



# NIH Toolbox

Assessment of Neurological and Behavioral Function

## INTRODUCTION TO THE NIH TOOLBOX FOR THE ASSESSMENT OF NEUROLOGICAL AND BEHAVIORAL FUNCTION

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**NIH Blueprint**

for Neuroscience Research



Tools, Resources and Training

For more information, please visit [www.nihtoolbox.org](http://www.nihtoolbox.org)  
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## Tools, Resources and Training

- ◆ Coordinate research efforts across 13 Institutes
- ◆ Reduce duplication of effort
- ◆ Produce efficiencies of scale
- ◆ Create new cross-Institute avenues of discovery and translation

# NIH Toolbox Goals



- ◆ Develop unified/integrated measures (assessment tool) of multiple indicators (cognitive, emotional, motor, sensory) of neural and behavioral **health** functioning for use in large cohort studies and clinical trials
- ◆ Could be used as a form of “common currency” across diverse study designs and populations
- ◆ Would maximize yield from large, expensive studies with minimal increment in subject burden and cost

# Final Toolbox (Fall, 2012)



- ◆ Four domain-level batteries
- ◆ Domain batteries to take no more than 30 min to administer; entire Toolbox administration max of 2 hours (33 instruments in all)
- ◆ English and Spanish versions
- ◆ Supplemental set of 15 additional instruments

# Organization



- ◆ Steering Committee (monthly)
  - ◆ Principals
  - ◆ Domain Team Leaders: 9 Primary Scientific Teams
  - ◆ Contract Project Officer
- ◆ 9 Domain Teams (weekly/monthly)
  - ◆ Including Subgroups of NIH Project Team
- ◆ ~40 Instrument Development Teams (weekly/monthly)

# Other Working Teams



- NIH Project Team
- Epidemiology/Biostatistics Team
- Technology Team
- Spanish Language Team
- Multi-Cultural Team
- Pediatric Team
- Geriatric Team

# Staffing



- ◆ Established rich collaborative network
  - ◆ 242 named
  - ◆ 20 NIH Science Officers
  - ◆ 19 subcontracts

# Instrument Selection Criteria



- ◆ Applicable across the age span
- ◆ No intellectual property concerns
- ◆ Psychometrically sound
- ◆ Brief, easy to use
- ◆ Applicable in variety of settings and with different subgroups
- ◆ Preference for instruments already validated and normed for ages 3 – 85 years

# Toolbox Development



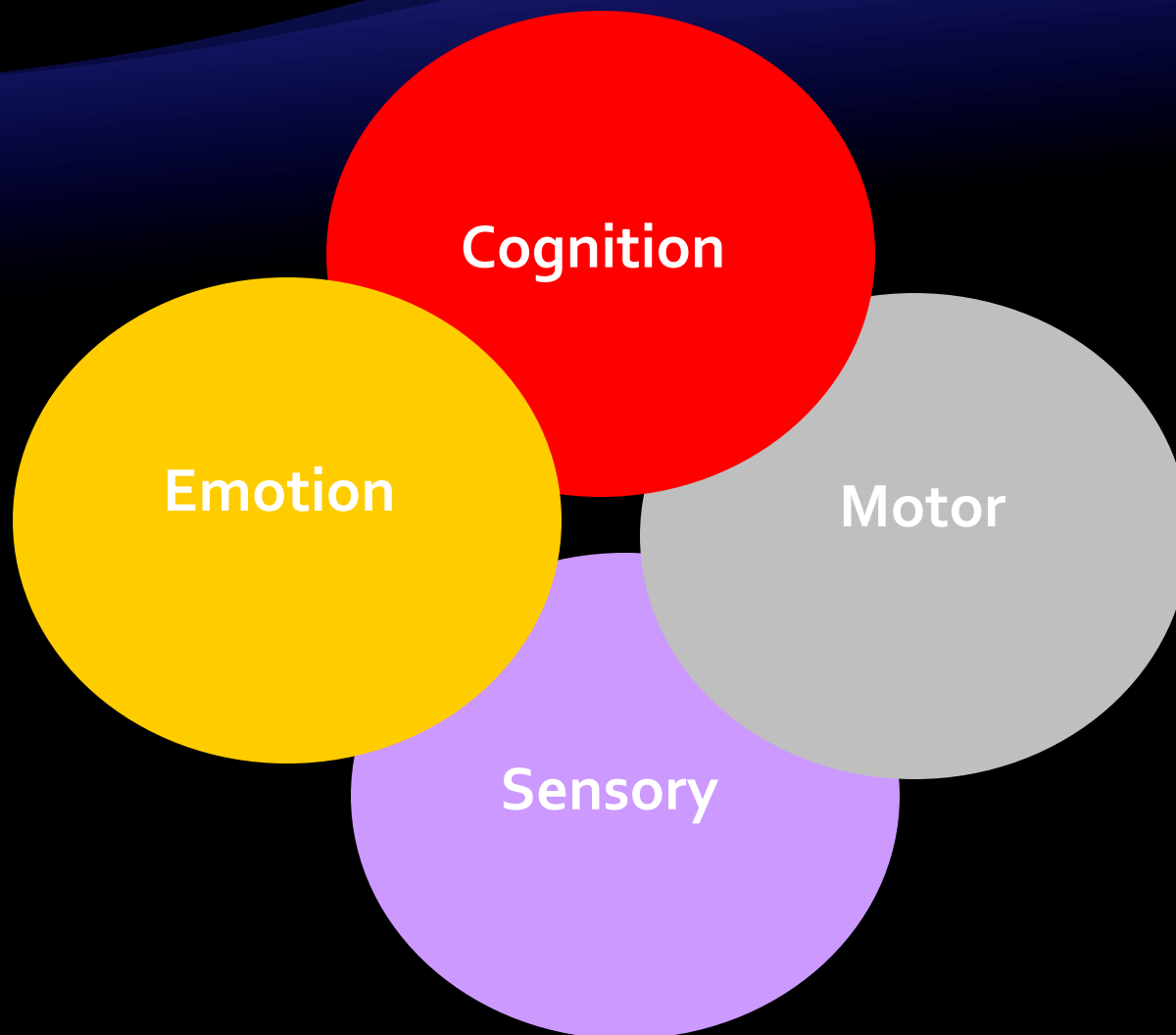
- ◆ Released Request for Information (152 responses) and conducted Expert Interviews (44 interviews)
  - ◆ Nominate and rank sub-domains and constructs
  - ◆ Determine instrument cost and time constraints
- ◆ Conducted literature review
  - ◆ Developed library of 1,391 instruments based on review and expert interviews

# Instrument Development



- ◆ Draft development plans established for 61 different measures
- ◆ Concurrent validation with industry “Gold Standards” of 54 instruments to cover 48 constructs
- ◆ Selection of final instruments for norming

# Toolbox Domains





**Cognition**  
**Subdomains/  
Components**

**Executive Function**

*Inhibitory Control*  
*Cognitive Flexibility*

**Episodic Memory**

**Working Memory**

**Language**

*Vocabulary Comprehension*  
*Reading Decoding*

**Attention**

**Processing Speed**



Motor  
Subdomains/  
Components

Endurance

Locomotion

Strength

Dexterity

Balance

*Upper Extremity*  
*Lower Extremity*

*(Non-vestibular)*



Sensation  
Domains/  
Components

Olfaction

*Odor Identification*

Taste

*Preference*

*Intensity*

*Bitter Perception*

*PROP Sensitivity*

Vestibular Balance

*Vestibular-ocular Reflex*

*Vestibulospinal Function*

Audition

*Hearing Threshold*

*Speech Processing*

*Hearing Loss*

Somatosensation

*Texture Discrimination*

*Proprioception*

*Pain*

*Touch Discrimination*

*Touch Perception*

Vision

*Visual Acuity*

*Visual Function HRQOL*

*Peripheral Vision*

# Emotional Health Subdomains/Components



## Psychological Well-Being

## Negative Affect

## Stress and Self-Efficacy

## Social Relationships

*Positive Affect  
Life Satisfaction  
Meaning and Purpose*

*Sadness  
Fear  
Anger  
Apathy*

*Perceived Stress  
Self-Efficacy  
Coping Strategies*

*Social Support  
Companionship  
Social Distress  
Social Network Integration*

# Norming of the Toolbox is underway



- ◆ N=4,705 subjects English and Spanish, ages 3-85
  - ◆ 1-week retest (N=500)
- ◆ Stratified random sampling conducted at 10 geographically diverse market research firms
  - ◆ Single year age bands 3-17, 7 adult bands through 85
  - ◆ Census balanced by age, race, ethnicity and education
  - ◆ Separate English and Spanish samples
- ◆ Genetic material through ARRA grant

# Issues in Norming



- ◆ Spanish speaking does not mean Spanish reading
- ◆ 3 and 4 year olds



IMPROVING THE HEALTH  
OF AMERICA'S CHILDREN



THE NATIONAL  
CHILDREN'S  
STUDY  
HEALTH GROWTH ENVIRONMENT

The NCS will examine the effects of the environment, as broadly defined to include factors such as air, water, diet, sound, family dynamics, community and cultural influences, and genetics on the growth, development, and health of children across the United States, following them from before birth until age 21 years. The goal of the Study is to improve the health and well-being of children and contribute to understanding the role various factors have on health and disease (N=100,000).

# NCS Healthy Measurement Network



- ◆ Seeks to aggregate and perhaps augment numerous independent assessment efforts within the NCS
- ◆ Assessments of children birth - 21
- ◆ Parallel tests for parents (starting pre-conception)
- ◆ Measures of development, emotional health and all areas of functioning
- ◆ Incredible norming sample – 21 years in the making

# Testing Platform



- ◆ Based on Assessment Center (same platform used to deliver PROMIS instruments)
- ◆ Web-based setup
- ◆ Online and offline delivery and scoring of complete test batteries and individual instruments
- ◆ Unique dual screen mode for novel cognition instruments

# Long Term Availability



- ◆ Instruments generally will be freely available
  - ◆ Permission required to access Cognition battery to preserve instrument integrity
- ◆ Technology ([www.assessmentcenter.net](http://www.assessmentcenter.net))
- ◆ Scoring Algorithms and National Norms
- ◆ Specialty Hardware and Materials
- ◆ Training Materials

# Still to come (2011-2012)



- ◆ Analysis of norming data
  - ◆ Item and test level analyses
- ◆ Final instrument reviews
  - ◆ potential to remove items
- ◆ Calculation of norms and factor scores
- ◆ Final instrument formatting
- ◆ Completion of manuals and training materials



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