



EDITORIAL

Physical activity in patients with cystic fibrosis: a new variable in the health-status equation unravelled?

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During the past few years, it has become clear that in chronic respiratory disease, health status is severely impaired and that this should be a prime target for treatment, both in patients with chronic obstructive pulmonary disease (COPD) and cystic fibrosis (CF) [1, 2]. Lung function impairment is relatively poorly related to impaired health status in COPD patients [3]. The same concepts appear to apply in CF patients [2]. Indeed, evidence is available demonstrating that aerobic capacity in these patients is related to survival [4], quality of life [2] and professional achievements [5].

Exercise training programmes have been developed for chronic respiratory illness, and their popularity has increased tremendously since the late 1990s. In COPD, exercise training clearly enhances functional exercise capacity and health status and reduces the utilisation of healthcare resources [6, 7]. Indirect indications suggest it may also improve survival in these patients, but, to date, no direct evidence to this effect has been provided [6]. A clear demonstration of this effect would require a large study, which may no longer be ethically acceptable as the benefits of exercise training (in terms of functional exercise capacity and health status) have now been demonstrated beyond doubt. Similar effects were demonstrated in patients with CF, although on average the studies were understandably smaller [8]. The prime purpose of a rehabilitation programme is to make patients more apt at performing activities of daily living, and to enhance their activity levels as a whole. The latter would allow for a change in lifestyle responsible for the maintenance of the effects of rehabilitation. Whether this is really achieved with the present rehabilitation programmes is not known.

In this context, at present, surprisingly little is known about patients' activities at home. So far, subjective methods, such as activity questionnaires and diaries, are being used to assess patients' activities [9, 10]. Although these methods have shown limited validity and reliability [11], they provide a patient's personal perception of functional status, effort and difficulties in performing activities [12]. Recently, this activity has become directly measurable by means of pedometers and accelerometers [13]. Uni-axial accelerometer measures vertical

acceleration and provides activity counts. In COPD patients, tri-axial accelerometers were used to measure body positions, movement patterns and the intensity at which movements are performed. This allows measurement of the time spent by the patient in active conditions, such as standing and walking, *versus* passive conditions like sitting and lying down. These measurements were shown to be reliable as they were in close accordance to the data obtained by video recording [13]. By way of contrast, patient estimations of their activity proved to be less reliable as they did not correlate well with the objective measurements. Patients consistently overestimated the time walking and underestimated the time standing [13].

The results of measurement of activity levels in COPD patients by PITTA *et al.* [14] were really remarkable. In stable patients, it was demonstrated that the time spent in an active position in COPD patients, such as walking, was very limited. It was only 6% in patients with COPD compared with 11% in the healthy elderly. Time spent standing was only 27% in COPD patients *versus* 41% in the healthy elderly. Walking time was poorly related to pulmonary function, but best related to the 6-min walking distance (6MWD; $r=0.76$, $p<0.0001$). Also the relationship to peak oxygen uptake ($V'O_{2,peak}$) was relatively poor ($r=0.33$, $p<0.05$). The good relationship with 6MWD confirmed the older concept that 6MWD was related to activities in daily living and better so than $V'O_{2,peak}$.

This means that the tools to study patients in their normal activities are now available. Thus, the first studies seem to confirm important inactivity in COPD patients. In addition, this inactivity is severely enhanced in COPD exacerbations, stressing the importance of this factor in the generation of the muscle weakness that occurs in these patients [15]. Finally, we can study under what conditions rehabilitation improves activity levels.

An array of devices is presently available to measure patient activity. In the present issue of the *European Respiratory Journal*, HEBESTREIT *et al.* [16] used a MTI/CSA 7164 accelerometer (MTI Health Services, Fort Walton Beach, FL, USA), a uni-axial accelerometer, to assess periods of moderate and vigorous physical activity (MVPA), and an average daily accelerometer count (ADAC) in patients with CF. This device does not allow the measurement of movement patterns, but gives a rough idea of movement intensity. HEBESTREIT *et al.* [16] studied a total of 71 patients, making this study large in the context of CF. Interestingly, they found that both MVPA and ADAC independently explained part of the variance in maximal oxygen uptake ($V'O_{2,max}$; 3.7 and 2.5% of the variance,

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respectively), after correcting for the effects of body size, sex, lung function and muscle power. Clearly, this relationship was not caused by the expected relationship between muscle power and $V'O_{2,max}$. This is the first study to extend the observations that were recently made on COPD patients, and cited previously, to patients with CF.

Whether activity levels determine $V'O_{2,peak}$ or whether $V'O_{2,peak}$ determines activity levels cannot be determined from the study by HEBESTREIT *et al.* [16], as only correlations were studied. The answer to the former question would require some sort of intervention study examining the effects of exercise training on activity levels, and studies in which activity levels are varied by patient instruction without exercise training. Such studies still need to be performed. Although there is some evidence that suggests rehabilitation enhances $V'O_{2,peak}$ in cystic CF [17, 18], at present there are no studies examining the effects of rehabilitation on activity levels, nor is there any evidence that rehabilitation would be the only way to enhance activity levels in these patients.

Nevertheless, the present study extends observations that were made in chronic obstructive pulmonary disease patients, and stresses that peak oxygen uptake and activity levels [19] may be related to health status in patients with cystic fibrosis as well. In this way, it also contributes to further understanding of the factors determining health status in these patients. This is without question a necessary step towards optimal improvement of health status in cystic fibrosis patients.

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