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 ‘pace’ (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 Our experience from a recent unpublished survey among Dutch (paediatric) physiotherapists is there is a large variety in performance of the 6MWT among therapists, especially distance between turning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.

References

International Standards for the Neurological Classification of Spinal Cord Injury

Description

The International Standards for Classification of Spinal Cord Injury (ISCSCI) are widely used to classify the type and extent of a spinal cord injury (SCI) (American Spinal Injury Association 2003). The standards are based on comprehensive sensory and motor tests and are used to derive right and left sensory and motor levels. Sensory and motor deficits can be summarised by tallying scores in different ways. For example, strength deficits in the upper limbs can be summarised by tallying the results of the upper limb motor tests (maximal score is 50). Importantly, the sensory and motor tests are also used to classify the type of spinal cord injury using the American Spinal Injury Association Impairment Scale (AIS). The important feature of the AIS is its definitions of complete and incomplete SCI. An SCI is only classified as incomplete if there is some sensory or motor function in the S4/5 segments, ie, if a person has anal sensation or the ability to voluntarily contract the anal sphincter.

Validity and Reliability: The ISCSCI has good face validity because they were developed by expert and international consensus over a 20-year period. The Standards have two components: the physical examination and the classification. Reports on the inter-reliability of performing the sensory and motor tests are variable. One study reported a median (interquartile) Kappa value for assigning sensory and motor scores of 0.59 (0.48 to 0.70) and 0.65 (0.57 to 0.69), respectively (Jonsson et al 2000) while another study reported inter-reliability coefficients (ICCs) (95% CI) ranging from 0.69 to 1.00 (0.25 to 1.00) (Marino et al 2008). The validity of the motor scores have been verified in studies which have found that these scores can predict motor Functional Independence Measure scores reasonably well provided the upper and lower limbs scores are treated separately ($R^2 = 0.71$) (Marino et al 2004).

The reliability of correctly classifying patients using the AIS has also been investigated (Cohen et al 1994, Cohen et al 1996). ICC for assigning total motor and sensory scores is very high (0.91 to 0.99) with little variability due to raters' profession or years of experience. The inter-reliability of correctly classifying patients is more variable with higher reliability for complete paraplegia (1.00) than incomplete tetraplegia (0.91). Another recent study indicated an overall 11% error rate in assigning AIS classifications from trained staff, with a particularly high 46% error rate in correctly assigning an AIS D classification (Chafetz et al 2008).

Commentary

While the ICSCSI are primarily of interest to clinicians working in the area of spinal cord injuries, the sensory and motor tests could be relevant to musculoskeletal physiotherapists. The sensory and motor tests provide a concise way of testing each dermatome and myotome. For example, a three-point testing system is used to test light touch and pinprick for each of the 28 dermatomes on each side of the body spanning from C2 to S4/5. In addition, one key muscle is tested using standard manual muscle testing procedures to evaluate ten important myotomes, namely the C5 to T1 and L2 to S1 myotomes.

An AIS assessment form is freely available in a one page document (http://www.asia-spinalinjury.org/publications/2006_Classif_worksheet.pdf). This makes the assessment appear misleadingly simple. In reality, there are many complexities involved in correctly testing and defining a person's AIS which leads to confusion and a high error rate especially in untrained staff (Chafetz et al 2008). There are also a number of anomalies and ambiguities which are yet be resolved (Waring III et al 2010). There is a comprehensive online training module put out by the American Spinal Injuries Association but it is not freely available.

It is unfortunate that classification by the AIS requires S4/5 sensory and motor tests. These tests are intrusive and involve an assessment of deep anal sensation. The rationale for the reliance on S4/5 is debated in SCI international spheres. Advocates argue that S4/5 sensation or motor function is a strong predictor of future recovery and therefore essential to the classification standards. Others argue that the ISCSCI should not be solely concerned with capturing people's potential for recovery especially as this is primarily of relevance in the first two years after injury when recovery is greatest. Instead, they argue that a classification system should readily convey a person's level of disability, which is best gauged by looking at the overall sensory and motor deficits. Of course, the tallied sensory and motor scores can be used for this purpose. However, tags of ‘incomplete’ or ‘complete’ SCI which are reliant on S4/5 sensory and motor function are often misunderstood outside professional spheres.

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References


