

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.

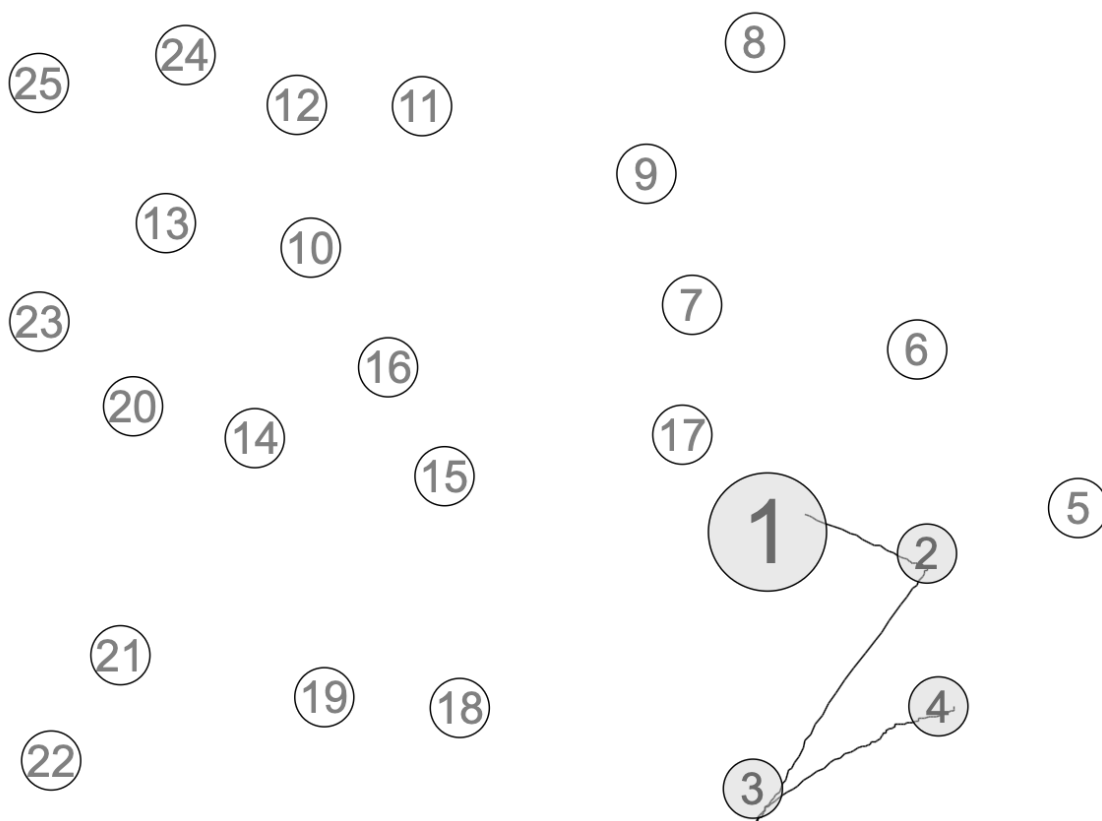
TMB Trail-Making Task (Part A)

Constructs Measured: Visual attention, cognitive processing speed

Duration: 1 minute

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

Description of procedure: Connect a series of 25 numbered dots in 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 B), a similar test that involves a task-switching component; 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). Average reaction times become faster throughout adolescence and peak in young adulthood, with reaction time slowing with age throughout adulthood (see Figure 2). The average reaction time for male participants is slightly faster than that of female participants (see Figure 3). Participants with less than a high school education show slightly slower reaction times than other education groups, but there is not a consistent effect of education (see Figure 4).

Repeat participants show slightly faster performance (median reaction time group mean = 683.27, SD = 250.30) than first-time participants (mean = 701.92, SD = 244.13), suggesting that there may be practice effects on this test.

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 A is strongly correlated with TMB Trail-Making Task Part B, a similar task that adds 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 $r = 0.20$, 95% CI = (0.19, 0.22)) and TMB Digit Symbol Matching (age-controlled $r = 0.27$, 95% CI = (0.26, 0.30)), 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 A) 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. iPhone users showed slower reaction times (mean = 852.71, SD = 455.44) than users of iPad tablets (mean = 588.50, SD = 266.34) or Macintosh computers (mean = 685.85, SD = 196.74).

Participant Burden: The TMB Trail-Making Test (Part A) is relatively well-tolerated by participants. Batteries containing this test have a mean participant rating of 3.85/5, higher than average battery ratings on TestMyBrain.org (3.67/5). 81% of participants who begin this task complete it, a rate equal to the average sitewide battery completion rate.

Figure 1. Distribution of scores

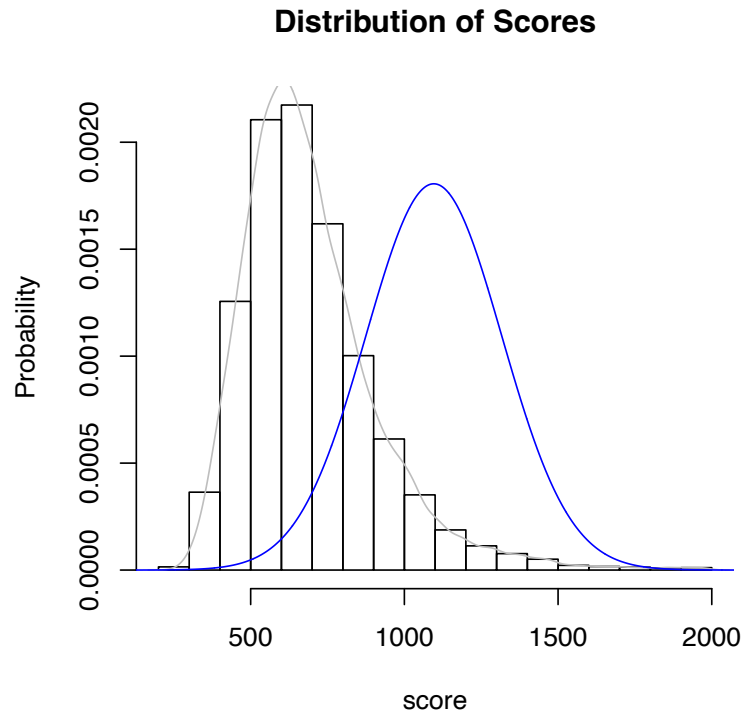


Figure 2. Age-related differences in performance

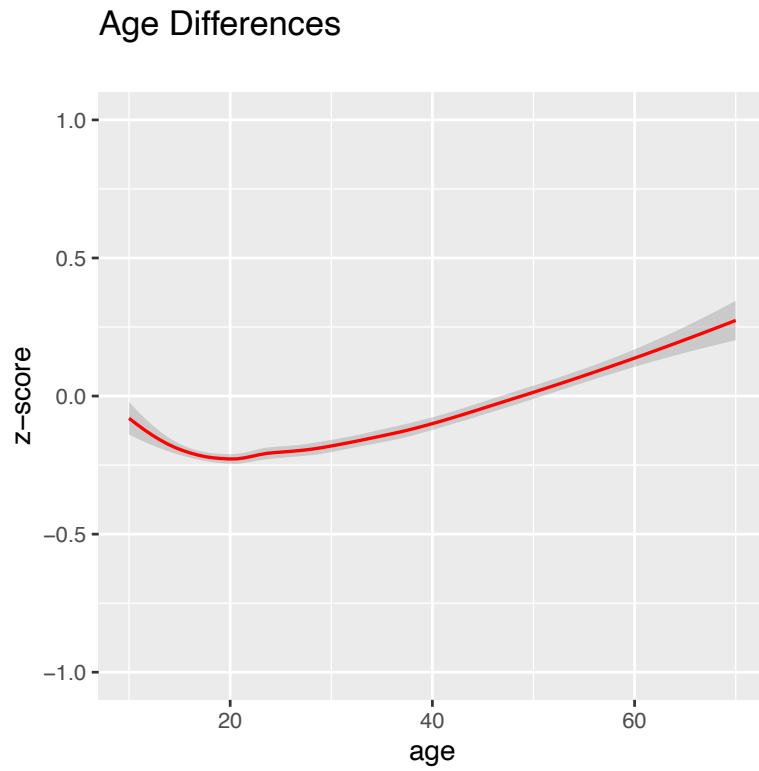


Figure 3. Sex differences in performance

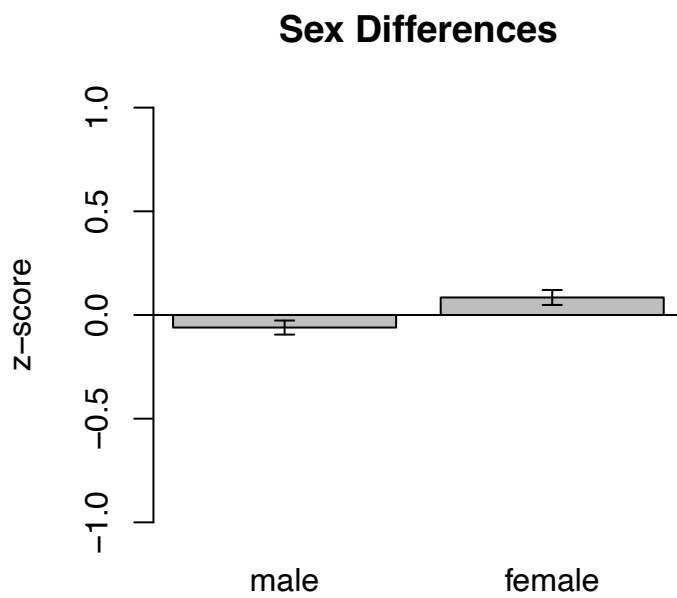


Figure 4. Education-related differences in performance

