

Outcome Measure	Trail-Making Test (TMT)
Sensitivity to Change	Yes
Population	Adult
Domain	Neuropsychological Impairment
Type of Measure	Objective test
ICF-Code/s	b1
Description	<p>The Trail Making Test is a neuropsychological test of visual attention and task switching. It can provide information about visual search speed, scanning, speed of processing, mental flexibility, as well as executive functioning. It was originally part of the Army Individual Test Battery (Armitage, 1946).</p> <p>There are 2 parts to the TMT. Both parts of the Trail Making Test consist of 25 circles distributed over a sheet of paper. In Part A, the circles are numbered 1 – 25, and the patient should draw lines to connect the numbers in ascending order. In Part B, the circles include both numbers (1 – 13) and letters (A – L); as in Part A, the patient draws lines to connect the circles in an ascending pattern, but with the added task of alternating between the numbers and letters (i.e., 1-A-2-B-3-C, etc.). The patient should be instructed to connect the circles as quickly as possible, without lifting the pen or pencil from the paper. Time the patient as he or she connects the "trail." If the patient makes an error, point it out immediately and allow the patient to correct it. Errors affect the patient's score only in that the correction of errors is included in the completion time for the task. It is unnecessary to continue the test if the patient has not completed both parts after five minutes have elapsed.</p>
Properties	<p><u>Test-retest reliability</u>: (des Rosiers & Kavanagh, 1987) In head injured patients following intervals of between 24-36 hours, correlations for Trails A was .83 and for Trails B was .90. Practice effects have been found to significant only for Trails B. In other studies (not specific to TBI), test-retest or intra-interview (within rater) reliability (as applicable): For intervals of 3 weeks to 1 year, test-retest reliability is moderate to high for Part A (r=.36 to .79) and Part B (r=.44 to .89) (Bornstein et al., 1987, Matarazzon et al., 1974, Dikmen et al., 1999).</p> <p><u>Alternative-form reliability</u>: (de Rosiers & Kavanagh, 1987) In head injured patients, correlations between alternative forms of Trails A was .79 and .88 for Trails B.</p> <p><u>Construct validity</u>: (de Rosiers & Kavanagh, 1987) In head injured patients, TMT was most dependent on Rapid Visual Search and Visuomotor sequencing. In normal participants, trails A was found to reflect mainly visuoperceptual abilities, Trails B was found to primarily reflect working memory and secondarily task-switching ability, while B-A minimizes</p>

	<p>visuoperceptual and working memory demands, providing a relatively pure indicator of executive control abilities (Sanchez-Cubillo et al., 2009). Digit Symbol subtest and Digits forward/Backward (WAIS-III), a Finger Tapping Test, Stroop Test, and a task-switching paradigm inspired by the WCST was used in this study. Part A and B correlate moderately ($r=.31$) (Heilbronner et al., 1991). Subtests also found in other studies to correlate with visual search tasks ($r=.37$ to $.93$) (Ehrenstein et al., 1982).</p> <p><u>Concurrent validity:</u> Both Trails A and B (and alternate forms) clearly differentiated brain injured from control groups TMA ($F(1,62) = 9.01$, $p<.023$) and TMB ($F(1,62) = 8.12$, $p<.034$).</p> <p>Also see Lezak et al. (2004) and Strauss (2006).</p>
Advantages	<ul style="list-style-type: none"> • Easy to administer. • No clinical training is necessary. • Normative information is available. • Free, although there are versions available for purchase. • Tests, specific cognitive processes (i.e, processing speed and cognitive flexibility). • Parallel version of the TMT are available, but not often used (de Rosiers & Kavanagh, 1987). • Task has been tested at sites in the United States, Canada, United Kingdom, Australia, Germany, and Spain.
Disadvantages	<ul style="list-style-type: none"> • There are practice effects, particularly for Trails B. • Instructions can be confusing for some individuals. • Can be frustrating for people who lose track of where they are and cannot proceed. Participants who are very cognitively impaired may not be able to complete the task, which must be dealt with statistically (e.g., set a maximum time for noncompleters). • Test doesn't give a clear indication of function which is impaired, this needs to be interpreted. • The examiner must carefully monitor a participant's performance to accurately score errors. The reliability of test administration can vary by examiner's reaction time in noticing errors and pointing them out, which introduces imprecision. • More severe motor impairment may influence results.
Additional Information	<p>The TMT is a Core measure in the Neuropsychological Impairment Domain in Wilde et al (2010).</p> <p>Note: Some of the above psychometric property information was obtained from the US-based common outcome measure project briefs.</p>
Reviewers	Skye McDonald

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