

Note: this document may not describe the most recent version of this cognitive test available from TestMyBrain. TestMyBrain cognitive test documentation will be updated over the next several months to align with current test versions.

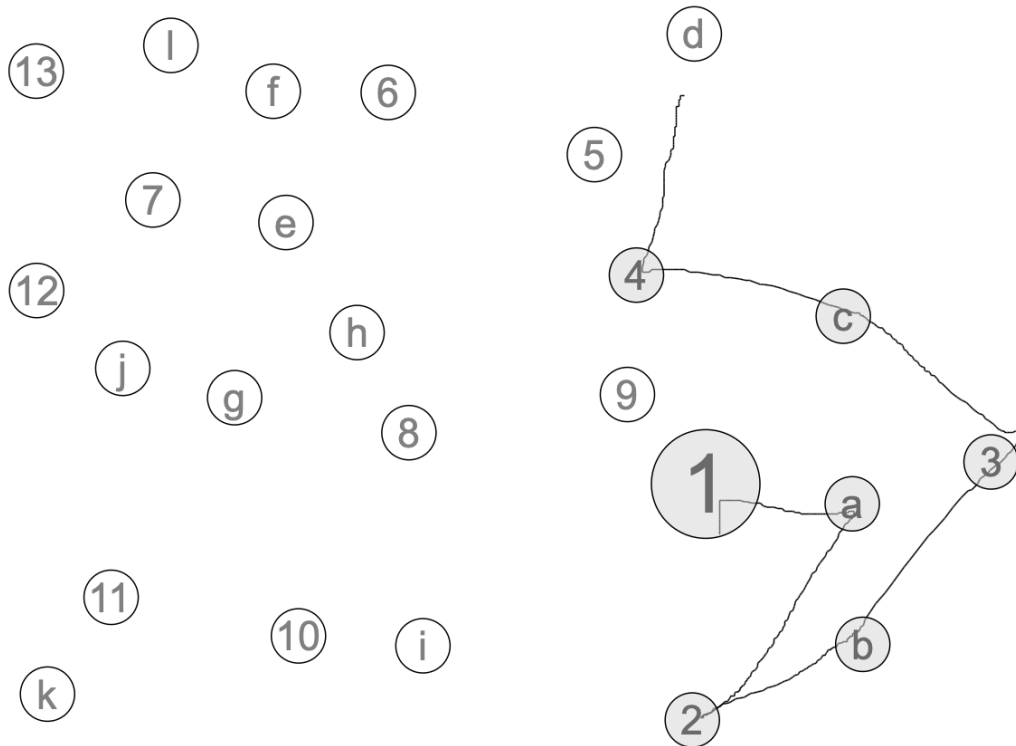
## TMB Trail-Making Task (Part B)

**Constructs Measured:** Visual attention, cognitive processing speed, executive function

**Duration:** 1 minute

**Sample size for which normative data are available:** 27,857

**Description of procedure:** Connect a series of 25 dots labeled with letters and numbers in alternating alphabetical and numerical order as quickly as possible while maintaining accuracy.



This test is a digital adaptation of the trail-making task, a widely-used neuropsychological assessment (e.g. Reitan, 1958). It is typically used in conjunction with TMB Trail-Making Task (Part A), a similar test does not involve task switching; see documentation for this test for more information. This task is brief, reliable, and interpretable in the context of existing literature. However, one main drawback of this test is that it is difficult to complete on small screens, such as those on typical mobile phones. Thus, it should only be used for participants who are known to have access to a computer or tablet.

## **Psychometric Characteristics**

Here we focus on median time (in ms) to connect 2 points as the primary outcome measure or score. Overall duration to complete all 25 points, mean reaction time, or accuracy can also be used as measures of performance.

This test shows high reliability; split-half reliability for median reaction time was 0.96 (using Spearman-Brown correction). Distribution of scores is normal (see Figure 1). Scores on this test are close to normally distributed (see Figure 1). Average reaction time decreases throughout adolescence and is fastest in young adulthood before slowing with age throughout adulthood (see Figure 2). Gender differences in performance on this test are minimal (see Figure 3). Higher levels of education are associated with faster performance (see Figure 4).

Participants who reported that they had completed this test before had a mean reaction time of 1026.39 ms, compared to 1101.41 ms for participants who were taking the test for the first time. This suggests that there is some effect of practice on performance.

## **Validation**

Trail-making tasks are widely used in clinical neuropsychology to measure impairments in cognitive processing, attention, and executive function. TMB Trail-Making Task Part B is strongly correlated with TMB Trail-Making Task Part A, a similar task that does not involve a task-switching component (age-controlled  $r = 0.44$ , 95% CI = (0.43, 0.44)). It is also correlated with TMB Simple Reaction Time (age-controlled  $r = 0.23$ , 95% CI = (0.22, 0.25)) and TMB Digit Symbol Matching (age-controlled  $r = 0.38$ , 95% CI = (0.35, 0.40)), measures of cognitive processing speed.

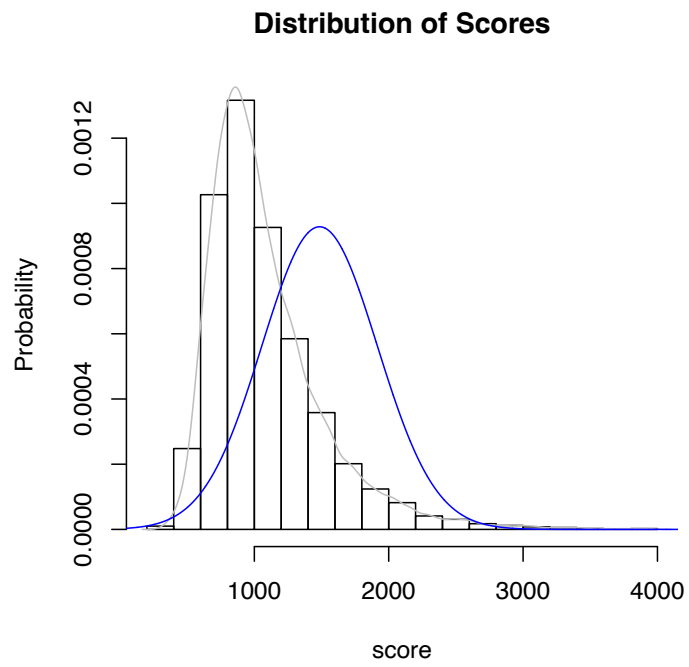
## **Appropriateness for Field Test Use**

This test includes a practice trial in which participants complete a 12-target version of the trail-making task; they must complete this trial correctly before they can begin the test. This ensures that participants understand the requirements of the test before the scored portion begins.

**Device Effects:** The TMB Trail-Making Test (Part B) is best suited to completion on laptop and desktop computers or tablets; the close clustering of targets and small size of target labels make completion difficult on mobile phone screens. Participants who completed the test using an iPhone had a mean reaction time of 1358.18 (SD 605.31), compared to 1051.23 (SD 599.53) for users of iPads and 1027.87 (SD 399.25) for users of Macintosh laptop or desktop computers.

**Participant Burden:** This test appears to pose a relatively low burden to participants. Batteries on TestMyBrain.org containing this test had a mean participant rating of 3.84/5, compared to a sitewide average of 3.67/5. 91% of participants who began this test completed it.

Figure 1. Distribution of scores



*Figure 2. Age-related differences in performance*  
**Age Differences**

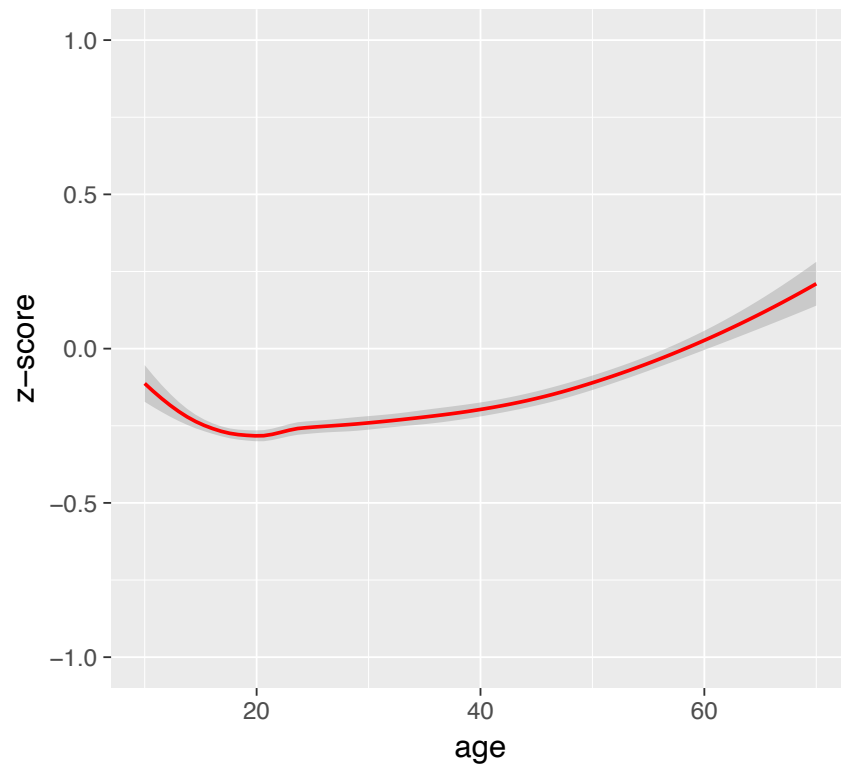


Figure 3. Sex differences in performance

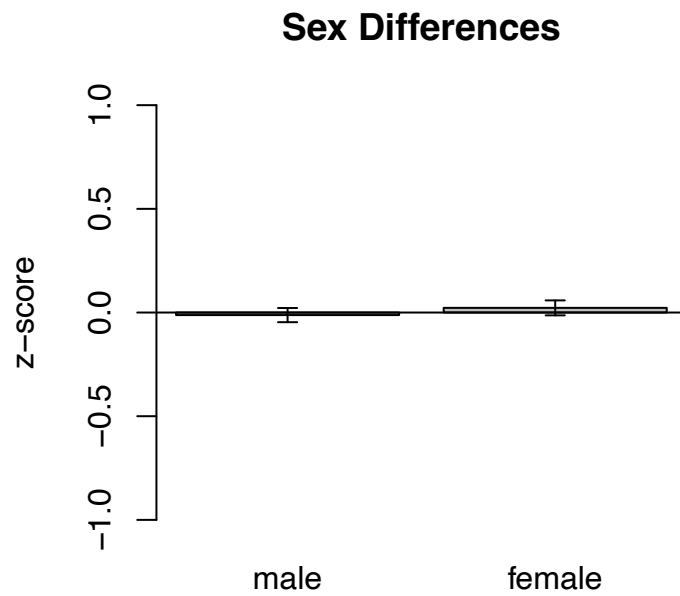


Figure 4. Education-related differences in performance

