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The six-minute walk test in paediatric populations

Description

The six-minute walk test (6MWT) is a self-paced, submaximal exercise test used to assess functional exercise capacity in patients with chronic diseases (Chang 2006, Solway et al 2001). It has been used widely in adults, and is being utilised increasingly in paediatric populations; it has been used as an estimate of physical fitness in, for example, children with severe cardiopulmonary disease, cystic fibrosis, and juvenile idiopathic arthritis (Hassan et al 2010).

Instructions to clients and scoring: Standardised guidelines for the performance of the 6MWT are published by the American Thoracic Society (ATS) (ATS 2002). Walking distance is accepted as the main outcome measure of the 6MWT, although the product of walking distance times body weight is suggested as an alternative outcome (Hassan et al 2010).

The 6MWT is performed individually with standardised encouragements during the test (ATS 2002). The subject is instructed to cover as much distance as possible in 6 minutes without running. We recommend using a distance of 15–20 metres between turning points, in contrast to the 30 metres recommended for adults. In addition, the test is performed indoors in a quiet corridor or exercise room with no 'pacer' (therapist who walks behind the patient) except when there is a high risk of falling (as has been described for children with Duchenne muscular dystrophy) (McDonald et al 2010).

It is recommended that heart rate should be monitored consistently both at rest and during the walk when using the 6MWT (Verschuren et al 2011). This might help differentiate whether low scores are because the child was more or less prepared psychologically to complete a 6MWT, or because the child was able to move with less ease and, thus, had higher physiological strain.

Commentary

The 6MWT is an inexpensive instrument for measuring functional exercise capacity in paediatric populations. Care should be taken to ensure appropriate execution of the test. Our experience from a recent unpublished survey among Dutch (paediatric) physiotherapists is there is a large variety in performance of the 6MWT among therapists, especially distance between turning points (variation 5–50 metres), lay-out of circuit (circle, squares, and even on treadmill), instructions for turning, as well as differences in encouragements. For optimal reliability it is important that the test is performed in a standardised manner as recommended by the ATS (ATS 2002). Furthermore, the various sets of reference values differ substantially. Therefore, it is advised to use the same set of norm values all the time.

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The only requirements are a 15–20 metre corridor or exercise room, four cones, measuring tape, a stop-watch, a heart rate monitor, and written instructions for the encouragements.

In children, varying associations have been reported between age, height, weight, and gender, and 6MWT distance. Several studies have reported reference values from healthy children from different geographic regions, Europe, Asia, Africa, and North America (Ben Saad et al 2009, Geiger et al 2007, Klepper and Muir 2011, Lammers et al 2007, Li et al 2007), making it possible to determine the predicted 6MWT distance for individual patients.

Reliability: Reproducibility testing has shown good reliability (ICC 0.96 to 0.98) for children with or without chronic disease. In the same literature, agreement varies among paediatric populations with smallest detectable differences ranging from 36 metres in children with spina bifida (de Groot et al 2011) up to 139 metres in children with cystic fibrosis (Cunha et al 2006), so caution is advised when evaluating individual changes in 6MWT distance after interventions or follow-up.

Validity: Several publications have indicated that there are only low correlations between walking distance and VO_{2max} in children. The following Pearson's correlations between 6MWT distance and VO_{2max} are reported: juvenile idiopathic arthritis, $r = 0.25$; hemophilia, $r = 0.31$; spina bifida, $r = 0.46$; end-stage renal disease, $r = -0.25$. Recently it was reported that in children with pulmonary hypertension correlation between 6MWT distance and VO_{2max} was significant when the walk distance is lower than 300 m, and there was no association when the 6MWT distance was > 300 m (Lammers et al 2011). Because of these low correlations, the 6MWT cannot be used as a replacement for a maximal exercise test (Takken 2010).

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