CNS Vital Signs

Normed Neurocognitive Tests

Verbal Memory (VBM)
Approx. 3 Minutes

- Learning Words
- Memory for Words
- Word Recognition
- Immediate and Delayed Recall

VBM measures recognition memory for WORDS. Fifteen words are presented, one by one, on the screen every two seconds. For immediate recognition, the participant has to identify those words nested among fifteen new words. Then, after six more tests, there is a delayed recognition trial.

Visual Memory (VIM)
Approx. 3 Minutes

- Learning Geometric Shapes
- Memory for Geometric Shapes
- Geometric Shapes Recognition
- Immediate and Delayed Recall

VIM measures recognition memory for FIGURES or SHAPES. Fifteen geometric figures are presented, one by one, on the screen. For immediate recognition, the participant has to identify those figures nested among fifteen new figures. Then, after five more tests, there is a delayed recognition trial.

Finger Tapping (FTT)
Approx. 2 Minutes

- Motor Speed
- Fine Motor Control

FTT test requires subjects to press the Space Bar with their right index finger as many times as they can in 10 seconds. They do this once for practice, and then there are three test trials. The test is repeated with the left hand.

Symbol Digit Coding (SDC)
Approx. 4 Minutes

- Complex Information Processing Accuracy
- Complex Attention
- Visual-Perceptual Speed
- Information Processing Speed

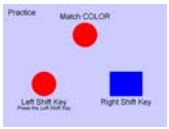
SDC test consists of serial presentations of screens, each of which contains a bank of eight symbols above and eight empty boxes below. The participant types in the number that corresponds to the symbol that is highlighted. Only the digits from 2 through 9 are used; this is to avoid the confusion between “1” and “l” on the keyboard. ***The computer program does not allow a person to use a numerical pad*** preventing a distinct advantage for those who are skilled at using the numerical pad or for those that are right- versus left-handed.

Stroop Test (ST)
Approx. 4 - 5 Minutes

- Simple Reaction Time
- Complex Reaction Time
- Stroop Reaction Time
- Inhibition / Disinhibition
- Frontal or Executive Skills
- Processing Speed

Stroop test has three parts. In the first part, the words RED, YELLOW, BLUE, and GREEN (printed in black) appear at random on the screen, and the participant presses the space bar as soon as the test subject sees the word. In the second part, the words RED, YELLOW, BLUE, and GREEN appear on the screen, printed in color. The participant is asked to press the space bar when the color of the word matches what the word says. In the third part, the words RED, YELLOW, BLUE, and GREEN appear on the screen, printed in color. The participant is asked to *press the space* bar when the color of the word does not match what the word says.

Shifting Attention (SAT)
Approx. 2.5 Minutes



- Executive Function
- Shifting Sets: Rules, Categories, & Rapid Decision Making
- Reaction Time

SAT test is a measure of ability to shift from one instruction set to another quickly and accurately. Participants are instructed to match geometric objects either by shape or by color. Three figures appear on the screen, one on top and two on the bottom. The top figure is either a square or a circle. The bottom figures are a square and a circle. The figures are either red or blue (mixed randomly). The participant is asked to match one of the bottom figures to the top figure. The rules change at random (i.e., match the figures by shape, for another, by color).

Continuous Performance (CPT)
Approx. 5 Minutes

- Sustained Attention
- Choice Reaction Time
- Impulsivity

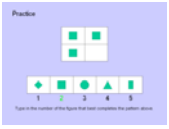
CPT test is a measure of vigilance or sustained attention or attention over time. The test subject is asked to respond to the target stimulus “B” but not to any other letter. The stimuli are presented at random.

Perception of Emotions (POET)
Approx. 2 Minutes

- Social Cognition or Emotional Acuity
- Choice Reaction Time

The POET measures how well a subject can perceive and identify specific emotions. "Social cognition" or "emotional acuity" has been defined as "the way in which people make sense of other people and themselves". It is the ability to perceive and understand social information. The reaction times in POET are much longer than in the other tests, indicating the complexity of central processes governing emotional acuity.

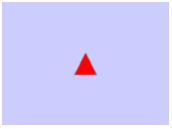
Non-Verbal Reasoning (NVRT)
Approx. 3.5 Minutes



- Reasoning
- Reasoning Recognition Speed

The NVRT measures how well a subject can perceive and understand the meaning of visual or abstract information and recognizing relationships between visual-abstract concepts. The NVRT is comprised of 15 matrices, or visual analogies. The matrices are progressively more difficult. Non-verbal or visual-abstract reasoning is the process of perceiving issues and reaching conclusions through the use of symbols or generalizations rather than concrete factual information.

4-Part Continuous Performance (FPCPT)
Approx. 7 Minutes



- Sustained Attention
- Working Memory

The 4PCPT test is a four part test that measures a subject's working memory and sustained attention. PART ONE - is a simple reaction time test, PART TWO - is a variant of the continuous performance test, the reaction times that are generated are "choice reaction times". PART THREE - is a "one back" CPT. The subject has to respond to a figure only if the figure immediately preceding was the same. PART FOUR - is a "two-back" CPT. It is a difficult task and is used to measure working memory. Parts two, three, and four of the tests are used to calculate sustained attention domain.

CNS Vital Signs Clinical Domain Guide

Single Test Score Domain Multiple Test Score Domain

CNS Vital Signs "Brief-Core" Neurocognitive Clinical Evaluation Domains

Neurocognitive Index (NCI)	Measure: An average score derived from the domain scores or a general assessment of the overall neurocognitive status of the patient. Relevance: Summary views tend to be most informative when evaluating a population, a condition category, and outcomes.
Composite Memory	Measure: How well subject can recognize, remember, and retrieve words and geometric figures. Relevance: Remembering a scheduled test, recalling an appointment, taking medications, and attending class.
Verbal Memory	Measure: How well subject can recognize, remember, and retrieve words. Relevance: Remembering a scheduled test, recalling an appointment, taking medications, and attending class.
Visual Memory	Measure: How well subject can recognize, remember and retrieve geometric figures. Relevance: Remembering graphic instructions, navigating, operating machines, recalling images, and/or remember a calendar of events.
Psychomotor Speed	Measure: How well a subject perceives, attends, responds to complex visual-perceptual information and performs simple fine motor coordination. Relevance: Ability preform simple motor skills and dexterity through cognitive functions i.e., use of precision instruments or tools, performing mental and physical coordination i.e., driving a car, playing a musical instrument.
Reaction Time*	Measure: How quickly the subject can react, in milliseconds, to a simple and increasingly complex direction set. Relevance: Driving a car, attending to conversation, tracking and responding to a set of simple instructions, taking longer to decide what response to make.
Complex Attention	Measure: Ability to track and respond to a variety of stimuli over lengthy periods of time and/or perform complex mental tasks requiring vigilance quickly and accurately. Relevance: Self-regulation and behavioral control.
Cognitive Flexibility	Measure: How well subject is able to adapt to rapidly changing and increasingly complex set of directions and/or to manipulate the information. Relevance: Reasoning, switching tasks, decision-making, impulse control, strategy formation, attending to conversation.
Processing Speed	Measure: How well a subject recognizes and processes information i.e., perceiving, attending/responding to incoming information, motor speed, fine motor coordination, and visual-perceptual ability. Relevance: Ability to recognize and respond/react i.e., fitness-to-drive, occupation issues, possible danger/risk signs or issues with accuracy and detail.
Executive Function	Measure: How well a subject recognizes rules, categories, and manages or navigates rapid decision making. Relevance: Ability to sequence tasks and manage multiple tasks simultaneously as well as tracking and responding to a set of instructions.
Simple Attention	Measure: Ability to track and respond to a single defined stimulus over lengthy periods of time while performing vigilance and response inhibition quickly and accurately to a simple task. Relevance: Self-regulation and simple attention control.
Motor Speed	Measure: Ability to perform simple movements to produce and satisfy an intention towards a manual action and goal. Relevance: Preparation and production of simple manual dexterity actions e.g. manipulate and maneuver objects

CNS Vital Signs "Expanded" Neurocognitive Clinical Evaluation Domains

Social Acuity	Measure: How well a subject can perceive, process, and respond to emotional cues. Relevance: Spectrum screen, ability to recognize social cues or read facial expressions. Provides insight into inappropriate behavior, decreased inhibition, insensitivity to social standards, and social behavioral regulation.
Reasoning	Measure: How well is subject able to recognize, reason and respond to non-verbal visual-abstract stimuli. Relevance: Problem solving skills, ability to forge insights, discern meaning, and ability to perceive relationships.
Sustained Attention	Measure: How well a subject can direct and focus cognitive activity on specific stimuli. Relevance: How well a subject can focus and complete task or activity, sequence action, and focus during complex thought.
Working Memory	Measure: How well a subject can perceive and attend to symbols using short-term memory processes (4PCPT). Relevance: Ability to carry out short-term memory tasks that support decision making, problem solving, planning, and execution. Enables "right-now" responses.