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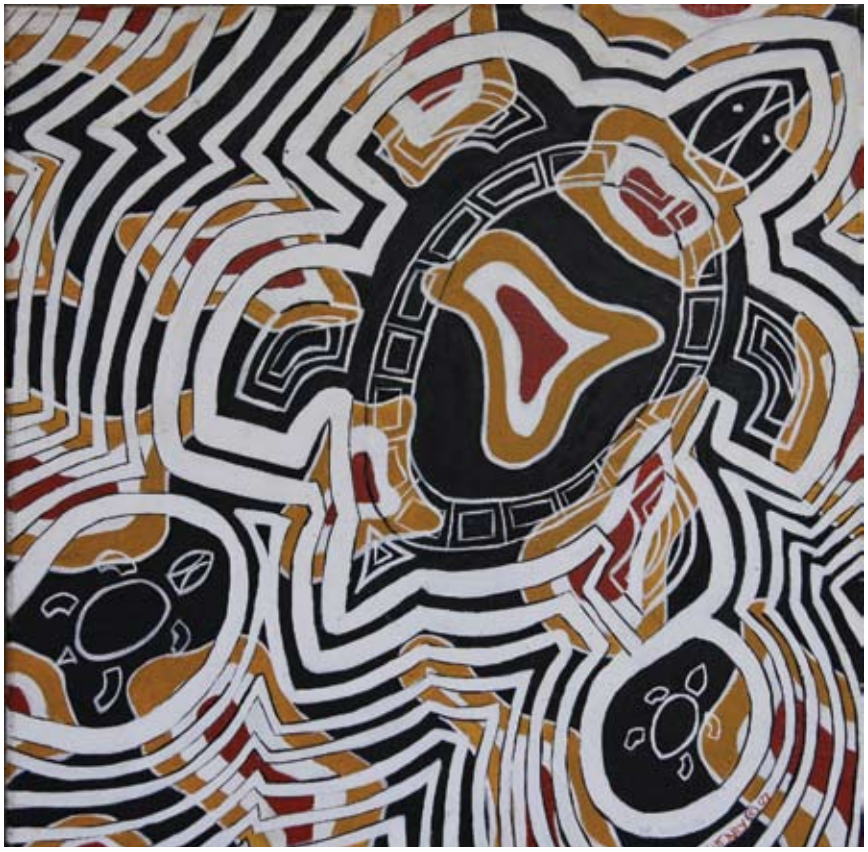

AUSTRALIAN PHYSIOTHERAPY ASSOCIATION

10-metre Shuttle Run Test

Description

The 10-metre shuttle run test is an adapted version of the 20-metre shuttle run test to accommodate children with cerebral palsy (CP) classified at Level I or Level II on the Gross Motor Function Classification System (GMFCS) (Verschuren et al 2006). Separate protocols were designed for each level (SRT-1 and SRT-2). The course is 10 metres long; the end is marked with 2 cones and measuring tape. Subjects should wear regular sports clothing and shoes, and orthoses, if applicable. Each child should also wear a heart rate monitor. Children walk or run between the 2 markers at a set incremental speed. These runs are synchronised with a pre-recorded CD, which plays beeps at set intervals. As the test proceeds, the interval between each successive beep reduces, forcing the child to increase speed over the course of the test, until it is impossible to keep in sync with the recording. There are 2 protocols available for the shuttle run test. The Level I shuttle run test (SRT-I) is for children classified at GMFCS Level 1 (ie, able to walk indoors and outdoors without restrictions). The SRT-I starts at 5 km/h. The Level II shuttle run test (SRT-II) is for children classified at GMFCS Level 2 (ie, able to walk indoors and outdoors with restrictions). The SRT-II starts at 2 km/h. Speed is increased 0.25 km/h every level (minute) for both tests.

Reliability, validity and sensitivity to change: The test-retest reliability for exercise time (ICC coefficients of 0.97 for the SRT-I and 0.99 for the SRT-II) and reliability for peak heart rate attained during the final level (ICC coefficients of 0.87 for the SRT-I and 0.94 for the SRT-II) are good. High correlations were found for the relationship between data for both shuttle run tests and data for the treadmill test (both $r = 0.96$). The test has also been shown to be sensitive to change in children with CP (Verschuren et al 2007). Change in a child's performance of more than 0.84 minute (one level) for the SRT-I and of more than 0.50 minute (half level) for SRT-II can be attributed to real change with 95% confidence.

Commentary

Field tests of aerobic capacity can provide valid, reliable outcome measurements without the burden of expensive equipment in a sophisticated laboratory setting. Although they were developed almost 30 years ago, shuttle run tests are the most widely used field tests to estimate aerobic capacity (Leger and Lambert 1982).

For children who are able to walk independently, the most functional way to assess their aerobic capacity would be a walking- or running-based exercise test. The treadmill protocols that are often used in clinical practice are not appropriate for children with CP. For most children with CP who have problems with movement co-ordination and an equinus position of the foot, the increasing speed and inclining floor are problematic.

For many children, adolescents, and adults with physical disabilities, the 20-m shuttle test is not suitable, because the starting speed (8 km/h) and increase (0.5 km/h) every minute are beyond their capabilities. A continuous progressive exercise lasting between 6 and 17 minutes is optimal for achieving a maximal effort. Both 10-m protocols might be an alternative test to measure aerobic capacity. To choose between the two protocols the 6 minute walk test can be used. If a person walks less than 350 m (< 3.5 km/hr) the SRT-II protocol should be used. If a person walks more than 350 m (> 3.5 km/hr) the SRT-I should be used.

Some people may encounter difficulty in pacing their running speed with the audio signal. Therefore, it is recommended that during the first stages of the test, a 'pacer' might assist the test subject. Once the person understands the instructions, he or she can continue the test without assistance.

Shuttle run tests can be administered easily in a clinical setting. The only requirements are a set of pre-recorded CDs, a 12 metre corridor or exercise room, four cones, measuring tape, a stop-watch, a heart rate monitor, and preferably two test leaders. The heart rate is read from the wrist monitor at the end of the test and noted on a recording sheet. This heart rate can be used to check whether a person has performed maximally (heart rate > 180 bpm).

In summary, shuttle run tests are non-threatening, safe, and can be performed easily. The subject can terminate the test at any point, however the person should be encouraged to produce maximal effort. Moreover, as shuttle run tests require a person to either run or walk between 2 lines, the test does not require acquisition of new skills. Shuttle run tests can be widely used, and seem to be a useful field test for evaluating the aerobic capacity of patients.

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