs) to address them. Unfortunately, most physicians are simply unfamiliar with the complex physiological responses to both acute exercise and, more importantly, the adaptations associated with exercise training. Additionally, exercise training is 'the hard way' because as the Shibata paper shows, individuals in a severely deconditioned state essentially need supervised exercise training in a supportive environment. The Shibata paper also shows that when this environment is available the results can be remarkable and there is some evidence that with prolonged periods of training, even more dramatic improvement in the symptoms of these patients is possible (Levine, personal communication).

This brings me to a larger question – has deconditioning become medicalized? More importantly should deconditioning be medicalized? In this context, there are a number of other chronic medical conditions, most notably fibromyalgia and chronic fatigue syndrome, that are associated with poor exercise capacity and the patient narratives and physician responses are frequently similar to those outlined above for POTS (Joyner & Masuki, 2008; Parsaik *et al.* 2012; Sañudo *et al.* 2012). Despite years of trying, it has been difficult to identify a limited set of causative agents or factors that account for these conditions and devise effective drug based therapeutic protocols. This leads to frustrated patients, frustrated physicians, and people seeking all sorts of explanations for these conditions (Groom & Bishop, 2012). This is made worse because patients' symptoms are clearly real.

The Shibata study offers hope for these patients and shows that carefully monitored and progressive exercise training in a supportive environment is a treatment option that should be tried first. If deconditioning were a more mainstream medical diagnosis, perhaps the awareness of the average physician treating the average patient would increase and more formal therapeutic rehab programmes that include cognitive and behavioural therapy would emerge. In cases like POTS 'secondary' deconditioning could be diagnosed and treated. For many other types of patients, like those with obesity and type II diabetes, the diagnosis might be 'primary' deconditioning.

Physical inactivity and lack of exercise – deconditioning – is one of the most common preventable causes of morbidity and mortality known for an impressive array of diseases (Thyfault & Booth, 2011). It also appears to be a final common pathway for conditions like POTS, fibromyalgia and chronic fatigue syndrome. If deconditioning were a recognized syndrome or diagnosis like hypertension, diabetes and POTS, it would be easier to educate the general public and medical community about the one universally effective treatment for it – exercise training.

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DOI: 10.1113/jphysiol.2012.238550

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