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EDITORIAL

Assessment of disability

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The proposal for the quantitative assessment of respiratory disability put forward by Dr Cotes and his colleagues on the working party of the European Society for Clinical Respiratory Physiology on page 1074 of this issue represents an advance in this area. The approach is soundly structured on the conceptual framework established by the World Health Organization, classifying impairment, disability, and handicap/hardship applied specifically to respiratory disorders. In this framework the impairment of lung function may be measured using pulmonary function testing (forced expiratory volume in one second (FEV_1), vital capacity (VC), FEV_1/VC ratio and diffusing capacity of the lungs for carbon monoxide (DLCO). Again within the WHO framework impairment contributes to disability, which may be defined as a reduced ability to exercise and thus measured by exercise testing; impairment and disability contribute to hardship/handicap, which is seen as specific to the subject within the contest of his life and is thus not solely a medical issue.

The working group clearly indicates that impairment is only important inso much as it contributes to disability, but it draws attention to the highly variable relationship between impairment and disability. This relationship does not constitute a reasonable working framework for the evaluation of disability on the basis of impairment alone, except perhaps in extreme cases. Thus, impairment is a necessity for respiratory disability, but the ability to perform exercise, directly measured or predicted on the basis of submaximal exercise responses, is a central feature in the present proposal. When subjects fail to achieve an oxygen uptake at maximal exercise less than twice resting (0.5 $l \cdot min^{-1}$ approx) they are considered to be 100% disabled; when they can achieve an oxygen uptake at maximal exercise equivalent to the lowest normal predicted maximum oxygen uptake (mean-1.64 SD) they are considered to be 0% disabled. Disability may thus be graded between these extremes. Conceptually there is a refreshing simplicity about this approach, although doubtless the working party is prepared for discussion regarding the application of the particular approach advocated and the standards chosen. We find ourselves in the privileged position to begin this discussion.

We believe there are shortcomings in the execution of this approach, many of which are addressed in the report but not adequately resolved. Firstly, some subjects inevitably make a submaximal effort to magnify the extent of their disability. The number of such subjects remains largely anecdotal but there remains perhaps an unjustified bias that the number is large. The identification of poor motivation, and even correction to a common level of motivation using physiogical responses during exercise is tempting. The prediction of disability on the basis of resting function and submaximal exercise responses should be solidly founded before this approach can be advocated. All motivated subjects stop when the discomfort involved in continuing exercise becomes intolerable. Toleration of discomfort is a determinant of exercise capacity and varies in the population. Ventilation and heart rate at maximal exercise decline as impairment in lung function increases, but the physiological responses at maximal exercise continue to reflect this variability in tolerance. The mean responses and acceptable variability for exercise capacity, heart rate and ventilation, expressed as a percentage of predicted, can be empirically established for various levels of impairment, and then applied to establish "fair" levels of motivation. If subjects fail to reach these levels, poor motivation may be the dominant cause for the disability, but other reasons for "submaximal" physiological responses should be identified where possible, in particular where symptoms appear to have reached an intolerable limit. Simplicity and fairness in the assignment of acceptable physiological limits are essential.

A second and related shortcoming in the proposed approach is the question of whether the subject should be penalized for the "normal" behavioural and/or pathophysiological effects of impairment. There is the unsupported assumption that all patients with respiratory disability are limited by dyspnoea. The behavioural and pathophysiological consequence of all disorders associated with limited activity is the development of weakness and disuse atrophy of peripheral skeletal muscles. Do we deny the designation of respiratory disability to patients with impairment in lung function if they are limited by peripheral muscle fatigue? Many patients are limited equally by dyspnoea and peripheral muscle fatigue and some are more limited by peripheral muscle fatigue than by dyspnoea. One could substitute a requirement that the patients be more dyspnoeic than normal subjects exercising at a comparable work intensity.

The choice of exercise testing protocol has a systematic effect on the measured exercise capacity.

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Thus, standardization of protocol to ensure comparability is essential, and the acceptance of comparable measurement standards from laboratory to laboratory is a major practical issue. As COTES and WOOLMER [1] showed many years ago, the actual measurement of (V_{O_2}) is technically complex, introduces variability in measurement across laboratories and adds considerable cost. Is the actual measurement of oxygen uptake essential to the assessment of disability? Exercise testing has a long tradition which embraces oxygen uptake as a central component of physiological and pathological understanding, but is it necessary for the purposes of assessing disability? The very close relationship between measured O_2 uptake and work performed on a calibrated cycle ergometer, with a residual variation of about 5%, raises doubt as to the necessity for its measurement, as mechanical work output can be measured with greater ease and less variability. Established normal values are available and can be used within the same conceptual framework for the assessment of disability.

To conform with the approach suggested by the working party, maximum workload (W_{max})-1.64 SD could be substituted for 0% disability. In essence, standards could be established which would not violate the intentions of the present proposal. The result would be a considerable practical simplification. The only potential problem then relates to a reliable and transferable work capacity between treadmill and cycle ergometer. A treadmill protocol places a demand for oxygen uptake measurements which can be avoided with cycle ergometry. One may reasonably ask why we do not agree on an approach based on cycle ergometry.

If the measurement of exercise capacity is seen as central to disability assessment, the interactive contribution of various parameters of impairment (FEV_1, FEV/VC ratio, DLCO) to disability becomes less important. Even the requirement for significant impairment of respiratory function loses some of its strength. All three may fall within the normal ranges, but if all three are at their lower limits, patients may be disabled, in spite of the arbitrary decision that they cannot be considered disabled because of this prerequisite. Similarly in the presence of severe impairment, exercise testing is considered unnecessary but the interactive contribution of these and other adaptive factors may contribute to a lessening of disability.

The guidelines proposed by the working party are deserving of experimental validation in an adequately characterized population in order to establish the strengths and weaknesses of the approaches suggested. Unless tested in this manner the use of this or other approaches will always remain unproven.

Reference

1. Cotes JE, Woolmer RF. – A comparison between 27 laboratories of the results of analysis of an expired gas sample. *J Physiol*, 1962, 163, 36–37.