



# NIH Toolbox

Assessment of Neurological and Behavioral Function

## NIH Toolbox for the Assessment of Neurological and Behavioral Function: Developing Measures for Assessment Across the Lifespan

Society for Research in Child Development  
Montreal, Quebec, Canada  
March, 31, 2011

Supported by



For more information, please visit  
[www.nihtoolbox.org](http://www.nihtoolbox.org)  
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# NIH Toolbox

Assessment of Neurological and Behavioral Function

## Identifying, Developing, and Validating Instruments for Use in the NIH Toolbox

Kathleen Wallner-Allen

Westat

Nathan A. Fox

University of Maryland

Society for Research in Child Development

Montreal, Quebec, Canada

March, 31, 2011

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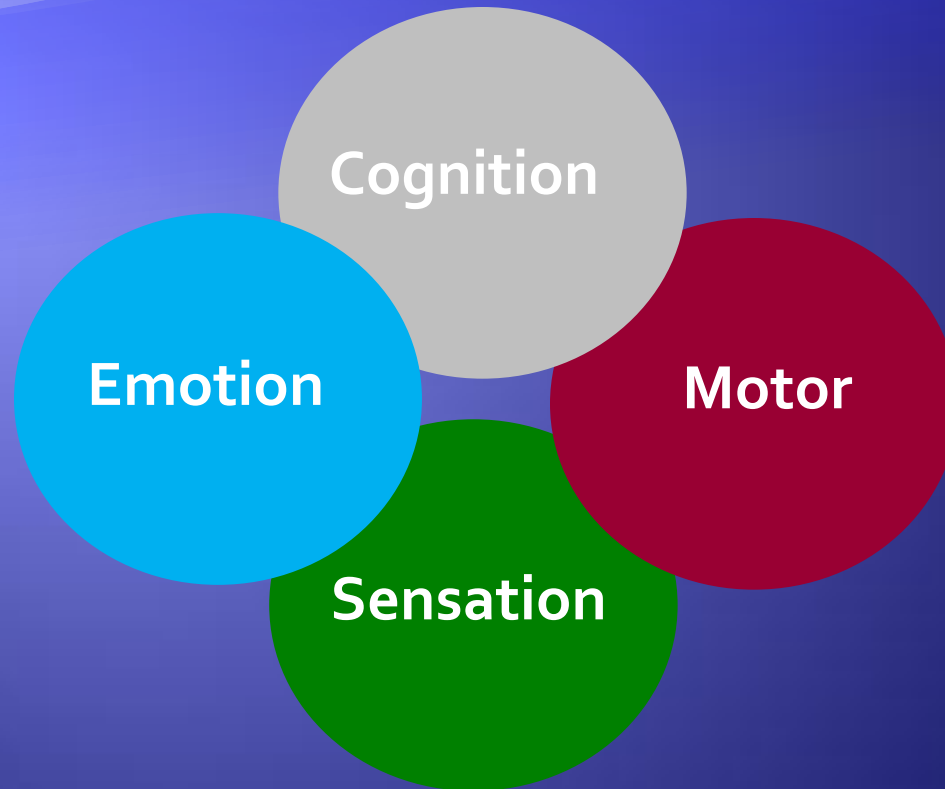
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# NIH Toolbox for Assessment of Neurological and Behavioral Function



# Sponsor



- ◆ NIH Blueprint for Neurosciences Research
- ◆ Overseen by the National Institute for Aging (Molly Wagster)

# NIH Toolbox for Assessment of Neurological & Behavioral Function



- ◆ Contract awarded September 2006 (FY06) to NorthShore University HealthSystem Research Institute, Richard Gershon, PhD [PI]

## Other Principals –

David Cella, PhD – NorthShore

Nathan Fox, PhD – University of Maryland

Richard Havlik, MD - Westat

Hugh Hendrie, MB, ChB, DSc – Indiana University





# Vision for the Final NIH Toolbox

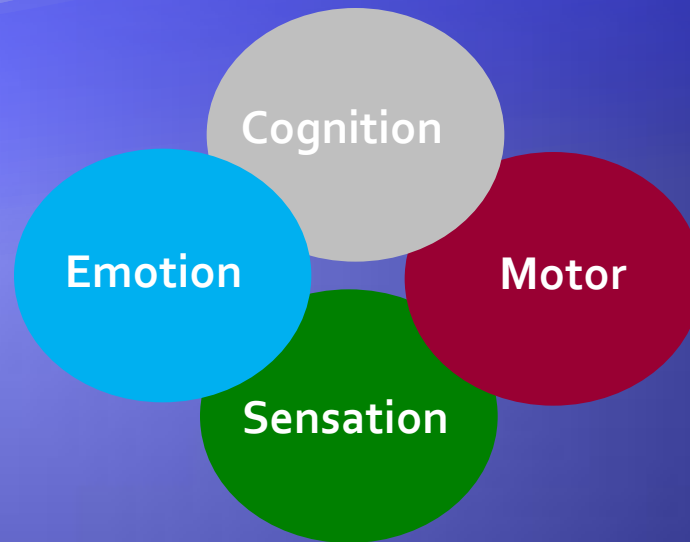
- ◆ 2 hour battery, covering the full range of normal function
- ◆ Not meant as a clinical instrument
- ◆ 4 domain-level batteries (cognition, emotion, motor, sensation)
- ◆ 30 min domain-level battery
- ◆ Validated with “gold standard” instruments
- ◆ Normed for ages 3-85 years.
- ◆ Tool “shed” of additional instruments



# Impact of Toolbox

- ◆ “Common Currency” across diverse study designs and populations
- ◆ Same task/construct over the lifespan
- ◆ Maximize yield from large, expensive, studies
- ◆ Low cost
- ◆ Cutting-edge, short, easy-to-administer

# NIH Toolbox for Assessment of Neurological and Behavioral Function



- ◆ Valid and reliable
- ◆ Multidimensional
- ◆ Versatile but brief
- ◆ Diverse
- ◆ State-of-the-art
- ◆ Dynamic



# Phase 1: 2006-2008

- ◆ Domain and Sub-domain selection
- ◆ Instrument Selection
- ◆ Pediatric Option
- ◆ Instrument Development



## Phase 1: 2006-2008/Phase 2: 2008-

- ◆ Domain and Sub-domain selection
- ◆ Instrument Selection
- ◆ Pediatric Option
- ◆ Instrument Development
- ◆ Field Testing
- ◆ Validation
- ◆ Norming



# Serving Diverse Populations

- ◆ General population dwelling in the community
- ◆ Ages 3-85 years
- ◆ Capable of following directions in English or Spanish
- ◆ Capable of understanding the informed consent process.

# Serving Diverse Populations



## Toolbox Working Groups

Accessibility

Geriatric

Cultural

Pediatric



# Pediatric Working Group Members

- ◆ **Marilyn Jager Adams, Ph.D.**  
*Brown University*
- ◆ **Patricia Bauer, Ph.D.**  
*Emory University*
- ◆ **David Blitz, M.A.**  
*Northwestern University*
- ◆ **Nathan Fox, Ph.D.\***  
*University of Maryland*
- ◆ **Richard Gershon, Ph.D.**  
*Northwestern University*
- ◆ **Jean Berko Gleason, Ph.D.**  
*Boston University*
- ◆ **Roberta Golinkoff, Ph.D.**  
*University of Delaware*
- ◆ **Kathy Hirsh-Pasek, Ph.D.**  
*Temple University*
- ◆ **Jin-Shei Lai, Ph.D.**  
*Northwestern University*
- ◆ **Gigliana Melzi, Ph.D.**  
*New York University*
- ◆ **Kathleen Wallner-Allen, Ph.D.\***  
*Westat*
- ◆ **Phil Zelazo, Ph.D.**  
*University of Minnesota*
- ◆ **Nick Zill, Ph.D.**  
*Westat*

\* Co-Chair



# Pediatric Assessment Principles

- ◆ Importance of having an examiner present
- ◆ Clarity and brevity of instructions
- ◆ Practice trials to ensure understanding
- ◆ Importance of feedback after practice trials and during task performance
- ◆ Importance of stop rules
- ◆ Importance of engaging child and motivating performance
- ◆ Pace of assessment



# Pediatric Review of Instruments

- ◆ All Toolbox and Toolshed measures reviewed
- ◆ Age-appropriateness of instrument
- ◆ Construct appropriateness
- ◆ Instructions
- ◆ Equipment
- ◆ Child's Perspective



# Pediatric Design Issues

- ◆ Computer interface
- ◆ Flexibility – by design
- ◆ “Live” or “Prerecorded” instructions
- ◆ Quality of the Voice
- ◆ Gender of speaker
- ◆ Training and Documentation

# Norming



- ◆ August – December 2011
- ◆ Normative reference values
- ◆ Toolbox and Toolshed

# Spanish



- ◆ Spanish and English versions
- ◆ Separate norms for Spanish-speaking
- ◆ Age 3-7 and 18-85



# Current NIH Toolbox Battery

- ◆ Final or close to final
- ◆ Norming study -- Shorten, refine, drop
- ◆ Final Toolbox Battery will be determined post-norming



# Cognition

## Executive Function

*Inhibitory Control  
Cognitive Flexibility*

## Episodic Memory

*Visual*

## Language

*Voc. Comprehension  
Reading*

## Processing Speed

## Attention

## Working Memory



# Emotion

## Positive Affect

*Pos. Feeling States  
Life Satisfaction/  
Meaning*

## Negative Affect

*Sadness  
Fear  
Anger*

## Stress and Self-Efficacy

*Perceived Stress  
Self-efficacy*

## Social Relationships

*Social Support  
Companionship  
Social Distress  
Pos. Social Dev.*



# Motor

Endurance

Locomotion

Strength

Dexterity

Balance

*Upper Extremity*

*Lower Extremity*



# Sensation

## Olfaction

*Odor Identification*

## Taste

*Sucrose Preference  
Regional Sensitivity*

## Vestibular Function

## Audition

*Hearing Threshold*

## Somatosensation

*Tactile  
Discrimination*

## Vision

*Visual Acuity*



# Studies Using Toolbox Instruments

- ◆ **Terry Jernigan, UCSD**
  - ◆ 2-year GO Grant
  - ◆ Ages 3-20
  - ◆ PING Study (Pediatric, Imaging, Neurocognition, and Genetics)
- ◆ **Richard Gershon, Northwestern U**
  - ◆ Go Grant to add collection and storage of DNA to the planned NIH Toolbox Norming Study

# Timeline



- ◆ Norming: Aug-Dec 2011
- ◆ Review Norming Results
- ◆ Final Instrument Modifications
- ◆ Documentation, Procedural and Technical Manuals
- ◆ September 2012: End User Meeting

# Additional Information



- ◆ [www.nihtoolbox.org](http://www.nihtoolbox.org)