

Cognitive Task Workflow Overview: TestMyBrain Verbal Paired Associates Memory (Abstract/Hard Version)

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TMB Test Name: TestMyBrain Verbal Paired Associates Memory (Abstract/Hard Version)

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The Many Brains Project

[The Many Brains Project](http://TheManyBrainsProject) is a US-based 501(c)3 non-profit focused on the development of digital cognitive testing tools. We currently support many different types of research studies through our infrastructure for cognitive assessment - these range in size from small lab-based pilot studies to large longitudinal, multisite clinical research studies with tens of thousands of participants. As TestMyBrain.org has been continuously in operation since 2008, we provide a stable and secure platform for hosting and delivering mobile and web-based cognitive assessment protocols. Through TestMyBrain.org, data have been collected from over 2.5 million participants in a *citizen science* framework that includes structured return of research results toward the development, validation, and normative characterization of cognitive measures. We currently support research and education at over 400 sites worldwide as well as support for over 1200 clinicians or clinical sites engaged in remote digital neuropsychological assessment. For more information contact info@manybrains.net.

CITATION

Please credit The Many Brains Project and TestMyBrain in any papers, posters, or publications related to the TMB tests or data collected by TMB tests.

- Example:
 - All tasks were selected from and hosted on The Many Brains Project's web-based cognitive testing platform, TestMyBrain (Germine et al., 2012; The Many Brains Project).
 - Germine, L., Nakayama, K., Duchaine, B. C., Chabris, C. F., Chatterjee, G., & Wilmer, J. B. (2012). Is the Web as good as the lab? Comparable performance from Web and lab in cognitive/perceptual experiments. *Psychonomic Bulletin & Review*, 19(5), 847-857.
 - The Many Brains Project. *TestMyBrain Cognitive Tests*. URL: www.manybrains.net

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General Task Overview

Background:

TestMyBrain Verbal Paired Associates (Germine et al., 2012; Singh et al., 2021) is a recognition memory test adapted from the Wechsler Memory Scale-III (Wechsler, 1997) for remote administration.

Task Parameters:

Participants are visually presented with 25 pairs of words (e.g., OFFICER | KETTLE), and informed they will later be tested on which words were paired together. Word pairs are presented sequentially for 3000 ms each, with a 500 ms interstimulus interval between pairs. After a delay of approximately 1.5-2.5 minutes, during which another brief test is typically completed (e.g., TMB Digit Symbol Matching), participants are sequentially presented with one word from each of the studied word pairs, and asked to identify which word was previously paired with it by selecting the correct word from a list of four response options. On each test trial, there are four response options presented in a random order: (1) the correct answer, which also appears on another trial as an incorrect answer, (2) an incorrect answer that also appears on another trial as the correct answer, (3) an incorrect answer that also appears on another trial as an incorrect answer, and (4) an incorrect answer that is only a response option for the current trial. Participants complete one unscored practice trial before beginning the 25 test trials. All participants complete the trials in the same order.

Primary Outcome:

The suggested primary outcome is the proportion of trials answered correctly.

Input Device:

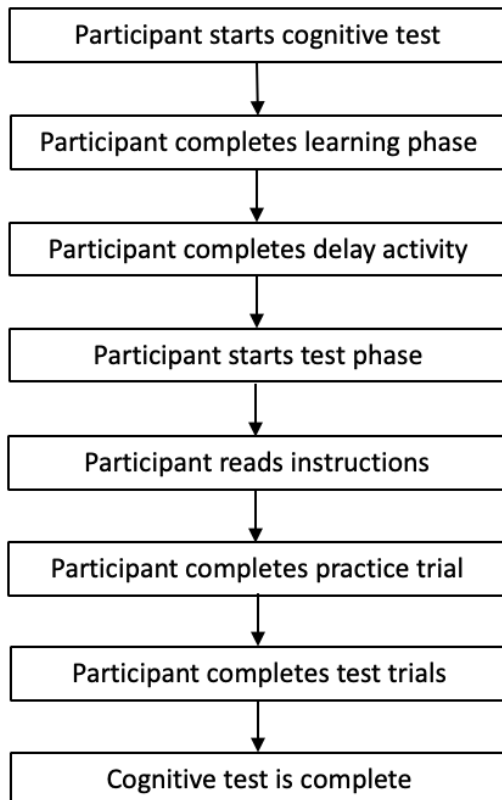
Participants using touch-compatible devices select their responses by touching the desired response option, whereas participants without touch-compatible devices make their response by selecting their desired response option with a mouse click.

References:

- Germine, L., Nakayama, K., Duchaine, B. C., Chabris, C. F., Chatterjee, G., & Wilmer, J. B. (2012). Is the Web as good as the lab? Comparable performance from Web and lab in cognitive/perceptual experiments. *Psychonomic Bulletin & Review*, 19(5), 847-857.
- Singh, S., Strong, R. W., Jung, L., Li, F. H., Grinspoon, L., Scheuer, L. S., Passell, E. J., Martini, P., Chaytor, N., Soble, J. R., & Germine, L. (2021). The TestMyBrain Digital Neuropsychology Toolkit: Development and Psychometric Characteristics. *Journal of Clinical and Experimental Neuropsychology*, 43(8), 786-795.
- Wechsler, D. (1997). Wechsler Memory Scale-III. San Antonio, TX: Psychological Corporation.

Detailed Task Activities

Flow Diagram



1) Learning Phase

Description

Participants are visually presented with 25 pairs of words (e.g., OFFICER | KETTLE), and informed they will later be tested on which words were paired together. Word pairs are presented sequentially for 3000 ms each, with a 500 ms interstimulus interval between pairs. Participants' progress through the learning phase is presented above the word pairs.

Screenshots

- Instructions:

Instructions:

SKY - BLUE

You will see 25 word pairs, like above.
Learn which words go together.
Later you will be tested on that!

[Click here to continue](#)

- Trial Structure:

Intertrial Interval 500 ms	Word Pair Displayed 3000 ms
1 of 25	1 of 25 OFFICER - KETTLE

2) Delay Activity

Description

After completing the learning phase of the test, a message appears informing participants that they will be tested later on the word pairs they just studied. A delay of approximately 1.5-2.5 minutes then occurs before the testing phase of the test is completed. During this delay, participants typically complete a separate cognitive test (e.g., TMB Digit Symbol Matching).

Screenshots

- Message after learning phase:

You will be tested on these word pairs shortly.
But first, let's do some other tests!

[Click here to continue](#)

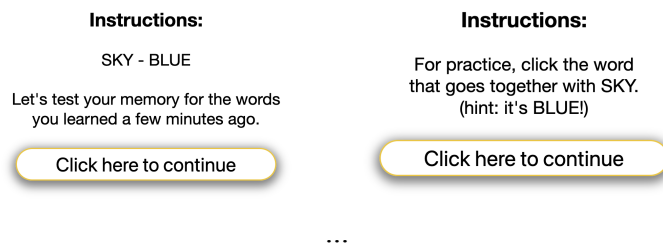
3) Testing Phase: Instructions

Description

The participant views brief instructions for the testing phase and clicks a button when ready to start the practice trial. No data is generated during the instructions phase.

Screenshots

- Instructions:



4) Testing Phase: Practice Trial

Description

The participant completes one practice trial. The probe word (SKY) and four response options remain on the screen until the participant selects a response, or 10 seconds elapse and the trial times out. If the wrong answer is selected or the trial times out, the participant is informed that they should click the correct answer (BLUE) and is required to retry the practice trial. The practice trial is recorded in the trial level data for the test, but does not contribute to full test outcomes.

Screenshots

- Practice trial probe word and response options:

Practice

SKY – ?

1. POT
2. PAN
3. BLUE
4. DISH

- Feedback following incorrect response or timeout:

The word pair you learned was:
'sky - blue'

You should click **'blue'**.

[Click here to retry](#)

5) Testing Phase: Test Trials

Description

After completing the practice trial, the participant views a screen informing them the test trials are about to begin. The participant then completes 25 test trials without receiving response feedback. On each trial, the participant has 10 seconds to make a response before the trial times out and a message appears informing them they are taking too long to respond; when this occurs, the participant must press a button to restart the trial. The participant's progress through the test is presented at the top of the screen throughout the test trials. On each trial, one of the wrong answers is a correct response to another trial. Test trials are recorded in the trial level data for the test, and also contribute to full test outcomes. The test ends when participants have made responses for all 25 test trials.

Screenshots

- Message before test trials:

Excellent!

You will be asked to recall all 25 pairs of words you saw previously.

Let's start!

[Click here to continue](#)

- Timeout message:

You are taking too long to respond.

You should click the word that goes with '**chance**'.

[Click here to retry](#)

- Test trial structure:

Intertrial Interval 500 ms	Trial Displayed until response or timeout (10 s)	Response Highlighted 300 ms
1 of 25	1 of 25 CHANCE - ? 1. ESSENCE 2. INTELLECT 3. DISTINCTION 4. IMPULSE	1 of 25 CHANCE - ? 1. ESSENCE 2. INTELLECT 3. DISTINCTION 4. IMPULSE

Trial Level Data

Variable	Description
type	Trial type ['practice', 'test']
probe	probe word
target	target word
response	word chosen by the user
correct	response correctness, boolean [0,1]
rt	reaction time (ms)
state	event triggered by the response: timeout => no response until timeout touchend, pointerup.touch => touchscreen touch mouse, pointerup-mouse => mouse

Full Test Outcome Data

Variable	Description
score	number of correct 'test' trials
accuracy	Proportion correct responses for 'test' trials. Recommended primary test outcome.
meanRTc	Average reaction time of correct responses to 'test' trials (ms)
medianRTc	Median reaction time of correct responses to 'test' trials (ms)
sdRTc	Standard deviation of reaction times of correct responses to 'test' trials (ms)
responseDevice	User's response device: touch mouse pen
testVersion	Test's script version
score	number of correct 'test' trials

