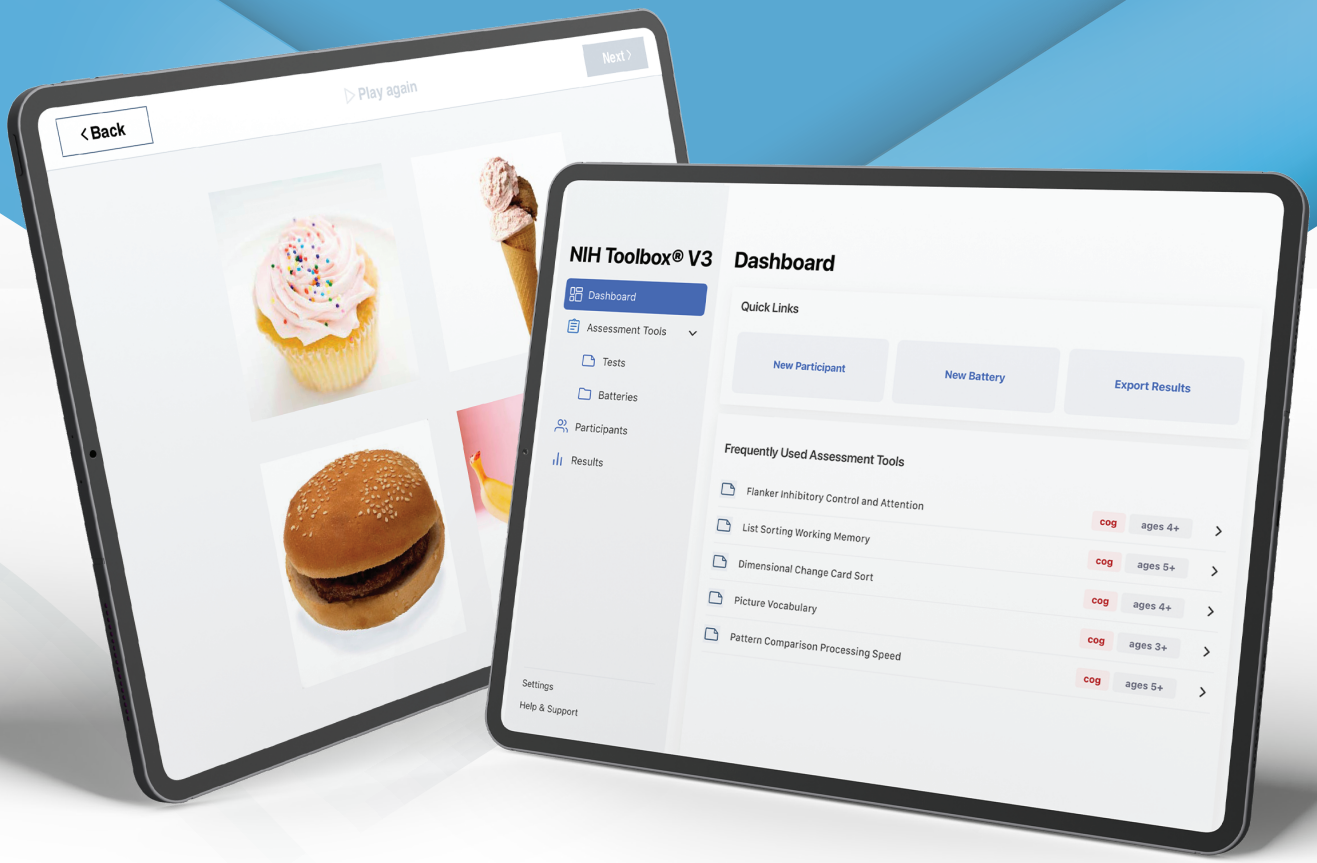
NIH TOOLBOX®
Motor
Emotion
Sensation
Cognition

Introducing V3

Assessment of

Cognition **Motor** **Sensation** **Emotion**

Ages 3-85+

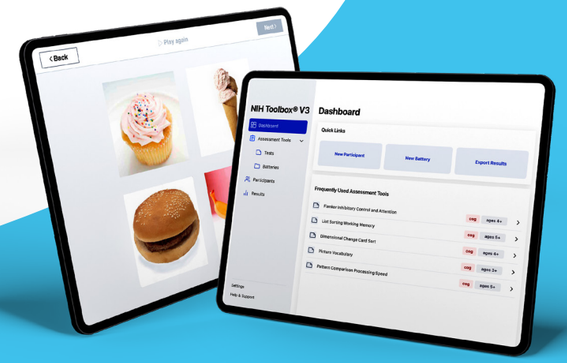


Download on the App Store

NIHToolbox.org

NIH Toolbox® V3

Over 50 digital assessments of Cognition, Motor, Sensation, and Emotion in one iPad app. Our valid, reliable and norm-referenced tests allow for the assessment of participants across the lifespan (3 to 85+ years).



Development At-A-Glance

2006
The NIH Blueprint for Neuroscience awarded a contract under the leadership of **Dr. Richard Gershon**, Principal Investigator, and a team of 250+ scientists across 80 academic institutions, to develop a brief, standardized assessment of neurobehavioral function to enhance data collection.

2012
Version 1 of the NIH Toolbox released to the research community as a web-based system.

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.

2021
Collected updated normative data for select NIH Toolbox tests aligned with the US 2020 Census.

2023
The NIH Toolbox Version 3 iPad app rolled out with improved UI and UX capabilities, user-friendly administration features, streamlined tests and updated scoring algorithms.

What's New in V3?

EXAMINER INTERFACE

- ENHANCED WORKFLOWS
- USER-FRIENDLY ADMINISTRATION
- IMPROVED UX/UI CAPABILITIES

TESTS

- UPDATED NORMED SCORES FOR AGES 3-85+
- NEW & UPDATED TESTS
- STREAMLINED SCORE REPORTS WITH GRAPHICS

Overview of V3 Development

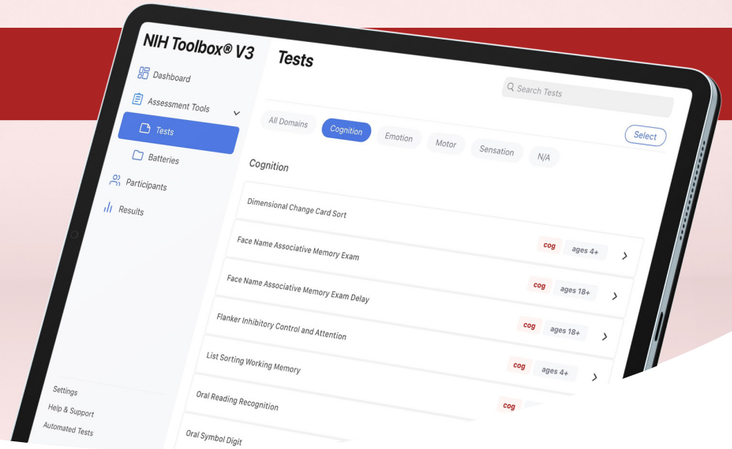
The NIH Toolbox V3 app offers a redesigned interface that incorporates input from usability and accessibility experts to enhance its user experience for both the examiners and their participants. Users will find an easy-to-navigate interface, allowing for the ready selection and administration of tests. Once the assessment is complete, results can be accessed through a Score Report or .CSV file.

As part of the V3 update, a new normative sample was collected for the NIH Toolbox Cognition Tests, and the Standing Balance Test (Motor Domain). A total of 3,900 participants ages 3–85+ were collected and their demographics were representative of the 2020 US Census. Data collection was performed by trained examiners across the US with 17% of cases collected in the Northeast, 36% in the South, 23% in the Midwest, and 24% in the West.

Users will also find updates on norm calculations for the NIH Toolbox V3 Cognition Tests and the Standing Balance Test, which have continuous norms that use chronological age in years, half-years, or quarter-years, depending on the participant's age. Change-sensitive scores are available for core Cognition Tests, as well as a norming approach that is based on the change-sensitive scores.

For other tests, in the Emotion, Motor, and Sensation Domains, the normative data was pulled forward from V2. Users will find other updates across these domains, such as a new scoring engine for Emotion Computer Adaptive Tests (CAT) which will allow for shorter, more targeted administrations. Please see the NIH Toolbox V3 Manuals for more detailed information.

Cognition



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

NIH Toolbox Cognition Tests produce individual test scores, and cognition batteries produce composite scores by age. Supplemental tests not used in the calculation of composites can be administered to better understand the participant's cognitive functioning.

Ages 7+ Composites

Total Cognition Composite =

Crystalized Composite:
Picture Vocabulary & Oral Reading Recognition tests.

+

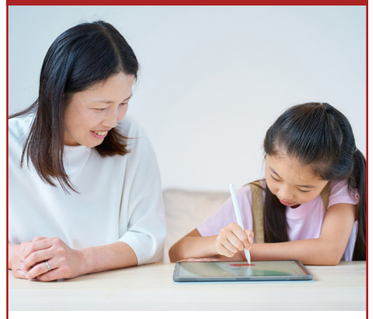
Fluid Composite:
Dimensional Change Card Sort, Flanker, Picture Sequence Memory, List Sorting, & Pattern Comparison tests.

Ages 4–6 Composite

Early Childhood Composite =

Dimensional Change Card Sort, Flanker, Picture Sequence Memory, Picture Vocabulary, & Speeded Matching tests.

Ages 3–6 Composite



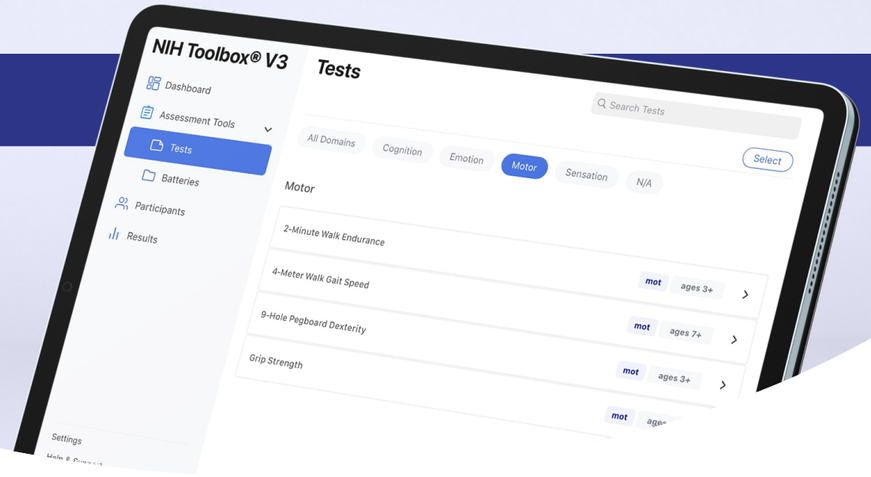
Early Childhood Cognition Composite—Crystallized-Fluid-Processing Speed (CFPS) =

Picture Vocabulary, Visual Reasoning, & Speeded Matching tests.

Cognition Tests

TEST	SUBDOMAIN	DESCRIPTION	AGE IN YEARS	ADMIN TIME IN MINUTES
Flanker Inhibitory Control and Attention	Attention, Executive Function	Assess the ability to focus attention and inhibit automatic response tendencies that can interfere with goal attainment.	4+	3
Dimensional Change Card Sort	Executive Function	Measure the capacity for switching among multiple aspects of a strategy or task.	4+	4
Visual Reasoning	Executive Function	Examine the ability to identify patterns and rules, integrate the information and apply it to solve problems.	3+	7
Oral Reading Recognition	Language, Expressive	Assess reading ability which is a robust measure of verbal intelligence.	7+	4
Picture Vocabulary	Language, Receptive	Measure word knowledge which has a high association with overall intelligence ('g-factor').	3+	3
Face Name Associative Memory Exam	Memory, Learning, Delayed, Visual, Immediate	Examine the capability to learn a set of twelve faces and names and the ability to recall them later.	18+	7
List Sorting Working Memory	Memory, Working	Assess the ability to process, store and manipulate information across a series of tasks.	5+	7
Picture Sequence Memory	Memory, Episodic	Investigate the ability needed to memorize a sequence of pictures and reproduce it.	3+	7
Rey Auditory Verbal Learning	Memory, Learning, Immediate, Delayed, Verbal	Assess the ability to learn a list of 15 words over three repeat trials and recall them after delay.	5+	4
Oral Symbol Digit	Processing Speed	Examine the ability to quickly process information through matching symbols with digits.	5+	3
Pattern Comparison Processing Speed	Processing Speed	Examine the speed of visually detecting whether two stimuli are the same or different.	5+	4
Speeded Matching	Processing Speed	Measure the speed of selecting a target picture amongst distractors.	3–6	3

Motor



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

Motor Battery

Recommended for ages 7+:

9-Hole Pegboard Dexterity, Grip Strength, Standing Balance, 4-Meter Walk Gait Speed, & 2-Minute Walk Endurance tests.

Early Childhood Motor Battery

Recommended for ages 3–6:

9-Hole Pegboard Dexterity, Grip Strength, Standing Balance, & 2-Minute Walk Endurance tests.

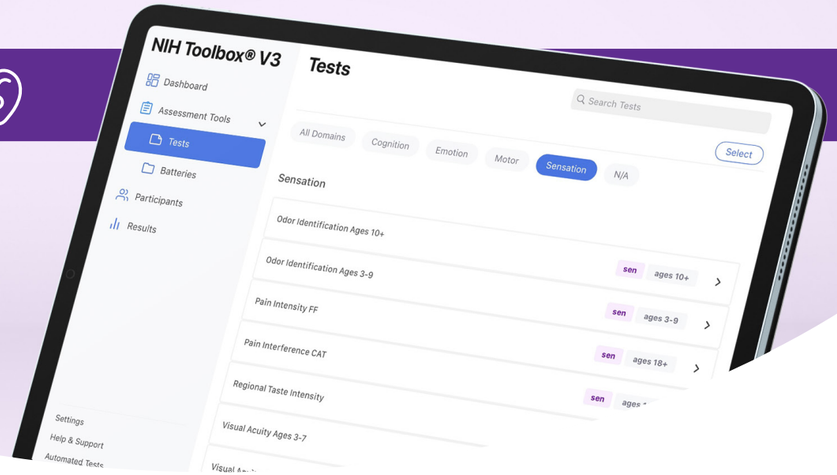
Motor Tests

TEST	SUBDOMAIN	DESCRIPTION	AGE IN YEARS	ADMIN TIME IN MINUTES
2-Minute Walk Endurance	Endurance	Measure of overall physical fitness and endurance, which requires one to walk at a normal speed on a flat surface for 2 minutes.	3+	4
4-Meter Walk Gait Speed	Locomotion	Assess locomotion by walking 4 meters at a normal speed on a flat surface.	7+	3
9-Hole Pegboard Dexterity	Dexterity	Examine fine motor dexterity by placing 9 pegs into a board with 9 holes, then removing them as quickly as possible.	3+	4
Grip Strength	Strength	Measure upper extremity strength by squeezing a hand dynamometer as hard as they can, one hand at a time.	3+	3
Standing Balance	Balance	Assess balance by performing a series of poses on the ground and on a foam pad.	3+	7

Motor function is indicative of current physical health status, burden of disease and long-term health outcomes, and is integrally related to daily functioning and quality of life.

Note: All Motor Tests require additional equipment to properly administer.

Sensation



Sensation refers to the biochemical and neurologic process of detecting incoming nerve impulses as nervous system activity. Sensory processes are vital to one's level of independence in relationships with others, academic and occupational endeavors, and activities of daily living.

Recommended Inclusion of Additional Tests at Older Ages

Words-In-Noise, Visual Acuity, Odor Identification, Regional Taste (Ages 12+), Pain Intensity (Ages 18+), & Pain Interference (Ages 18+) tests.

Recommended for Ages 3–6+

Visual Acuity and Odor Identification tests.

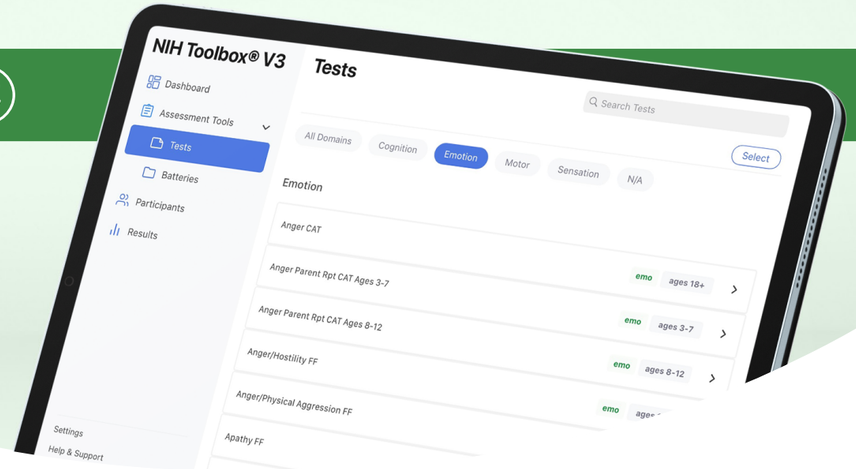
Sensation Tests

TEST	SUBDOMAIN	DESCRIPTION	AGE IN YEARS	ADMIN TIME IN MINUTES
Odor Identification	Olfaction	Assess olfaction by identifying and naming odors on scratch-and-sniff cards.	3+	4
Pain Intensity	Pain	Assess one's level of pain in the past 7 days.	18+	1
Pain Interference	Pain	Assess how much pain has interfered or affected one's enjoyment of activities in the past 7 days.	18+	1
Regional Taste Intensity	Taste	Measure taste sensitivity by asking one to rate the intensity of salty and bitter solutions on the tip of their tongue and mouth.	12+	6
Visual Acuity	Vision	Assess distance vision by having one sit 3 meters away and identify letters as they appear on the screen.	3+	3
Near Visual Acuity	Vision	Measure near vision by verbally indentifying letters on a screen 16 inches away.	8+	3
Words-In-Noise	Audition	Assess the ability to detect, discriminate and localize speech in a noisy background.	6+	6
Hearing Threshold	Audition	Assess participants' ability to hear sounds that gradually decrease in volume.	7+	6

Objective measures of sensation can systematically examine and determine if one has intact sensory functioning. Given the changes in sensory functioning across the lifespan, there is value in characterizing age-related sensory improvement and decline.

Note: Some Sensation Tests require additional equipment to properly administer.

Emotion



Emotion refers to any strong feelings, such as joy, sorrow, or fear. It is an affective state of consciousness in which one of these feelings is experienced, as distinguished from cognitive and volitional states of consciousness.

Test items are presented in a self-report format and a parent proxy-report for younger children.

The NIH Toolbox Emotion Battery

Recommended for Ages 8+:

Consists of tests of Positive Affect, General Life Satisfaction, Emotional Support, Friendship, Loneliness, Perceived Rejection, Perceived Hostility, Self-Efficacy, Anger, Fear/Anxiety, and Sadness/Depression.

For ages 13+, the battery also includes a test of Perceived Stress. For ages 18+, the battery also includes tests of Meaning and Purpose and Instrumental Support.

The NIH Toolbox Parent Proxy Emotion Battery

Recommended for parents of children ages 3–12:

Includes tests of Positive Affect, General Life Satisfaction, Positive Peer Interaction, Social Withdrawal, Peer Rejection, Empathic Behaviors, Fear, Sadness, and Anger. For those with children ages 8–12, tests for Perceived Stress and Self-Efficacy are included.

Emotion Tests

TEST	SUBDOMAIN	DESCRIPTION	AGE IN YEARS
Anger	Negative Affect	Assess irritability, frustration, interpersonal sensitivity, envy, disagreeableness, and efforts to control anger. (FF, CAT)	3+
Apathy	Negative Affect	Evaluate deficits in goal-oriented behavior and decrements in goal-related thought. (FF)	18+
Emotional Support	Social Relationships	Assess one's perception that their social network is available to listen to their problems with empathy, caring, and understanding. (CAT)	18+
Empathic Behaviors	Social Relationships	Measure a parent's perception of their child's prosocial behaviors. (CAT)	3–12
Fear/Anxiety	Negative Affect	Assess one's feelings of fear, anxious misery, hyperarousal, and somatic symptoms related to arousal. (CAT)	8+
Friendship	Social Relationships	Assess the availability of friends or companions with whom to interact or affiliate. (CAT)	8+
General Life Satisfaction	Psychological Well-Being	Assess one's cognitive evaluation of life experiences and whether they like their life. (CAT, FF)	3+
Instrumental Support	Social Relationships	Assess one's perception that people in their social network are available to provide material or functional aid in completing daily tasks, if needed. (CAT)	18+
Loneliness	Social Relationships	Assess one's perceptions of being alone, lonely, or socially isolated from others. (FF)	8+
Meaning and Purpose	Psychological Well-Being	Assess one's feelings around whether life has purpose and there are good reasons for living. (CAT)	18+
Peer Rejection	Social Relationships	Assess how often one is left out, avoided, or teased by peers. (CAT)	3–12
Perceived Hostility	Social Relationships	Evaluate one's perceptions of hostility in their daily social interactions. (CAT, FF)	8+
Positive Affect	Psychological Well-Being	Measure feelings of pleasurable engagement with the environment, such as happiness, joy, excitement, enthusiasm, and contentment. (CAT)	3+
Sadness/ Depression	Negative Affect	Evaluate poor mood and negative perceptions of the self, the world, and the future. (CAT)	3+
Self-Efficacy	Stress and Self-Efficacy	Measure one's capacity to manage problems and have control over meaningful events. (CAT)	8+
Social Withdrawal	Social Relationships	Assess the perception of being alone, lonely, or socially isolated from others. (FF)	3–12

All tests are administered in 2 minutes or less. *Computer Adaptive Test = CAT; Fixed Form = FF

Note: This listing is only a representative sample of included Emotion Tests. For a full list, visit our website or app.

For Assessment of Neurological and Behavioral Function

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Thank you to the hundreds of scientific experts who helped to develop, maintain, and support the NIH Toolbox over the years.

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