Appendix SI.

NARROWING BEAM-WALKING TEST

Test overview

The narrowing beam-walking test was designed to assess balance ability in ambulatory individuals with lower-limb impairments who may be at risk for falls (e.g. lower-limb prosthesis users). Its design facilitates an assessment of balance ability with minimal subjective interpretation (i.e. participants are either on or off the beam), while the increasing level of difficulty (i.e. decreasing beam width), renders it suitable for a broad range of ability levels and possible applications.

Equipment

The narrowing beam-walking test requires fabrication of a 7.32 m (24.0 ft) narrowing beam. The beam should be constructed from 4 fixed-width beam segments (wide = 18.6 cm (7.3 inches (in)), intermediate = 8.6 cm (3.4 in), narrow = 4.0 cm (1.6 in), and very narrow = 2.0 cm (0.8 in)) that are each 1.83 m (6.0 ft) in length and 3.8 cm (1.5 in) in height (SFig. 1). Beam segments should be assembled end-to-end, and in order based on width of the walking surface (e.g. wide, intermediate, narrow, and very narrow). Braces should be affixed to the lateral edges of the narrow and very narrow beam segments to restrict beam movement. Braces should extend laterally from both ends of each beam segment. Calibrated marks should be placed every 15.24 cm (6 in) starting at 30.4 cm (2.0 ft) to facilitate scoring each trial. A solid line should be drawn on the top and down the sides of each beam segment at 30.5 cm (1 ft) increments from 0 to 7.32 m (24 ft). Next to each solid line, mark the corresponding distance (e.g. 30.5 cm (1 ft), 61.0 cm (2 ft)). A dashed line is marked every 15.24 cm (0.5 ft) increments between each of the solid lines. Non-slip material can be added to the beam surface if the beam surface is (or may become) slick.

Space

The narrowing beam-walking test requires an open space (e.g. a hallway) suitable for assembling the narrowing beam segments and administering the test. The narrowing beam should be constructed and placed at least 0.91 m (3.0 ft) away from the wall or other structures so that tested individuals cannot rely on them for support. It is also recommended that administrators leave at least 0.91 m (3.0 ft) at the beginning and end of the walking beam. Therefore, an open area at least 9.14 m (30.0 ft) by 2.03 m (6.7 ft) is recommended.

Administration

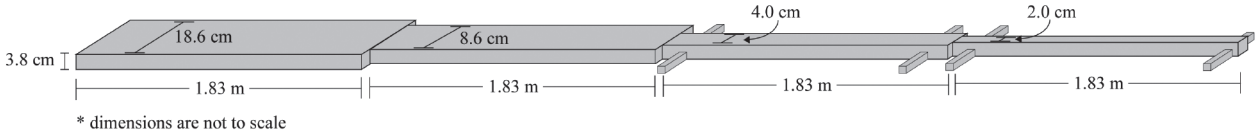
Number of trials. The narrowing beam-walking test requires that individuals attempt 5 walking trials along the length of the narrowing beam. Administrators should give tested individuals rest breaks between each trial.

Starting position. Tested individuals should begin the test on the wide segment (18.6 cm, 7.3 in) of the narrowing beam. The tested individual should start with one foot on the beam and the other on the ground to the side. The tested individual should be asked to walk along the beam without using an assistive device other than a prosthesis (e.g. cane).

Test instructions. Tested individuals should be provided with the following standardized verbal instructions:

- First, describe the goal of the test: "*The goal of this test is to walk as far as possible along the beam. Speed is not being evaluated.*"
- Secondly, describe the starting position: "*Begin the test by standing with one foot on the wide end of the beam and the other foot to the side on the ground. You may choose which foot to put on the beam and which to put on the ground. Please cross both your arms across your chest.*"
- Thirdly, describe the walking task: "*When I say 'begin' you may start to walk along the beam as far as you can. Please walk at a comfortable speed. Remember to keep your arms crossed over your chest as you walk. Once you uncross your arms or step off the beam, I will ask you to stop. I will now demonstrate the test for you.*"
- Lastly, demonstrate the test and confirm that the tested individual understands the test. Upon confirmation, begin the test: "*Are you ready? Begin.*"
- Repeat the test 4 more times (a total of 5 trials).

Placement of test administrators. Narrowing beam-walking test administrators should position themselves half a step behind the tested individual so as not to pace or distract them. This distance also allows the administrator to be close enough to spot and prevent them from falling, should the tested individual lose their balance.



SFig. 1. Narrowing beam-walking design.

Scoring

Each narrowing beam-walking test trial should be scored using the "normalized distance". Normalized distance for each trial is measured based on the most anterior position of the last foot on the beam when the tested individual steps off the beam or uncrosses his or her arms. Distance should be recorded in 15.24 cm (0.5 ft) increments using the calibrated marks on the side or surface of each beam segment. If a tested individual's foot is between markings when he or she steps off the beam or uncrosses their arms, round down to the nearest increment. Normalized distance is calculated by dividing the distance walked in each trial by the final 6.71 m (22.0 ft) of the beam. Using 6.71 m (22.0 ft) rather than the full 7.32 m (24.0 ft) accounts for the distance tested individuals need to start with one foot on the beam and take an initial step as they begin walking on the beam.

For example, if the tested individual did not reach the 0.61 m mark on a trial then the normalized distance was 0.0. If he or she successfully walked the length of the beam the normalized distance was 1.0. Normalized distance was calculated as 0.36 if the tested individual stepped off the beam at the 3.05-m mark (i.e. 2.44 m/6.71 m).

The narrowing beam-walking test should be scored as the mean normative distance walked on trials 3 through 5. Record the normative distances and final narrowing beam-walking test score using STable I.

STable I. Narrowing beam-walking test (NBWT) scoring sheet (SI units)

Trial	Walking distance (in feet or m)	Normative distance (Distance/22.0 feet or Distance/6.7 m)
1		
2		
3		
4		
5		
NBWT Score*	N/A	

*NBWT Score is calculated as the mean normative distance measured during trials 3–5.