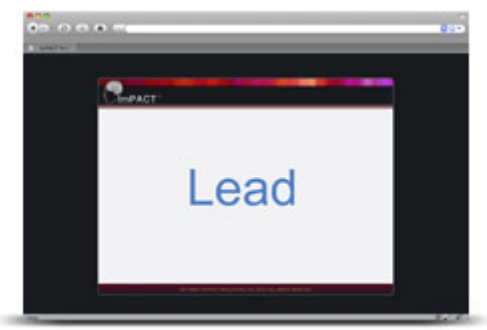
Basline and Post-Injury Neurocognitive Tests

Module 1: Word Discrimination



This module evaluates attentional processes and verbal recognition memory utilizing a word discrimination paradigm.

Twelve target words are presented for 750 milliseconds on the computer screen. This word list is presented twice to facilitate learning of the list. At the end of the second presentation of the list, the subject is tested for recall via the presentation of the 24-word list that is comprised of 12 target words and 12 non-target words that have been chosen from the same semantic category as the target word.

For example, the word "ice" is a target word, while the word "snow" represents the non-target word. The subject responds by mouse-clicking the "yes" or "no" buttons on the screen. Individual scores are provided both for correct "yes" and "no" responses. In addition, a total percent correct score is provided. There are five different forms of the word list.

Delay Condition: Following the administration of all other test modules (approximately 20 minutes), the athlete is again tested for recall via the same method described above. The same scores that are described above are provided for the delay condition.

Module 2: Design Memory

This module evaluates attentional processes and visual recognition memory utilizing a design discrimination paradigm.

Twelve target designs are presented for 750 milliseconds on the computer screen. This sequence is presented twice to facilitate learning. At the end of the second presentation of the list, the subject is tested for recognition via the presentation of 24-designs comprised of 12 target designs and 12 non-target designs (target designs that have been rotated in space).

Similar to the word recognition task, the subject responds by mouse-clicking the "yes" or "no" buttons on the screen. Individual scores are provided both for correct "yes" and "no" responses. In addition, a total percent correct score is provided. There are five different forms of this task.

Delay Condition: Following the administration of all other test modules (approximately 20 minutes), the athlete is again tested for recall via the same method described above. The same scores that are described above are provided for the delay condition.

Module 3: X's and O's

This module measures visual working memory as well as visual processing speed and consists of a visual memory paradigm with a distractor task.

The athlete is allowed to practice the distractor task prior to presentation of the memory task. The distractor task is a choice reaction time test during which the athlete is asked to click the left mouse button if a blue square is presented and the right mouse button if a red circle is presented.

Once the athlete has completed this task, the memory task is presented. For each of the trials of the memory task, a screen is displayed for 1.5 seconds that has a computer-generated random assortment of X's and O's. For each of the trials, three of the X's or O's are illuminated in YELLOW on the screen. The athlete is asked to remember the location of the illuminated objects. The X's and O's that are illuminated are randomized by the computer for each trail and for each administration of the test.

Immediately after the presentation of the 3 X's or O's, the distractor task re-appears on the screen. Following the distractor task, the memory screen (X's and O's) re-appears and the athlete is asked to click on the previously illuminated X's and O's. Scores are provided for correct identification of the X's and O's (memory), reaction time for the distractor task, and number of errors on the distractor task. For each administration of the ImPACT test, the athlete completes four trials.

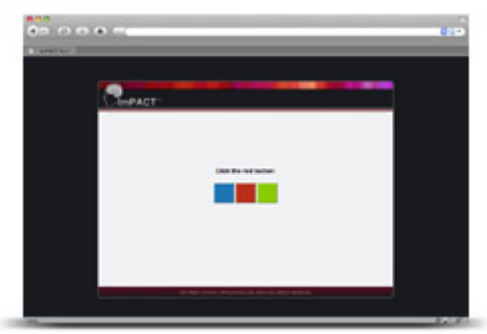
Module 4: Symbol Matching

This module evaluates visual processing speed, learning and memory.

Initially, the athlete is presented with a screen that displays 9 common symbols (triangle, square, arrow, etc). Directly under each symbol is a number button from 1 to 9. Below this grid, a symbol is presented. The athlete is required to click the matching number as quickly as possible and to remember the symbol / number pairings. Correct performance is reinforced through the illumination of a correctly clicked number in GREEN. Incorrect performance illuminates the number button in RED.

Following the completion of 27 trials, the symbols disappear from the top grid. The symbols again appear below the grid and the athlete is asked to recall the correct symbol / number pairing by clicking the appropriate number button. This module provides an average reaction time score and a score for the memory condition.

Module 5: Color Match



This module represents a choice reaction time task and also measures impulse control and response inhibition.

First, the athlete is required to respond by clicking a red, blue or green button as they are presented on the screen. This procedure is completed to assure that subsequent trials would not be affected by color blindness.

Next, a word is displayed on the screen in the same colored ink as the word (e.g. RED), or in a different colored ink (GREEN or BLUE). The athlete is instructed to click in the box as quickly as possible only if the word is presented in the matching ink. In addition to providing a reaction time score, this task also provides an error score.

Module 6: Three Letter Memory

This module measures working memory and visual-motor response speed.

First, the athlete is allowed to practice a distractor task, which consists of 25 numbered buttons (5 x 5 grid). The athlete is instructed to click as quickly as possible on the numbered buttons in backward order starting with "25." Once the athlete has completed this initial practice task, he/she is presented with three consonant letters that are displayed on the screen.

Immediately following display of the three letters, the numbered grid re-appears and the athlete is instructed to click the numbered buttons in backward order as quickly as possible. After a period of 18 seconds, the numbered grid disappears and the athlete is asked to recall the three letters by typing them from the keyboard. Both the number placement on the grid and letters displayed are randomized for each trial.

This module yields a memory score (total number of correctly identified letters) and a score for the average number of correctly clicked numbers per trial from the distractor test. Five trials of this task are presented for each administration of the test.