### About the Measure

<table>
<thead>
<tr>
<th>Domain:</th>
<th>Early Psychosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure:</td>
<td>Global Cognitive Functioning</td>
</tr>
<tr>
<td>Definition:</td>
<td>A battery of tests used to collect a broad range of neuropsychological functions.</td>
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<tr>
<td>Purpose:</td>
<td>The tests measure accuracy and speed of performance in cognition. The areas of cognition included are general cognitive ability/IQ estimate, abstraction, attention, psychomotor processing speed, working memory, episodic memory, language reasoning, nonverbal reasoning, spatial processing, emotion identification, emotion intensity differentiation, age differentiation, sensorimotor speed, and motor speed.</td>
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</tbody>
</table>

**Essential PhenX Measures:** Age, Current Educational Attainment, Gender

**Related PhenX Measures:** Executive Function, Context Processing, Relational Encoding and Retrieval, Auditory Vigilance

**Keywords:** Proprietary, Computerized Neurocognitive Battery, CNB, early psychosis, cognition, abstraction, attention, working memory, episodic memory, language reasoning, nonverbal reasoning, spatial processing, emotion identification, emotion intensity differentiation, age differentiation, sensorimotor speed, motor speed, schizophrenia, Neuroimaging and Cognitive Core, NICC

**Measure Release Date:**

### About the Protocol

<table>
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<tr>
<th>Protocol Release Date:</th>
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**PhenX Protocol Name:** Computerized Neurocognitive Battery (CNB)

**Protocol Name from Source:** Computerized Neurocognitive Battery (CNB)

**Description:** A series of tests used in neuroimaging studies that are formatted like computer games and puzzles, and are administered by study investigators. The Computerized Neurocognitive Battery (CNB) is administered in a specific order using clickable icons on a computer. A test administrator reads each test’s instructions, and then the participant performs each test. The following tests are recommended for all programs. However, additional CNB tests, or a shorter selection, can be given, depending on the needs of the setting.

1. **Penn Conditional Exclusion Test (PCET)**
   - Measurement of abstraction and concept formation
   - Four alternate forms available
   - Accuracy and speed scores calculated

2. **Penn Continuous Performance Test (PCPT)**
   - Measurement of attention
   - Attention speed is calculated from the median correct response time
   - Accuracy score is recorded

3. **Letter N-Back (LNB)**
   - Measurement of working memory
   - Speed is calculated from the median correct response time
4) Penn Word Memory Test (PWMT)
   a. Measurement of verbal episodic memory
   b. Speed is calculated from the median correct response time
   c. Accuracy score is recorded

5) Penn Face Memory Test (PFMT)
   a. Measurement of face episodic memory
   b. Speed is calculated from the median correct response time
   c. Accuracy score is recorded

6) Visual Object Learning Test (VOLT)
   a. Measurement of spatial episodic memory
   b. Speed is calculated from the median correct response time
   c. Accuracy score is recorded

7) Abbreviated Penn Verbal Reasoning Test (PVRT)
   a. Measurement of language reasoning
   b. 2 forms available
   c. Accuracy and speed scores are calculated

8) Penn Matrix Reasoning Test (PMAT)
   a. Measurement of nonverbal reasoning estimate of IQ
   b. Computerized version of Raven's Matrices
   c. Accuracy and speed scores calculated

9) Penn Line Orientation Test (PLOT)
   a. Measurement of spatial processing
   b. Computerized version of Benton’s test
   c. Accuracy and speed scores calculated

10) Penn Digit Symbol Substitution Test (DSST)
    a. Measurement of processing speed
    b. Computerized adaptation of the classical DSST
    c. Accuracy and speed scores calculated

11) Mouse Practice task (MP)
    a. Measurement of sensorimotor processing speed
    b. Speed is calculated from the median response time
    c. Two forms available

12) Computerized Finger Tapping Test (CTAP)
    a. Measurement of motor speed
    b. Number of taps is recorded in a period of 10 seconds

13) Emotion Recognition test (ER-40)
    a. Measurement of emotion identification
    b. Two forms available
    c. Accuracy score calculated
    d. Speed for correct responses is calculated from the median response time

Test results are uploaded to a data repository via an automated script. Results are scored by a program and evaluated by a neuropsychologist.

**Specific Instructions:**

The Computerized Neurocognitive Battery (CNB) takes approximately 1 hour to administer. An investigator interested in using the CNB can register for an account on the PennCNP® website at [https://penncnp.med.upenn.edu/request.pl](https://penncnp.med.upenn.edu/request.pl) by submitting a form to verify research credentials and Institutional Review Board compliance. For all funded (government or industry) projects, the rates are delineated by service type. The CNB has been translated into more than 15 languages and is adapted for children and adults.
**Protocol:**
The Computerized Neurocognitive Battery (CNB) is a proprietary instrument.

For license purchase, please contact:
Brain Behavior Laboratory
Neuropsychiatry Section
Hospital of the University of Pennsylvania
3400 Spruce Street
10th Floor, Gates Bldg.
Philadelphia, PA 19104-4283

**Selection Rationale:**
The Computerized Neurocognitive Battery (CNB) allows for centralized data collection, has good norms, and is appropriate for teenagers and young adults. The computerization allows for easy and standardized administration, scoring, and data collection. It has alternative forms on many of the subtests. The CNB has been administered to more than 10,000 people aged 8 years and older and thus has extensive norms. The CNB has a broad range of coverage and a depth of assessing cognition, and it can measure speed as well as accuracy. It measures a very wide selection of domains important in neuropsychological assessment. The CNB has a number of largely nonverbal tests that can be useful in non-English-speaking populations, and it has been translated into many languages. The CNB can measure change over time in a population. The computer captures reaction time, enabling predictions of participants’ real-world performance. The CNB provides a reliable estimate of IQ, which is important to estimate general cognitive ability. The CNB has a growth chart that can be printed out with a child’s profile for his or her parents, which is very helpful to show the child’s status before treatment and after a few months.

**Source:**

**Life Stage:**
Child, adolescent, adult, senior

**Language:**
English, Spanish, Others

**Participant:**
Adults and children, ages 8 years and older

**Personnel and Training Required:**
The Computerized Neurocognitive Battery (CNB) administrator must be trained to conduct testing with individuals from the general population. The CNB administrator must be trained and found to be competent (i.e., evaluated by an expert) at the completion of training.

**Equipment Needs:**
The Computerized Neurocognitive Battery (CNB) administrator will require a web-enabled laptop or desktop computer to administer the tests.

**General References:**
Neuroimaging and Cognitive Core (NICC). Perelman School of Medicine, University of Pennsylvania, accessed May 18, 2016.


Roalf, D. R., Ruparel, K., Gur, R. E., Bilker, W., Gerraty, R., Elliott, M. A.,


<table>
<thead>
<tr>
<th>Mode of Administration:</th>
<th>Performance-based task</th>
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<tbody>
<tr>
<td>Derived Variables:</td>
<td>None</td>
</tr>
<tr>
<td>Requirements:</td>
<td></td>
</tr>
<tr>
<td><strong>Requirements Category</strong></td>
<td><strong>Required (Yes/No):</strong></td>
</tr>
<tr>
<td>Major equipment</td>
<td>No</td>
</tr>
<tr>
<td>Specialized training</td>
<td>Yes</td>
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<tr>
<td>Specialized requirements for biospecimen collection</td>
<td>No</td>
</tr>
<tr>
<td>Average time of greater than 15 minutes in an unaffected individual</td>
<td>Yes</td>
</tr>
<tr>
<td>Annotations for Specific Conditions:</td>
<td>No annotations at this time.</td>
</tr>
<tr>
<td>Process and Review:</td>
<td>The Expert Review Panel has not reviewed this measure yet.</td>
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