

CORRESPONDENCE

Reference value of six-minute walking distance in healthy middle-aged and older subjects

To the Editor:

In a recent issue of the *European Respiratory Journal*, TROOSTERS *et al.* [1] carefully demonstrated that the six-minute walking distance (6MWD) can be predicted adequately using a clinically useful model in healthy elderly subjects.

The 6MWD is a quick and inexpensive measure of physical function and an important component in assessing health-related quality of life (HRQoL). Although the maximal cycle ergometry or treadmill exercise test is a more accurate means of assessing HRQoL and physical function, these exercise tests cannot be performed in all elderly subjects. This is why the 6MWD is more useful for measuring the submaximal exercise capacity and quality of life in elderly, frail and severely limited patients. Several studies have indicated that the 6MWD is a good marker of response to therapeutic intervention in patients with chronic obstructive pulmonary disease [2–4]. To this end, an adequate reference value is necessary for assessing physical function in middle-aged and older subjects.

The results of TROOSTERS *et al.* [1] are consistent with those of the several previous studies performed in various countries (table 1) [6]. However, reference equations for the 6MWD in healthy middle-aged and elderly subjects are not introduced for non-Caucasians. The experience of the present authors and the previous study in Japan [6] indicate that the reference value of the 6MWD in healthy elderly Japanese subjects is similar to that in elderly Caucasians (table 1). This evidence suggests that the normal value of the 6MWD at any given age may not be very different between Caucasians and non-Caucasians.

We agree with TROOSTERS *et al.* [1] that a normal 6MWD should not be fixed at 600 or 700 m as has been previously proposed by REDELMEIER *et al.* [7]. However, TROOSTERS *et al.* [1] also found that the 6MWD correlated significantly with patients' ratings of their own walking ability and that the variability in repeated measurements of the 6MWD in patients with good baseline functional status was greater than that in

patients with worse baseline functional status as measured by the 6MWD. This suggests that the interindividual variability in 6MWD in healthy elderly subjects is greater than that in severely limited patients with lung disease.

Although TROOSTERS *et al.* [1] claimed no information was available as to which factors may account for variability in the measured 6MWD in healthy elderly subjects, the previous studies have revealed that age and sex are the most important factors explaining the variability [4, 6]. ENRIGHT and SHERRILL [5] reported that age, sex, weight and height are independently associated with the measured 6MWD using a larger sample size compared with the current one. Thus the result and conclusion of the current study are not surprising. In addition, a minor, but significant, point is that elderly subjects are considered to be subjects aged ≥ 65 yrs by geriatric standards. Data in subjects with a mean age of 65 yrs may not be representative of those in elderly subjects as a whole.

It is true that the results of the 6MWD are interpreted more adequately if expressed as a percentage of the predicted value. Although the large variation in the 6MWD remains unexplained in terms of anthropometric parameters of age, weight, and height alone, the reference equations of the 6MWD should be simple for clinical usage. Future population-based studies would obviously be welcome to determine adequate reference equations for the narrow normal range of the 6MWD at a given age.

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Table 1. – The six-minute walking distance in male and female Asians and Caucasians

	Study			
	TROOSTERS [1]	ENRIGHT [5]	TAKISHIMA [6]	Present authors
Race	Caucasian	Caucasian	Asian	Asian
Mean age yrs	65	60	65	65
Males				
6MWD m	673	576	572	624
Subjects n	54	117	34	80
Female				
6MWD m	589	494	504	541
Subjects n	54	173	38	78

6MWD: six minute walking distance.

From the authors:

We agree with S. Teramoto and colleagues regarding the importance of the six-minute walking distance (6MWD) as a measure of functional exercise capacity in elderly subjects and patients. The 6MWD is an easily obtained measure of exercise performance. However, the 6MWD is not a replacement for the maximal stress exercise test, but rather gives additional information. As pointed out by S. Teramoto and colleagues, fixing the predicted walking distance at a given distance is inaccurate. We have shown that variability in the 6MWD in healthy subjects is partially explained by anthropometric characteristics (weight, height, sex) and age [1]. Indeed, ENRIGHT and SHERRILL [2] observed the same factors contributing to the explained variance. However, at the time of submission of our manuscript, their paper had not been published.

The observed regression equation in our study should be confirmed in a prospective study. The r^2 of this regression equation was 0.66. Indeed, numerous factors may interfere with the results obtained from the 6MWD, and may lead to slightly different weighting of the factors used to predict the walking distance. The length of the corridor, ambient temperature and, probably more importantly, encouragement of the patient and the number of practice walks can modify the results of this test. Therefore, when using the regression equation from a reference population, standardization of the walking test according to the procedures used in that reference population are essential. It is of note that widely accepted reference equations for maximal oxygen up-take or pulmonary function do not exceed the observed r^2 in the present study.

The term elderly subjects might indeed be inappropriate by geriatric standards. Indeed, in our sample, the mean age was 65 yrs, but patients up to the age of 85 yrs were studied. We found age to be related to walking distance. From this anal-

ysis, one would expect a yearly decline of 5m. However, the yearly decline in the healthy elderly can only be determined in a longitudinal trial.

Lastly, we fully agree with the comment of S. Teramoto and colleagues that the variability in the 6MWD in severely limited patients with lung disease may be different from that in healthy subjects. However, we would expect that the variability in patients would be larger. Indeed, the variability in walking distance may be influenced by the same anthropometric characteristics as in healthy subjects. In addition, indicators of the disease state, such as pulmonary function, cardiac function and skeletal muscle function, may add to the variability [3]. Perhaps including these variables, maybe helpful in adjusting for disease-specific variability in walking distance.

We would like to thank S. Teramoto and colleagues for their interest in our study and their suggestions.

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