

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.

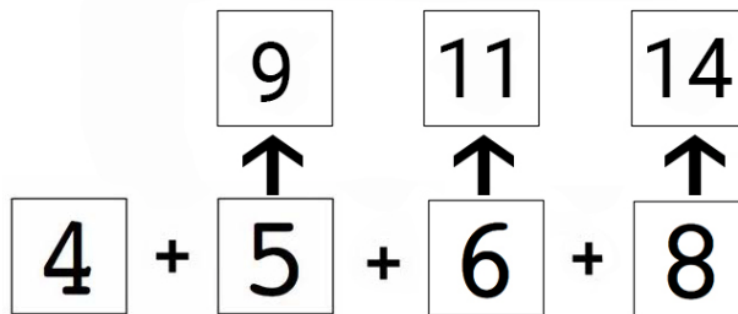
TMB Paced Serial Addition Test

Constructs Measured: Working memory, attention, information processing speed

Duration: 3 minutes

Sample size for which normative data are available: 3682

Description of procedure: A series of numbers (1-9) are presented on screen at a rate of 1 every 1.8 seconds. When a new number is shown, participants judge whether the past 2 numbers shown have a sum greater than or less than 10.



The Paced Serial Addition Test is a visually presented adaptation of the Paced Auditory Serial Addition Test, a widely used measure of information processing, memory, and attention. Advantages of the task are that it can be administered easily on a mobile device, assesses multiple cognitive domains, and is interpretable in the context of a large body of existing literature. Drawbacks include the significant burden placed on participants, who rate this test lower than most online cognitive tests.

Psychometric Characteristics

Here we focus on accuracy (proportion of responses that are correct) as the primary outcome measure or score. Scores are approximately normally distributed, with minor ceiling effects (see Figure 1). Performance is variable across the lifespan, with steep developmental improvements and modest age-related decline (see Figure 2). Looking at age-corrected scores, gender differences in performance are minimal (see Figure 3). Participants with higher educational attainment also show superior performance (see Figure 4).

This test shows high internal reliability ($r = 0.78$, split-half correlation with Spearman-Brown correction) despite its short length. There were no significant practice effects on this test; first-time participants had a mean accuracy of 74.8%, while repeat participants had a mean accuracy of 76.0%.

Validation

The TMB Paced Serial Addition Test is based on the Paced Auditory Serial Addition test (Gronwall, D., & Sampson, H., 1974), a task commonly used to assess impairments in cognitive processing in patients with traumatic brain injury or other neuropsychological syndromes. Unlike the original task, this test uses visual rather than auditory stimuli, making it easier to complete in a variety of contexts using a participant's own device.

Performance on the PSAT shows a strong correlation with performance on the TMB Gradual Onset Continuous Performance Test ($r = 0.26$), a sustained attention task, as well as the TMB Multiple Object Tracking task ($r = 0.29$), a measure of ability to attend to multiple stimuli. It also correlates negatively with TMB Choice Reaction Time median reaction time ($r = -0.29$), indicating that participants with shorter reaction times show better information processing on this task.

Appropriateness for Field Test Use

The PSAT includes multiple phases of practice before the test begins, including demonstrations of sample test items and short tests with immediate feedback. This ensures that participants are familiar with the task before they begin the scored test.

Device Effects. This test can be administered on both mobile devices and laptop/desktop computers. Differences in performance between users of different devices were minimal (mean accuracy for iPhone = 0.73, iPad = 0.74, Macintosh computer = 0.77). However, due to the fact that numbers are presented visually, it is important that the participant uses a device with a large enough screen to allow them to see the numbers clearly.

Participant Burden: This task is somewhat burdensome to participants. Average participant ratings of this test (3.46/5) are lower than average ratings of tasks on TestMyBrain (3.67/5). 71% of participants who started this test completed it, compared to a sitewide battery completion rate of 81%.

Figure 1. Distribution of scores

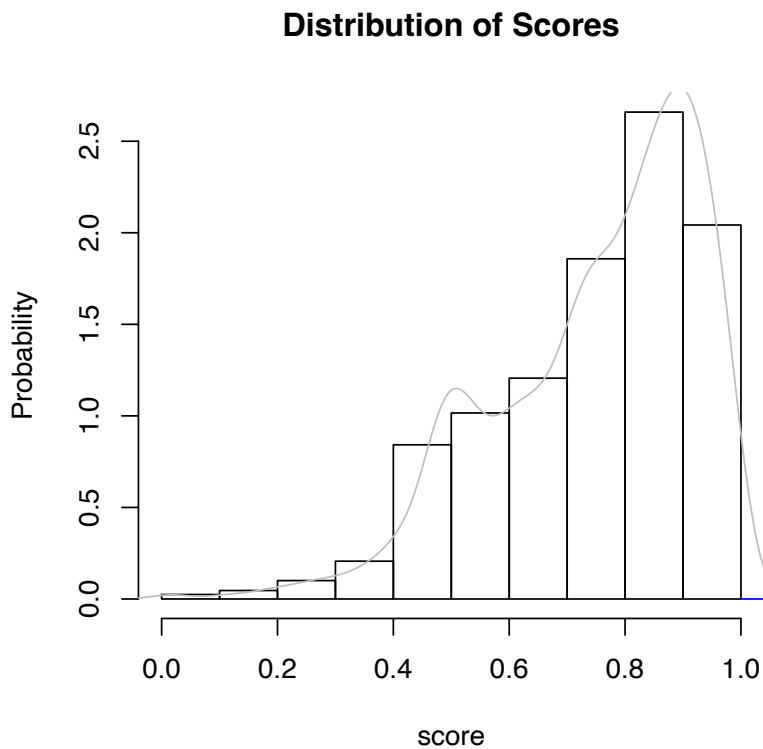


Figure 2. Age-related differences in performance

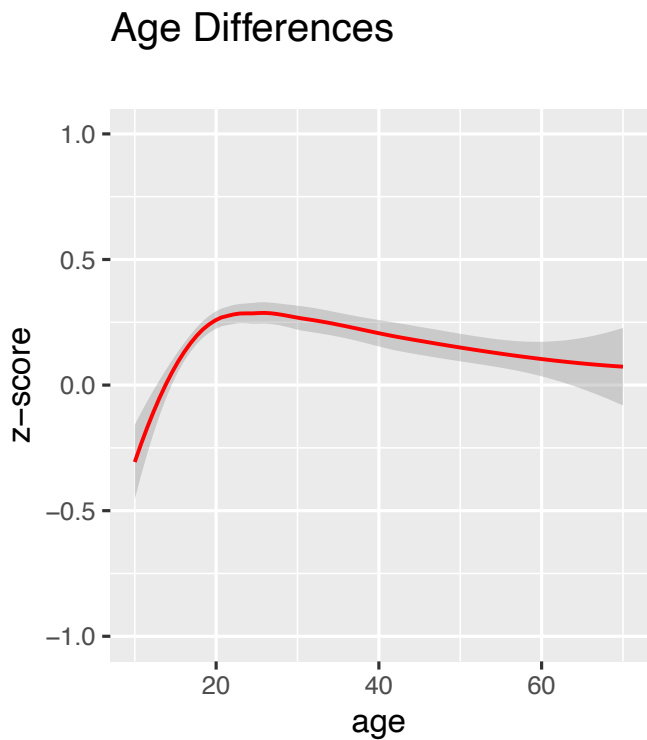


Figure 3. Sex differences in performance

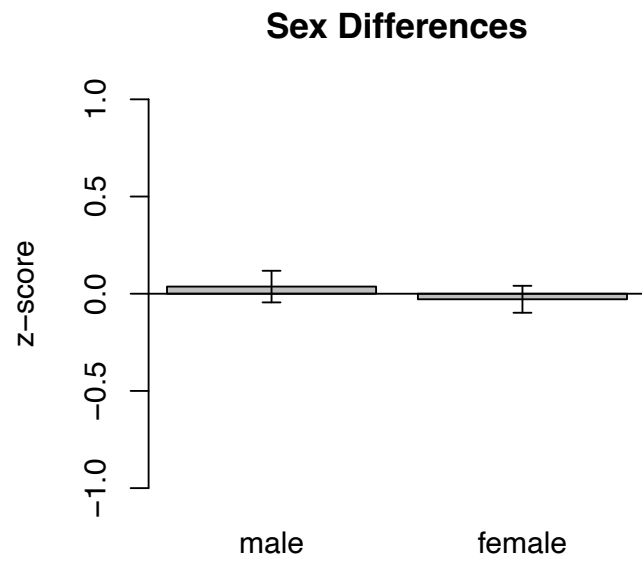


Figure 4. Education-related differences in performance

