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Outcomes

Completion of the MAZE is marked by the subject's arrival at the 'end point'. The participant's score is calculated by automatically summing the subject's errors, including colliding with the sides of the MAZE and the Time to complete the test and move the "DOT" from start to finish. This assists in determining the subject's ability to plan and co-ordinate the "DOT" movement. Results of this test are determined by comparing an assessment with a baseline composite or average score for this subject consisting of a minimum of three (3) baseline tests. Subjects who scored 'high' with a significantly higher number of 'wall collisions' and longer time to complete the test indicated qualities related to poor planning and foresight. High scores also related to differences in verbal and performance intelligence as determined by Professor Porteus.

More definitive comparisons are available as the subject is tested further. Each additional test is added to the subject’s cumulative baseline - up to ten (10) tests. To preserve currency of subject data and minimize maturation, the last most recent 10 tests for each subject are averaged for this subject’s updated baseline. Subjects may be compared subject within subject, subject to subject, subject to selected groups eg. by age or gender, or specific subgroups as specified in the customized data collection by the clinician or researcher. All subject data is de-identified and stored in an encrypted form on a multi-level security cloud to comply with HIPAA, and other electronic medical record storage requirements.

The initial test is discarded in each test session to allow for a learning factor or discarded if an abnormal situation occurring during the test assessment.

Porteus Test description - (Bear in Mind "High" scores show lots of collisions and a long test duration).

In his experiment, Porteus asked that participants trace his or her way through a complex network of passages, for which the participant must find a route that will bring them to an exit point. Participants are cautioned not to cross through solid lines with their 'pen'. Participants are expected to implicitly scan the maze viewing the pattern and determining a successful way to maneuver through the passages to the exit point. Entering a “blind alley” is a terminal error that results in the ending of the test. Participants are then allowed to repeat the same maze with a deduction to their scoring. The particular level of difficulty of the test determines the typical number of failed attempts that will end a subject's trial. The number of trials required to complete a given maze proves a measure of the skill to be beneficial, based on the system feedback and what has been learned from previous errors. The number of seconds to finish each maze can be seen as an indicator of cognitive efficiency as well as a marker of random acts, since time may be spent on fast but incorrect decisions.

The Porteus Maze Test (PMT) is a psychological test, designed to measure psychological planning capacity and foresight in children, adolescents, and adults. This nonverbal test of intelligence was developed by University of Hawaii psychology Professor Stanley Porteus (April 24, 1883 - October 21, 1972) [1]. The Maze test consists of a set of paper forms in which the subject is required to trace a path through a drawn maze of varying complexity with a limit of 15–60 minutes to perform this test. The subject must avoid blind alleys and dead ends; no back-tracking is allowed [2]. A maze procedure
is also involved as a supplementary subtest of the Weschler Intelligence scale as it allows for a wide range of applications [3].

The test is suitable for people of age 3 and up. The original Porteus Maze Test was developed by Porteus was a young man when he was head teacher of the Victorian Education Department’s first special school in Melbourne, Australia. Porteus developed his idea further when he migrated to Vineland, New Jersey, then Hawaii. A well-known version is called the "Vineland Series", after the Vineland Training School in New Jersey where Porteus first worked when he arrived in the US from his native Australia. Additional mazes were provided in the Extension to the Porteus Maze Test, and the Supplement to the Porteus Maze Test. The development of this particular maze test was in response to the restrictions of the Binet-Simon scales.

Mazes in general are thought to assess procedures such as selection, trying, rejection, or adoption of alternative sequences of conduct or thought.

Porteus asserts that, like the Binet-Simon scale, it is a valuable supplement in evaluating subjects’ foresight and planning abilities. Porteus considered that this capacity was essential for adaptation to the most practical life situations, and the failure in these tests is a measure of flawed diagnoses and inadequate assessment of the individual.

Ref* http://en.wikipedia.org/wiki/Porteus_Maze_Test
DIRECTIONS

1) The CHOICE Maze tests are a series of cognitive tests designed to test your ability to navigate through a small 2D maze.
2) The Red Dot will move automatically at a set speed throughout the test from the start position.
3) You will be using the ‘Arrow’ Keys on the keyboard - Left, Right, Up Down - to alter the Dot’s direction.
4) The goal is to navigate the Dot into the Green finish area. It may be necessary to determine the correct and/or quickest path to this goal.
5) If the Dot collides with a Black Maze Wall then your scores will be adjusted down accordingly.
6) Your Completion Times, Response Speeds and Wall Collisions are being evaluated during these tests.
7) There are three Maze tests of increasing difficulty to complete. However, the 1st test is a practice test and will not be evaluated.

4. I can’t correct “It may be necessary” “It is necessary to..”

Three Options are presented: "Training" - "Continue" - "Quit".

- Training (Provides a single training session)
- Continue (Provides the standard test)
- Quit (Closes the Program)
The Maze provides a countdown until the Dot commences to move.

Use the “Arrow Keys” or the Wired Controller on your keyboard to direct the Dot to the end of the maze.
Keeping the Dot moving steadily without touching the walls provides the best outcome – The First Maze Test
The Second Maze test.
The Third Maze Test
Wired Controller

MAZE can be used with a wired controller, this facilitates ease of use by subjects and allows for the subject to be seated or standing.

The X Box 360 Standard wired controller is plugged into a USB port prior to starting CHOICE or MAZE and will not require additional drivers in Windows 8.1 - 10. The use of the controls is outlined in the following image.
Diagram 4.0 displays the MAZE summary screen. Data is extracted from CHOICE tests completed on this system/machine. Test information for MAZE tests is summarized in these screens. Two tests can be viewed simultaneously from the same or different subjects.

A number of results are displayed including: accuracy, total time and rating. The MAZE Test Rating is calculated using the main test measurements (total test time, subject inputs, wall collisions and collision time) to produce a score/rating, which represents the quality and overall result of the test in one figure. A lower Rating is a better score.

The accuracy of the MAZE tests are calculated by the % of time not spent on a maze wall divided by the total time. If a user spent 5 seconds moving alongside the walls out of a 20 second test, they would get a 75% accuracy. So MAZE accuracy is considered on how accurate the user’s reflexes and coordination are.

- Each collision event adds 10.
- Each second of collision adds 10.
- Each input adds 3.
- Each second of test time adds 3.

Trend analysis of the CHOICE - MAZE tests can also be performed in the cognitive graphs screen as shown in diagram 4.0.

**Maze Summary**

A Maze Summary is presented when the "Maze Summary" tab is clicked. Data is extracted from MAZE tests completed on this system/machine.

Test Information for both Cognition (CHOICE) and Maze tests is summarized in these screens. Two tests can be viewed simultaneously from the same or different subjects. Please select subjects for one or both of the screens using the "CHOICE" tab.
Maze Test Rating

The Maze Test Rating is calculated using the main test measurements (total test time, subject inputs, wall collisions and collision time) to produce a score/rating which represents the quality and overall result of the test in one figure. A lower Rating is a better score.

- Each collision event adds 10
- Each second of collision adds 10
- Each input adds 3
- Each second of test time adds 3
Maze Graphs

If Matching CHOICE Data is present for the subject previously selected using the "browse" tab, the data will be displayed in a Maze Graphed Array.

Previously collected Test Information for Cognition and Maze tests can be selected using the "CHOICE" tab.
### CBS Composite Results

#### mCTSIB Balance Test Results Summary

**Date:** 26/06/2017  
**Name:** ONE1111  
**Height:** 188.0 cm  
**Age:** 47  
**Gender:** Male  
**Injury:** None

<table>
<thead>
<tr>
<th>Condition</th>
<th>Value</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes Open Firm Surface</td>
<td>Outside Expected Parameters</td>
<td>68.52%</td>
<td>0.16 cm</td>
<td>0.05%</td>
</tr>
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<td>Eyes Closed Firm Surface</td>
<td>Outside Expected Parameters</td>
<td>86.20%</td>
<td>1.01 cm</td>
<td>0.20%</td>
</tr>
<tr>
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<td>Outside Expected Parameters</td>
<td>23.76 cm</td>
<td>1.01 cm</td>
<td>0.20%</td>
</tr>
<tr>
<td>Eyes Open Firm Surface</td>
<td>Outside Expected Parameters</td>
<td>13.24 cm</td>
<td>3.02 cm</td>
<td>0.12%</td>
</tr>
</tbody>
</table>

#### Actual Score vs Mean Score

<table>
<thead>
<tr>
<th>Test</th>
<th>Actual Score</th>
<th>Mean Score</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>mCTSIB Balance Composite Score (Avg)</td>
<td>87%</td>
<td>83%</td>
<td>+</td>
</tr>
<tr>
<td>mCTSIB Movement Composite Score (Avg)</td>
<td>0.40</td>
<td>0.37</td>
<td>-</td>
</tr>
<tr>
<td>CHOICE Cognition Tests</td>
<td>100%</td>
<td>100%</td>
<td>+</td>
</tr>
<tr>
<td>MAZE Assessment Tests</td>
<td>72%</td>
<td>83%</td>
<td>-</td>
</tr>
<tr>
<td>Composite Deviation:</td>
<td>-2.92%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Within Expected Parameters**

### Test History - Accuracy

![Graph](image)

**Legend:**
- GREEN (EO): Outside Expected Parameters
- YELLOW (EO): Between Expected Parameters
- RED (EO): Inside Expected Parameters

**Note:**
- A reading with 5% negative variation may indicate fatigue. A reading with greater than 10% negative variation may indicate concussion, neurological degeneration, or consumption of medications or illicit substances.

In cases where concussion has occurred, it is common that the subject may exhibit substantially better balance with EO rather than EO.

A systematic test can help to validate the condition.