

Comprehensive Baseline Cognition Measurements Portal Dataset Overview

The following document provides high level information pertaining to the cognitive measurements performed by the CLSA participants and the CLSA cognitive data available to researchers for the Comprehensive cohort. For references on the version of the measurements lists please see the Comprehensive baseline questionnaires on <https://www.clsa-elcv.ca/>.

The CLSA Comprehensive cohort participants were asked to complete the following cognitive measurements:

1. Rey I (Rey Auditory Verbal Learning Test) - A memory test that required the participant to listen to a list of 15 common words and immediately recall them within 90 seconds.
2. AFT (Verbal Fluency (Category) - Animal Fluency Test) - Required the participant to name as many animals as they could in 60 seconds.
3. MAT (Mental Alternation Test) - Broken into 3 progressive sub-tasks, each sub-task was allowed 30 seconds. The sub-tasks are:
 - i. Count from 1 to 20;
 - ii. Recite the letters of the alphabet; and,
 - iii. Alternate between numbers and letters (i.e., 1, A, 2, B, 3, C, etc.).
4. Rey II (Delayed Rey Auditory Verbal Learning Test) - The participant had 60 seconds to recall as many of the 15 words as they could from task 1.0 (Rey I).
5. PMT (Event-based Prospective Memory Test) - A memory test that required the participant to complete a task at the sound of the alarm. Instructions were provided at the start of the test and a 30 minute time was set on the alarm.
6. Stroop Neurological Screening Test – Broken into three progressive sub-tasks, the participant was required to state the color of ink on stimulus cards. The cards were presented sequentially and were:
 - i. Colored dots;
 - ii. Common words printed in same colors as dots; and,
 - iii. Color words printed in non-corresponding colors of ink.
7. FAS (Controlled Oral Word Association Test) - Broken into 3 independent sub-tasks, each sub-task had a time limit of 60 seconds. The participant was required to name as many words as they could starting with;
 - i. “F” words;
 - ii. “A” words; and,
 - iii. “S” words.

8. CRT (Choice Reaction Time Test) - Required the participant to press a key on a touch screen as quickly and accurately as possible.
9. TMT (Prospective Memory Test) - A memory test that required the participant to complete a task at a certain time.

The purpose of the cognition module is to assess the cognitive functioning of participants and identify changes in function over time. Progressive decline in cognitive functioning may occur throughout late middle age and later life. Such decline may be associated with social withdrawal, limitations and depression. Below is a brief description of the measurements performed and the data available. More detailed information is available in the CLSA Comprehensive Cognition Process Document (Baseline).

1.0 REY I (REYI_SCORE_COM = VARIABLE NAME)

The participant was played a list of 15 recorded words and asked to recall as many words as possible in any order, with a 90 second time limit. The participant's responses were recorded electronically and entered into a database by two different typists that were blinded to each other. Data entry conflicts were identified electronically and resolved by a supervisor. The electronic scoring algorithm was applied to the cleaned data with the following rules:

- 1 point was awarded for each word correctly recalled (primary word).
- 1 point was awarded for any approved variant word, defined as a permitted word that sounded similar to the recorded word being recited (e.g., for the primary word "colour", collar was accepted as a variant, based on variability in participants' accents and the possibility that participants misheard the original recording).
- 0 points were awarded for any word provided that was not a primary or variant word.

Validation of the electronic scoring algorithm was performed during the tracking cohort by manually scoring 200 data sets and comparing them to the electronic score to ensure accuracy. A recheck was completed in the Comprehensive cohort by manually scoring 30 additional datasets which were compared to the electronic score.

The data available to researchers are; each participant's test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

2.0 AFT

2.1 Algorithm 1 (AFT_SCORE_1_COM = Variable name)

The participant was asked to name as many animals as possible in 60 seconds. The participant's response was recorded and the recordings were double data entered into a database. Data entry conflicts were identified electronically and resolved by a supervisor. Specific rules and guidelines were developed by the CLSA to ensure consistent scoring. Two AFT scores were determined from the data and details of the differences between the two scores are described below.

Animal names provided by the participants that met the CLSA animal definition were considered primary and coded based on their scientific taxonomic classification. The codes are 7 digits long, 1 digit was provided for each of the following: category (fish, arthropod, mammal, bird,

etc.), scientific taxonomic class, scientific taxonomic order, scientific taxonomic family, scientific taxonomic genus, scientific taxonomic species, breed/scientific taxonomic sub-species. The high level rules for coding animals were as follows: animals with the same scientific taxonomic classification with variant names (e.g., cougar and puma or basa and basa fish) received the same code; animals with different scientific taxonomic classifications received a unique code.

For this algorithm, only the first 6 digits were used; the 7th digit of the code representing the breed/scientific taxonomic sub-species was discarded for a less inclusive score. Using an electronic algorithm, all codes that existed where a matching lower taxonomic classification existed were discarded; all remaining unique codes received 1 point. For example, if a participant stated “bird, parrot, pheasant...” bird did not receive a point because it is the category to which both parrot and pheasant belong.

Validation of the algorithm was performed during the Tracking cohort by manually scoring 200 datasets and comparing them to the electronic score to ensure accuracy. A recheck was completed in the Comprehensive cohort by manually scoring 30 additional datasets which were compared to the electronic score.

The data available to researchers are each participant’s test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

2.2 Algorithm 2 (AFT_SCORE_2_COM = Variable name)

Administration of this test as well as the high level details on coding of animal names can be found in paragraphs one and two of Algorithm 1 (AFT_SCORE_1_TRM) above.

For this algorithm, all 7 digits of the animal code were used which allowed for broader inclusion criteria that included the breed/sub-species of animals. Using an electronic algorithm, all unique codes received one point. For example, if a participant said “bird, parrot, pheasant...” each response stated received one point (for a total of 3 points). Validation of the algorithm was performed during the Tracking cohort by manually scoring 200 datasets and comparing them to the electronic score to ensure accuracy. A recheck was completed in the Comprehensive cohort by manually scoring 30 additional datasets which were compared to the electronic score.

The data available to researchers are; each participant’s test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

3.0 MAT (MAT_SCORE_COM = VARIABLE NAME)

Participants were first asked to count from 1-20 and recite the alphabet.

Upon successful completion of counting and alphabet the participant was asked to state alternate consecutive numbers and letters beginning with number “1” and the letter “A” as many times as possible in 30 seconds. The participant’s response was recorded and double data entered into a database. Data entry conflicts were identified electronically and resolved by a supervisor.

Using an electronic algorithm, a point was given for each correct alternation. Alternations were considered to be correct if it was a different category (numbers versus letters) from the previous

response and was the next one in sequence from the previous response in the same category (i.e., 1, A, 2, B, 3, C, etc.). Responses that did not start with number 1 were not scored.

Validation of the algorithm was performed during the Tracking cohort by manually scoring 200 datasets and comparing them to the electronic score to ensure accuracy. A recheck was completed in the Comprehensive cohort by manually scoring 30 additional datasets which were compared to the electronic score.

The data available to researchers are each participant's test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

4.0 REY II (REYII_SCORE_COM = VARIABLE NAME)

The participant was asked to recall as many of the recorded words previously played (per Rey I above), in any order, in 60 seconds. The participant's responses were recorded and double data entered into a database. Data entry conflicts were identified electronically and resolved by a supervisor.

The electronic scoring algorithm was applied to the cleaned data with the following rules:

- 1 point was awarded for all primary or variant words.
NOTE: If the participant stated a variant word in Rey I and the matching primary word in Rey II (or vice versa), the primary word in Rey II did not receive a point. For example, in Rey I the participant said "drum, **collar**, bell, house", but in Rey II they stated "drum, **colour**, bell, house". **Collar** in Rey I would get a point, but **colour** in Rey II would not receive a point.
- 0 points were awarded for any other words stated.
- If the participant was prompted by the interviewer, this invalidated Rey II and a score of 0 was assigned to the test.

Validation of the algorithm was performed during the Tracking cohort by manually scoring 200 datasets and comparing them to the electronic score to ensure accuracy. A recheck was completed in the Comprehensive cohort by manually scoring 30 additional datasets which were compared to the electronic score.

The data available to researchers are: each participant's test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

5.0 PMT (PMT_ACR_COM = VARIABLE NAME)

The participant was presented with an envelope containing 3 loonies, 1 five-dollar bill, 1 ten-dollar bill, 1 twenty-dollar bill, a quarter and a nickel, and shown the money inside. The participant was shown the money inside and asked to present themselves with the ten-dollar bill as well as provide the interviewer with the five-dollar bill when the timer went off. The timer was set for 30 minutes; the participant was not informed of how much time was allotted.

Scores for this test were based on the participant's response when the alarm when off. Each of the following three categories received a score of 0-3:

- i. Intention to perform
- ii. Accuracy of response; and,
- iii. Need of reminders

The participant's responses were electronically recorded electronically with points awarded based on performance responses in each of the 3 categories above.

The data available to researchers are each participant's test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

6.0 STROOP NEUROLOGICAL SCREENING TEST (STP_COLTIME_SS_COM; STP_DOTTIME_SS_COM ; STP_WORTIME_SS_COM = VARIABLE NAMES)

This test measures cognitive flexibility gauged by the subject's effectiveness in processing material as task demands increase over three successive trials. The Victoria Stroop version, used in the CLSA, presents the participant with three stimulus cards sequentially

- i. Colored dots;
- i. Common words printed in same colors as dots; and,
- ii. Color words printed in non-corresponding colors of ink.

For the first card, participants were asked to name the color of each dot, from left to right, for each of the successive rows. For the second card, the participant was asked to identify the color of ink each word is printed in. For the final card, the participant was asked to identify the color of ink each of the color words was printed in. The participant's responses were recorded. The number of errors and the time to perform each task was entered electronically.

The data available to researchers are each participant's test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

7.0 FAS (FAS_A_SCORE_COM , FAS_F_SCORE_COM , FAS_S_SCORE_COM = VARIABLE NAMES)

The participant was asked to say as many words as they can think of that begin with the given letter of the alphabet excluding proper nouns and the same words with different suffixes. The FAS test was broken into the following 3 sub-tasks; each had a time limit of 60 seconds:

- i. "F" words;
- ii. "A" words; and,
- iii. "S" words.

The participant's response was recorded and the recordings were double data entered into a database. Data entry conflicts were identified electronically and resolved by a supervisor. Specific rules and guidelines were developed by the CLSA to ensure consistent scoring including rules pertaining to scoring of homophones based on frequency databases.

Dictionary sources were selected and approved for master use by the CLSA Cognition Scientific Working team for both the French and English languages. A sister table was created using

these sources and the same words with different suffixes were added to the table in both English and French.

An electronic algorithm identified;

- Homophones
 - All homophone words entered into the software were electronically corrected based on verbal frequency databases.
- Unique words
 - 1 point was awarded for each unique word.
- All sister words (the same root words with different suffixes)
 - 1 point was awarded for the first word and 0 points were awarded to any subsequent sister words.

For example, if a participant stated “far, farther, farthest...” far would receive 1 point, however farther, and farthest would receive 0 points each as they are both a root word of “far” with different suffixes on the end of each word.

- Duplicate or repeated words
 - 1 point was awarded for the first occurrence and 0 points were awarded for subsequent occurrences.
 - 1 point was awarded for the first word stated in the participants preferred language and 0 points were awarded to any repeat words in a different language.

For example, if a participant stated “sister, sun, slither, soeur...” Sister would receive 1 point, but soeur would receive 0 points as it is the same word in a different language.

Validation of the algorithm was performed during the Tracking cohort by manually scoring 200 datasets and comparing them to the electronic score to ensure accuracy. A recheck was completed in the Comprehensive cohort by manually scoring 30 additional datasets which were compared to the electronic score.

The data available to researchers are; each participant’s test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

8.0 CRT (CRT_MRT_CORRANS_COM = VARIABLE NAME)

The CRT was administered on a computer with a touch screen which displayed four horizontal plus signs and four keys, with one key underneath each plus sign. The touch screen would have one plus sign turn into a box and the participant was instructed to press the touch key on the screen underneath the box as quickly as possible. The exercise was repeated 52 times. Participant’s scores were generated automatically by the computer software and contain the following:

- Percentage of correct keystrokes; and,

- Mean Reaction Time (Latency) = the average of the correct answers, excluding incorrect answers and timeouts.

The data available to researchers are each participant's test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.

9.0 TMT (TMT_ACC_COM = VARIABLE NAME)

The participant was presented with a clock set to 8:00 o'clock and asked what time it was. The participant was then presented with an envelope containing cards with the numbers 28, 14, 17, 13 and 11 printed on them and shown the card with the 17 on it. The participant was asked to interrupt whatever was happening when the clock reached 8:15, ask for the envelope, take out the number 17 and present it to the interviewer.

Scores for this test were based on the participant's response when the alarm went off. Each of the following three categories received a score of 0-3:

- i. Intention to perform;
- ii. Accuracy of response; and,
- iii. Need of reminders

The participant's responses were recorded electronically with points awarded based on performance responses in each of the 3 categories above.

The data available to researchers are each participant's test score, metadata containing the quality of the recording, if the participant refused to complete the test and any notes regarding anomalies with the test.