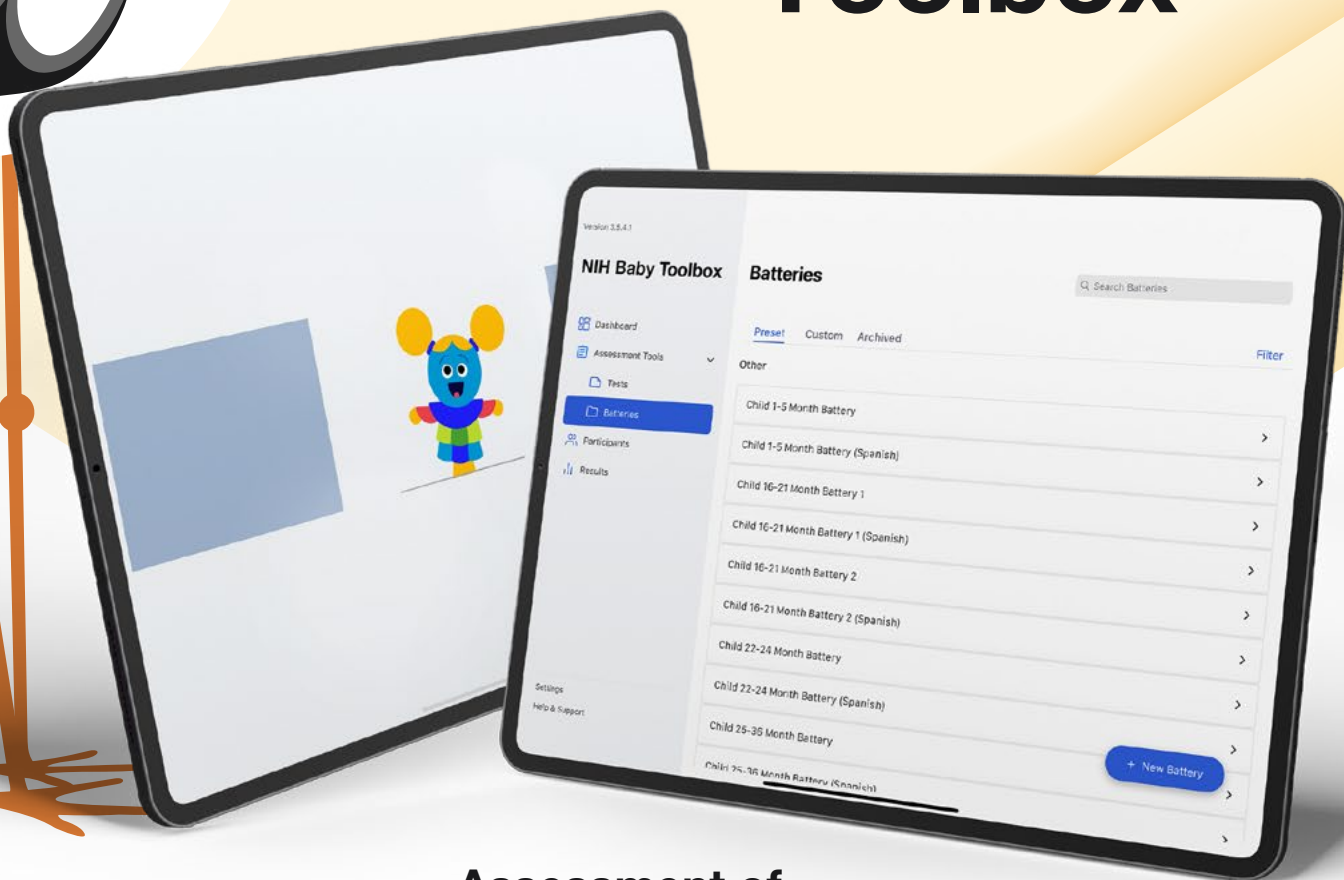


# NIH Infant and Toddler “Baby” Toolbox



Assessment of

Cognition

Motor

Social-Emotional

Available in Fall 2024

Ages 0-42 months



NIHBabyToolbox.org



# NIH Baby Toolbox

Contains more than 30 assessments of Cognition, Motor, and Social-Emotional domains in one iPad app. Our valid, reliable, and norm-referenced measures allow for assessment of children throughout infancy and early childhood (ages 0 to 42 months).



## Development At-A-Glance

2019



The National Institute of Child Health and Human Development awarded the NIH Baby Toolbox contract to Northwestern University using NIH Blueprint funds. Dr. Richard Gershon, Principal Investigator, and a team of 48 researchers started work to develop a brief, standardized assessment of neuropsychological, cognitive and social assessment of infants and toddlers ages 1-42 months.



2021

NIH Baby Toolbox began early validation.

2023

Collected validation and normative data for the NIH Baby Toolbox tests aligned with the U.S. Census.



2024

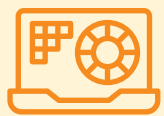
The analytics team for the NIH Baby Toolbox is developing scores and norms for the iPad-based tests. Public release is expected in the second half of 2024.

2015

In response to demand for a more portable assessment system, Version 2 of the NIH Toolbox launched to researchers and clinicians on the App Store for iPad.



## Key Features in the NIH Baby Toolbox



MODERN UX/UI CAPABILITIES CONSISTENT WITH THE TOOLBOX SYSTEMS



USER-FRIENDLY ADMINISTRATION



GAZE-BASED PREFERENTIAL LOOKING TASKS



NORMATIVE SCORES FROM 1-42 MONTHS



MULTI-METHOD ASSESSMENT MODALITIES

## Overview of Development

The NIH Baby Toolbox app assesses key developmental domains. Candidate measure selection was informed by input from an expert survey of developmental clinicians and researchers and a scoping review of over 30,000 manuscripts. Potential tests were reviewed for the ease of tablet-based administration and scoring, likelihood of standardization, scientific value, and ability to present stimuli in both English and Spanish. In this way, the Baby Toolbox tests were adapted from existing measures and laboratory-based paradigms, common among developmental researchers.

Key to the NIH Baby Toolbox is an emphasis on modern measurement methods. These methodologies include utilization of gaze-based preferential looking paradigms, on-device video recording and playback, and reporting functionality. To ensure the success of these developments, all of the NIH Baby Toolbox measures went through multiple stages of pilot testing and refinement. This includes feasibility testing new technology (e.g., four rounds of gaze-based pilot tests), evaluation of convergent validity between candidate Baby Toolbox measures, and existing developmental tests, as well

as a comprehensive “dry run” of the entire battery.

In preparation for the NIH Baby Toolbox release, a comprehensive norming study was conducted. Over 2,500 infants and toddlers from English- and Spanish-speaking households between the ages of 1 and 48 months were recruited across the country. Participant demographics were matched to the US Census for language spoken at home, race, ethnicity, sex assigned at birth, parental education, and geographic census region. Concurrent with the norming study, test-retest reliability and convergent validity studies were also conducted.

The NIH Baby Toolbox app is programmed using a similar user interface as the NIH Toolbox Version 3, which incorporates input from usability and accessibility experts to enhance its user experience for both examiners and participants. Users will find an easy-to-navigate interface, allowing for easy selection and administration of tests. Once the assessment is complete, results can be accessed through a Score Report or .CSV file designed for easy importing into research and clinical databases.

Cognition refers to the mental processes involved in attention, executive functioning, gaining knowledge, and comprehension, such as thinking, knowing, remembering, judging, and problem solving.

Through gaze-based and touch-based tasks on the iPad, behavioral observation, and parent report, the NIH Baby Toolbox Cognition domain produces individual measure-level scores and composite scores. Supplemental tests are not used in the calculation of composites but can be administered to better understand the participant's cognitive functioning.



## COGNITION

## Cognition Tests

TEST	SUBDOMAIN	DESCRIPTION	AGE IN MONTHS	ADMIN TIME IN MINUTES
Executive Function	Attention, Executive Function, Learning, Memory	Includes three gaze-based measures of executive functioning and memory: (1) familiarization to a stimulus, (2) novelty preference, and (3) Visual Delayed Response.	6-21	9
Visual Delayed Response	Attention, Executive Function, Memory	A measure that assesses attention, executive functioning, and memory via a visual-delayed touch-based paradigm.	22-42	5
Memory Task	Memory	Assesses memory using touch-based responses for learning and delayed recognition of items.	22-42	6
Mullen Visual Reception	Attention, Memory	Assesses visual reception using both elicited prompts and touch-based responses on the iPad.	0-42	4
MacArthur Bates CDI-CAT Production	Language	Assesses vocabulary production. Computerized Adapted Test versions of the classic MCDI parent report and requires responses to only 20-50 words.	9-30	2
MacArthur Bates CDI-CAT Comprehension	Language	Assesses vocabulary comprehension. Computerized Adapted Test versions of the classic MCDI parent report and requires responses to only 20-50 words.	7-18	1
Looking While Listening	Language	Assesses object-naming by showing infants two images on a screen and asking them to look at a target label using a gaze-based preferential looking paradigm.	6-23	5
Mullen Receptive	Language	Assesses receptive language and communication skills based on direct observation.	0-42	3

*Note: All NBT Tests require additional equipment and/or manipulatives to properly administer.*



## COGNITION

## Cognition Tests (Continued)

TEST	SUBDOMAIN	DESCRIPTION	AGE IN MONTHS	ADMIN TIME IN MINUTES
Mullen Expressive	Language	Assesses expressive language and communication skills based on direct observation.	0-42	3
Picture Vocabulary	Language	Assesses word knowledge which has a high association with overall intelligence ('g-factor'). Children are asked to select one of four images via a touch-based task.	24-42+	3
Object and Verbal Counting	Numeracy and Math	Assesses counting and cardinality by asking children to count as high as possible and to report the number of objects presented on a screen.	25-42	2
Subitizing	Numeracy and Math	Assesses approximate number system and number recognition by asking children to report on the number of objects presented briefly on a screen.	25-42	1
Who Has More	Numeracy and Math	Assesses approximate number system by asking children to select which of two numerical quantities on a screen is larger.	25-42	3
Verbal Arithmetic	Numeracy and Math	Assesses addition and subtraction by asking children to respond to simple arithmetic questions verbally.	25-42	2
Numerical Change Detection	Numeracy and Math	Uses gaze tracking and passive viewing to assess number sense, the approximate number system, and relative quantities.	6-23	4

*Note: All NBT Tests require additional equipment and/or manipulatives to properly administer.*

Social-Emotional functioning refers to the social competencies related to the perception/ recognition of others, social responsiveness/reciprocity, positive social interactions and communication, and relationships with adults and peers. It also covers the experience, expression, and management of any strong feelings (i.e., emotions), such as excitement, fear, or anger.

Early social-emotional functioning is foundational for lifelong health and well-being. Social-Emotional functioning is assessed in the NIH Baby Toolbox through behavioral observation and parent proxy report.



## SOCIAL-EMOTIONAL FUNCTIONING



## Social-Emotional Tests

TEST	SUBDOMAIN	DESCRIPTION	AGE IN MONTHS	ADMIN TIME IN MINUTES
Caregiver Checklist	Social Relationships, Social Communication	Parent-report measures of social-functioning.	6-42	2
Infant Behavior Questionnaire – Revised (IBQ-R) – Very Short Form	Temperament (Surgency, Negative Affectivity, Effortful Control)	Assesses intensity of feelings and strategies to manage them.	3-12	6
Early Childhood Behavior Questionnaire (ECBQ) – Very Short Form	Temperament (Surgency, Negative Affectivity, Effortful Control)	Assesses intensity of feelings and strategies to manage them.	13-36	6
Children’s Behavior Questionnaire (CBQ) – Very Short Form	Temperament (Surgency, Negative Affectivity, Effortful Control)	Assesses intensity of feelings and strategies to manage them.	37-42	6
PROMIS EC Parent-Report Bank v1.0 – Anger/Irritability	Negative Affect	Evaluates angry mood, including irritability and grouching, and angry behavior, such as tantrums.	13-42	1
PROMIS EC Parent-Report Bank v1.0 – Anxiety	Negative Affect	Assesses feelings of fear, anxious misery, hyperarousal, and social/separation anxiety.	13-42	1
PROMIS EC Parent-Report Bank v1.0 – Depressive Symptoms	Negative Affect	Measures feelings of sadness and withdrawal, negative self views, and anhedonia.	13-42	1
PROMIS EC Parent-Report Bank v1.0 – Positive Affect	Psychological Well-Being	Evaluates moods and feelings associated with positive affective experiences, such as happiness, joy, and enthusiasm.	13-42	1
PROMIS EC Parent-Report Scale v1.0 – Self-Reg – Frustration Tolerance 6a	Self-Regulation	Assesses the ability to recognize and regulate emotions and behaviors to serve one’s own goals.	13-42	1
PROMIS EC Parent-Report Scale v1.0 – Self-Reg – Flexibility 5a	Self-Regulation	Measures the ability to adapt in response to environmental demands, changes, and expectations.	13-42	1
PROMIS EC Parent-Report SF v1.0 – Soc Rel – Child-Caregiver Interactions	Social Relationships	Evaluates positive child-caregiver interactions, experiences, and connectedness.	13-42	1
PROMIS EC Parent-Report SF v1.0 – Soc Rel – Peer Relationships 4a	Social Relationships	Assesses positive peer interactions, sociability, and empathic behaviors.	13-42	1
Social Observation Younger (Joint Attention, Play, Prosocial Behavior)	Social Relationships, Social Communication	Assesses children’s social functioning in a semi-structured examiner-led interaction.	9-23	12
Social Observation Older (Joint Attention, Play, Prosocial Behavior)	Social Relationships	Assesses children’s social functioning in a semi-structured examiner-led interaction.	24-42	12

Note: All NBT Tests require additional equipment and/or manipulatives to properly administer.



Motor function involves complex physiological processes and requires the integration of multiple systems, including neuromuscular, musculoskeletal, cardiopulmonary, neural motor and sensory-perceptual systems.

The NIH Baby Toolbox motor measures assess both Fine Motor and Gross Motor abilities.



## MOTOR FUNCTION

## Motor Tests

TEST	SUBDOMAIN	DESCRIPTION	AGE IN MONTHS	ADMIN TIME IN MINUTES
Get up and Go	Gross Motor	Assesses postural transitions and locomotion by placing children on their back and observing how they get up, travel 3 meters, and get onto and off a step platform.	0-42	4.5
Reach to Eat	Fine Motor	Assesses manual planning, precision, dexterity, and tool use by observing how children grasp small objects and use tools.	0-42	5.5
Sit and Stand	Gross Motor	Assesses stationary postural control by placing children in various sitting and standing positions.	0-42	3.5

*Note: All NBT Tests require additional equipment and/or manipulatives to properly administer.*





**NIH Infant and Toddler (Baby) Toolbox**  
[www.nihbabytoolbox.org](http://www.nihbabytoolbox.org)

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