



# **NIH Toolbox® for Assessment of Neurological and Behavioral Function**

## **Administrator's Manual**

**iPad App Version 1.23 and up**

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## A. Introduction to the NIH Toolbox App

### A.1 What is the NIH Toolbox App?

The NIH Toolbox app provides access to the NIH Toolbox for Assessment of Neurological and Behavioral Function, a standard set of valid, reliable and royalty-free tools for assessing cognitive, emotional, motor and sensory function. Designed to benefit all scientists interested in investigating behavioral and neurological function, the NIH Toolbox App is also relevant for students and clinicians across a broad spectrum of health research. It is particularly well-suited for measuring outcomes in longitudinal epidemiological studies along with prevention or intervention trials. NIH Toolbox measures have been normed and validated across the lifespan in participants ages 3-85.

### A.2 Development of the NIH Toolbox

In 2004, 15 Institutes, Centers and Offices at the National Institutes of Health (NIH) that support neuroscience research formed a coalition called the *Blueprint for Neuroscience Research*. The NIH Blueprint goal was to develop new instruments, resources and training opportunities to accelerate the pace of discovery in neuroscience research. Because the research community had long sought the development of standard instruments to measure cognitive and emotional health, in 2006 the NIH Blueprint awarded a contract to develop an innovative approach to meet this need.

The NIH Toolbox was intended to include the following domains: Cognition, Emotion, Motor, and Sensation. Initial literature and database reviews and a ‘Request for Information’ of NIH-funded researchers identified the sub-domains for inclusion in the NIH Toolbox along with the criteria affecting instrument selection, creation and norming.

NIH Toolbox validation studies were conducted across the entire age range, typically including 450-500 subjects, and statistically compared NIH Toolbox against existing “gold standard” measures, whenever available. For tests using Item Response Theory (IRT) approaches to scoring, calibration samples generally included several thousand participants, ensuring robust models. In total, data were collected from more than 16,000 subjects as part of field-testing, calibration and validation activities.

The NIH Toolbox project conducted a large national norming study in both English and Spanish languages. A sample of 4,859 participants, ages 3-85, representative of the U.S. population based on gender, race/ethnicity, and socioeconomic status was administered all of the NIH Toolbox measures at sites around the country. NIH Toolbox normative scores are now available for each year of age from 3 through 17, as well as for ages 18-29, 30-39, 40- 49, 50-59, 60-69, 70-79, and 80-85, allowing for targeted, accurate comparisons for any research study participant groups against the U.S. population. In 2012, the web-based version of NIH Toolbox was released to the general public and in 2015, the iPad app version was released.

NIH Toolbox measures utilize several advanced approaches in item development, test construction, and scoring. Two of these are Item Response Theory (IRT) and Computer Adaptive Testing (CAT), which are used in a subset of instruments. IRT allows tests to be brief, yet precise and valid. Using IRT methodology, sets of items are calibrated along a continuum that covers the full range of the construct to be measured. This calibrated set of items enables the creation of CAT, a specialized type of computer-based testing that enables administration of

items based on individuals' responses, with minimal burden on participants and precise evaluation at the individual level.

NIH Toolbox instrument development has focused on the continuity of assessments throughout the lifespan. An expert team of early childhood and older adult assessment consultants was engaged to provide guidelines for administration, to offer input on instrument development, and to review all NIH Toolbox measures as they relate to the needs of young children and elderly participants.

### A.3 Characteristics of the NIH Toolbox App

The use of the NIH Toolbox has grown significantly since public release of the web-based version in 2012. Beginning in 2015, the NIH Toolbox is available in the form of an iPad app that presents the following user-friendly features and functions:

- Takes advantage of portable, easy-to-use technology
- Presents a complete stand-alone application – internet access is no longer required during test administration
- Administering the tests can be easily mastered with practice
- Minimizes the use of custom hardware
- Features enhanced normative scores for individual tests and composites
- Allows results to be stored locally on the iPad or exported to the iCloud or a configurable web address
- Provides basic reporting on an individual participant level
- Offers email support ([help@nihtoolbox.org](mailto:help@nihtoolbox.org))

### A.4 Future of the NIH Toolbox App

As detailed above, NIH Toolbox evolved from a web-based suite of tests (i.e., V1) to an iPad app (i.e., V2). That evolution continued in 2023 in the form of a new NIH Toolbox V3 app. The new NIH Toolbox V3 app features streamlined test instructions and workflows, added tests, updated normative data for the Cognition domain reflective of the 2020 US Census, updated scoring algorithms, user-friendly administration features, and a more intuitive examiner interface.

The NIH Toolbox app, also known as V2, has an app icon with a red toolbox and a black background. The NIH Toolbox V3 app icon has a red toolbox with a white background and a blue banner along the bottom. The NIH Toolbox V2 app is in its retirement phase, and will not be available beyond summer 2028. We recommend studies that have already begun on V2 that are expected to be completed before summer 2028 to complete data collection and data export on V2. For studies that have already begun on V2 but are expected to extend beyond 2028, we recommend you contact NIH Toolbox customer support for general (i.e., not study-specific) guidance. All new studies should begin in the NIH Toolbox V3 app.

The NIH Toolbox V3 app requires a separate subscription. Data cannot be transferred from the NIH Toolbox app to the NIH Toolbox V3 app. **Please export all V2 data before deleting the app; once the app is deleted, data cannot be recovered.**

## B. Learning about the NIH Toolbox App

Users will find that the NIH Toolbox is a user-friendly and effective resource for assessing functioning over time. This **NIH Toolbox Administrator's Manual** and the **NIH Toolbox eLearning Course** (see NIHToolbox.org) are designed to be used together when learning how to use the NIH Toolbox app. After reviewing sections A and B of this Manual, an administrator should go through the eLearning course for the NIH Toolbox app. Once an administrator has studied the eLearning course and completed practice sessions, each instrument is easy to administer.

Once training is complete, this manual should be used for review as needed.

When used electronically, this manual includes hyperlinks that, when clicked on or touched, take the user directly to the referenced section.

### B.1 NIH Toolbox App Structure

#### ***Introduction – Domain, Battery, Instrument***

To better understand the NIH Toolbox structure and to make informed choices as an administrator, there are a number of terms that the user needs to understand.

**Domain** – The NIH Toolbox spans four domains or broad areas of health and function: Cognition, Emotion, Motor and Sensation. Each domain includes multiple instruments that can be selected individually or used as part of a preset battery.

**Preset Battery** – A pre-defined set of instruments intended to be administered together in a specific order. The order of instruments within a preset battery cannot be changed. Individual instruments, or additional batteries, can be added to an assessment, before or after the preset battery. Scores are produced for each instrument in the battery as well as composites for the Cognition Battery and summary scores for Emotion batteries.

**Instrument** – A set of items administered in a predetermined fashion that cannot be changed by the administrator. Each instrument is an individual assessment resource that can be administered as a stand-alone measure, as part of a preset battery, or as part of a custom battery. Instruments are also referred to as “measures” and “tests” in this manual. All of these words are used interchangeably.

**Item** – A question or task within an instrument. The instrument is comprised of items.

**Custom Battery** – A user-created and named battery containing one or more instruments in any desired order. A custom battery may be created by saving a custom list of instruments for use in future assessments. Once a custom battery has been administered to a participant, it cannot be modified. If a user wishes to edit the custom battery, it must be saved under a new, unique name.

 Custom batteries are only available on the iPad on which it was created. Future releases may enable a custom battery that can be shared across iPads with the same Apple ID. An administrator can create a custom battery that contains instruments from more than one domain, and the battery can be given in any order specified by that administrator.

**Assessment** – A group of instruments given to a participant. These may or may not contain a custom or preset battery.

## B.2 Getting the NIH Toolbox App

### B.2.1 Hardware and Software Needed to Use the NIH Toolbox App

To get the NIH Toolbox App, you will need the following: an **iPad** and an **Apple ID**. These are described in more detail below. The NIH Toolbox App is only available through the “App Store,” a digital distribution platform for mobile apps on Apple devices. At this time, only an iPad version of the app has been developed.

#### iPad

Please see the most updated hardware requirements at:

<https://nihtoolbox.zendesk.com/hc/en-us/articles/13079138249492-Hardware-Requirements>.

**To obtain the latest version of iOS, see *Settings>General>Software Updates* on your iPad.**

#### Apple ID

You will need an Apple ID to use the App Store app, which comes pre-installed on your iPad.

An Apple ID is your all-in-one account used to log in to all Apple products. You may already have an Apple ID. If this is the case, you may use this ID or you may want to consider setting up another Apple ID for your NIH Toolbox activity. Please refer to Apple for more information about Apple IDs.

 An Apple ID is associated with your billing information (i.e. credit card). While the NIH Toolbox App is free to install, you must purchase a subscription to be able to score the instruments. More information about pricing options can be found at [nihtoolbox.org](http://nihtoolbox.org).

### B.2.2 Downloading and Opening the NIH Toolbox App

1. Tap on the **App Store** icon on your iPad.
2. Enter NIH Toolbox in the Search field in the upper right corner of the App Store and tap **Search**.
3. Once the NIH Toolbox app is displayed, tap the **Get** button next to it. It will turn into an **INSTALL** button.
4. Tap **Install** to confirm you wish to download and install the app. If you are already signed in using your Apple ID, a pop up screen will ask you to provide your password. If you are not signed in, you will be given the options of “Use Existing Apple ID,” “Create New Apple ID” and “Cancel.”
5. Since you have already created your Apple ID, tap the **Use Existing Apple ID** button and sign in using your Apple ID and password. At this point, the download will begin and the NIH Toolbox app will become available on your iPad.
6. If you cannot see the app on your iPad after downloading, try swiping to the right or left to see all of the apps installed on your iPad.
7. Open the NIH Toolbox App by tapping the NIH Toolbox icon.
8. Accept the NIH Toolbox app Terms and Conditions (see [Appendix 1](#)).
9. When opening the app for the first time, you will be asked to set up a passcode. You will be asked to enter this passcode every time you open the app in the future. Keep this passcode in a safe place.



The NIH Toolbox app is available through the App Store and can be downloaded for free. However, to use the app in its entirety, you will be asked to purchase a 12-month subscription. This subscription may be used on any iPad on which you

install the NIH Toolbox app, as long as you use the same Apple ID used for purchase. No cancellation of the current (paid) subscription is allowed during the subscription period. After expiration, you will still have access to your data on the iPad, but you will no longer be able to create new participants/patients or collect new data.

Prior to subscribing, you may explore the app while in Trial Mode. Trial Mode allows access to the instruments, batteries and running assessments. This will give you the opportunity to get comfortable and delve into what the NIH Toolbox app has to offer and how it functions. However, while using the app in the Trial Mode no data will be saved and you will not have access to the reports or data exports. To begin collecting data you must subscribe to the app.

### **B.3 NIH Toolbox Support**

To access a copy of this manual or view more resources about the NIH Toolbox, please visit [www.nihtoolbox.org](http://www.nihtoolbox.org). Contact [help@nihtoolbox.org](mailto:help@nihtoolbox.org) with questions, or to report technical problems.

The NIH Toolbox is more than a set of measures: we are a community of users, and NIH Toolbox continues to evolve. Help us make this product the best it can be. *If you have suggestions for changes or corrections, please share them here: [help@nihtoolbox.org](mailto:help@nihtoolbox.org).*

## B.4 Using the NIH Toolbox App

### B.4.1 NIH Toolbox App at a Glance



Once the app is launched, users will see 4 buttons on the home screen: [Participants](#), [Batteries and Profiles](#), [Export Data](#) and [Settings](#). This section of the manual is organized according to the functions achieved by tapping one of those buttons. Data security is described at the end of the section.



Required setting: A passcode must be set on the iPad running the NIH Toolbox app, for security purposes. The app will not launch if a passcode is not set.

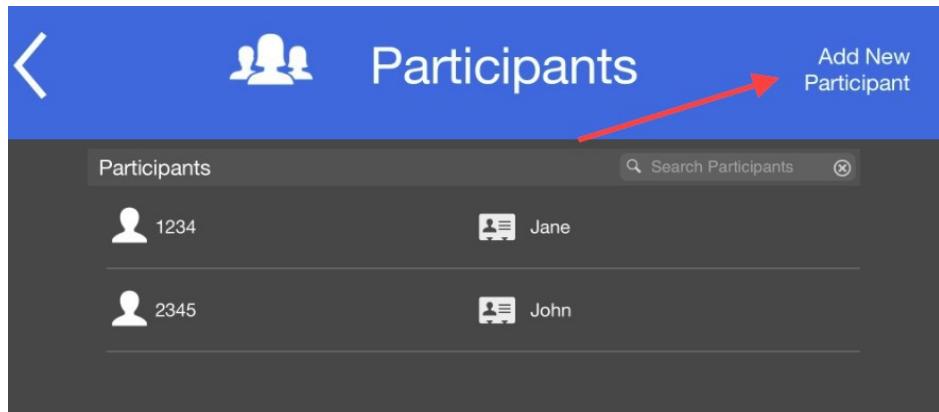


Recommended setting: Disable all pop-up messages (i.e. calendar alerts) on the iPad running the NIH Toolbox app. This will ensure smooth, uninterrupted data collection.

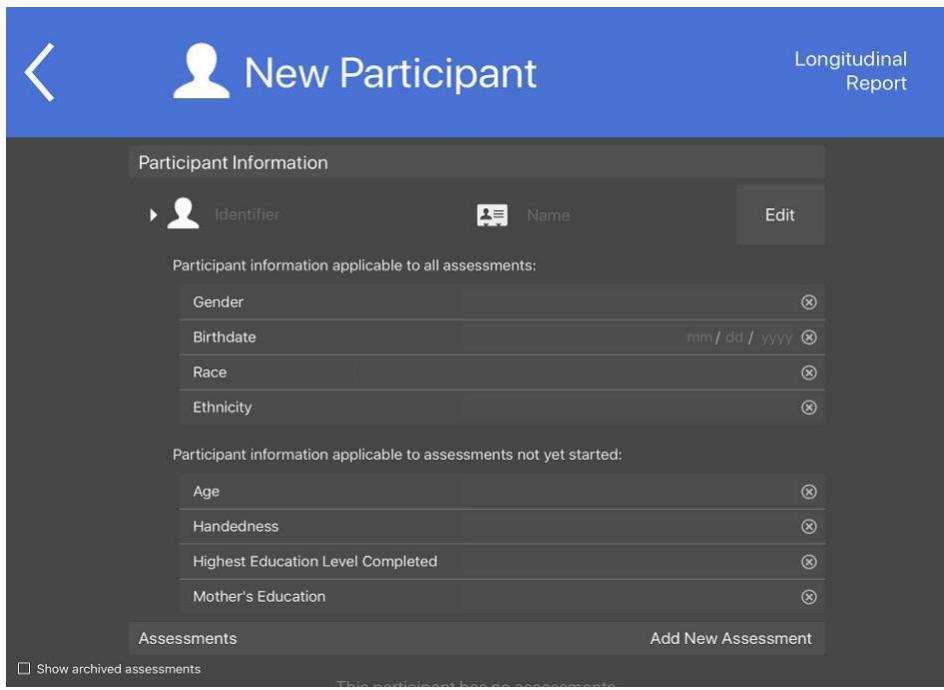
## B.4.2 Participants

### Create a new participant

**Step 1:** Tap **Add New Participant** in the upper right corner of the Participant screen:



**Step 2:** Complete the new participant information:



The screenshot shows the 'New Participant' screen. At the top, there is a blue header with a back arrow, a user icon, the text 'New Participant', and a 'Longitudinal Report' button. Below the header is a section titled 'Participant Information' with a sub-section for 'Identifier' (containing '1234') and 'Name' (containing 'Jane'). There is an 'Edit' button next to the Name field. Below this are sections for 'Participant information applicable to all assessments' (Gender, Birthdate, Race, Ethnicity) and 'Participant information applicable to assessments not yet started' (Age, Handedness, Highest Education Level Completed, Mother's Education). At the bottom, there is a 'Show archived assessments' checkbox and a note: 'This participant has no assessments'.

- **Identifier** – Any alphanumeric combination or special symbols you wish to assign to this participant. This is the only field that is **ALWAYS** required.
- **Name** – The participant's name. This is the only field that is **ALWAYS** optional regardless of the function you wish to use.
- **Birthdate or Age** – User to choose which of the two to enter for a participant
- **Handedness** (required) – If unknown, please refer to [Appendix 3](#) for a brief survey to determine handedness

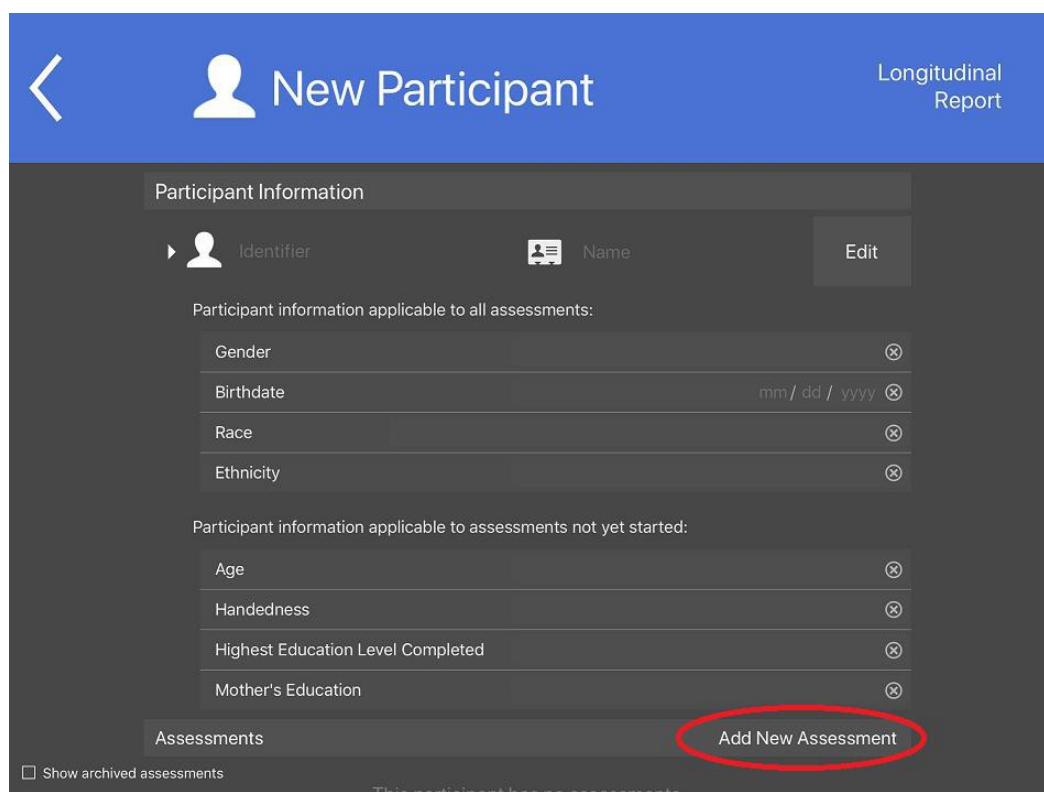
Please note that some of these fields may be required for some instruments. Examiners will be alerted when launching an assessment if one or more required fields are missing based on the selection of instruments. Error and Warning Error and Warning messages are described below in more detail.

If a participant is less than 18 years old and his/her Mother's Education is unknown, examiners will be asked to complete additional fields related to other family members' education.

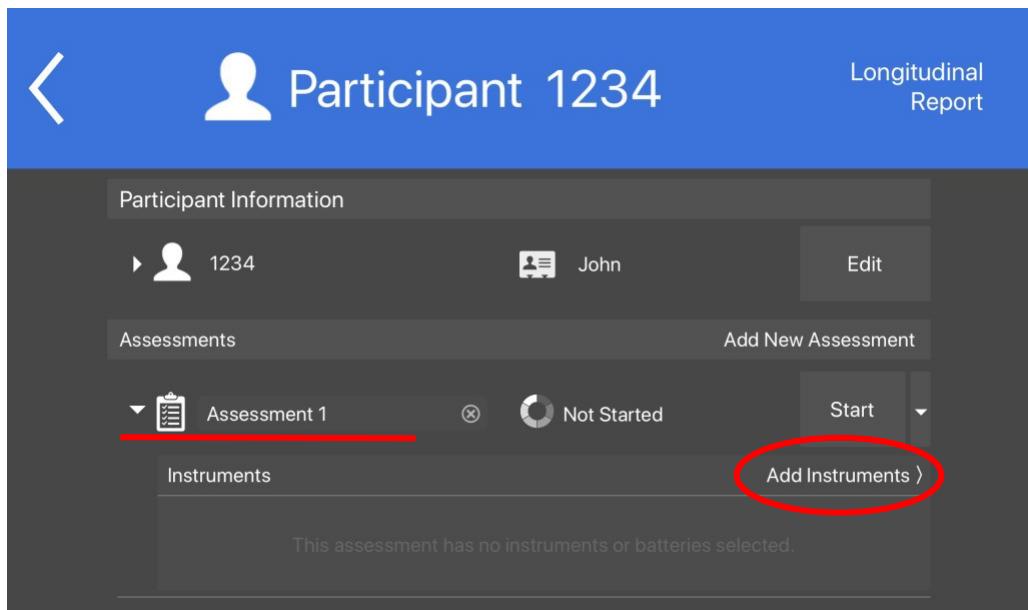
If the NIH Toolbox Picture Vocabulary Test or the NIH Toolbox Oral Reading Test is selected, examiners will also see a Starting Education Level Override field. If an examiner feels that a participant should begin the test at a level higher or lower than what would be appropriate for his/her grade/education level, the examiner should use this feature. Using the override will affect the difficulty of the initial items presented on these tests; this may be appropriate in cases where the participant is expected to be at a significantly higher or lower functioning level than would be expected by his/her grade level/education. This function should be used judiciously and only in cases where the examiner has prior evidence of lower or higher participant functioning.

### ***Assign batteries or instruments to a participant***

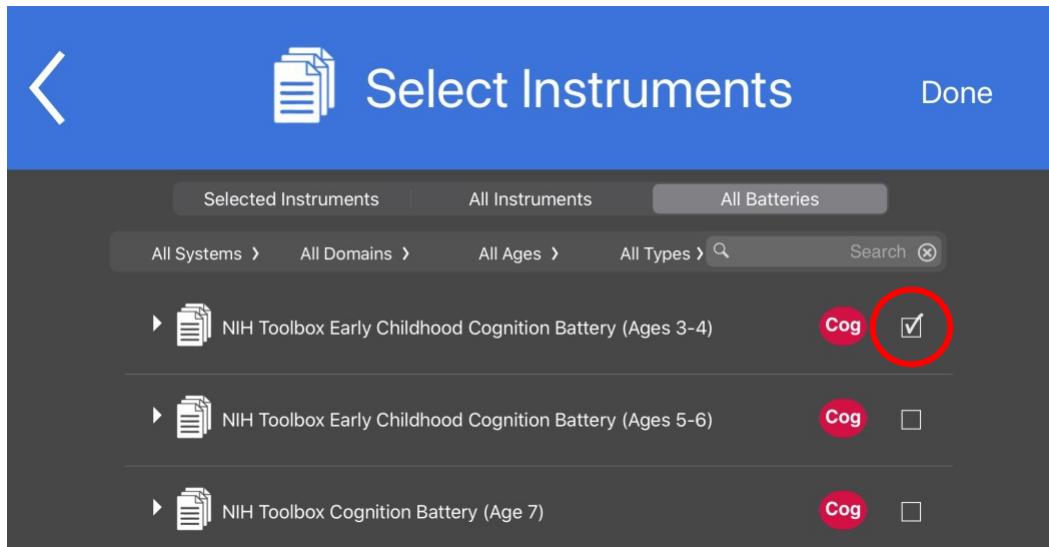
**Step 1:** Tap **Add New Assessment** either from a new participant or an existing participant window:



Once Add New Assessment is tapped, the app will create a new assessment and offer the user an opportunity to add instruments to that assessment (**Add Instruments** button). The name of the assessment defaults to "Assessment X," where X is a numeral, starting at 1 and moving up sequentially, depending on how many assessments have been assigned to this participant. Tap the name of the assessment to edit it.



**Step 2:** Select batteries or individual instruments to be added to the assessment from the list of available Instruments and/or Batteries by tapping the check mark next to the instrument's or battery's name.



Users can **filter** the list of available batteries, as well as the list of available instruments by tapping arrows and making selections from the following categories:

- Systems
- Domains
- Ages
- Types

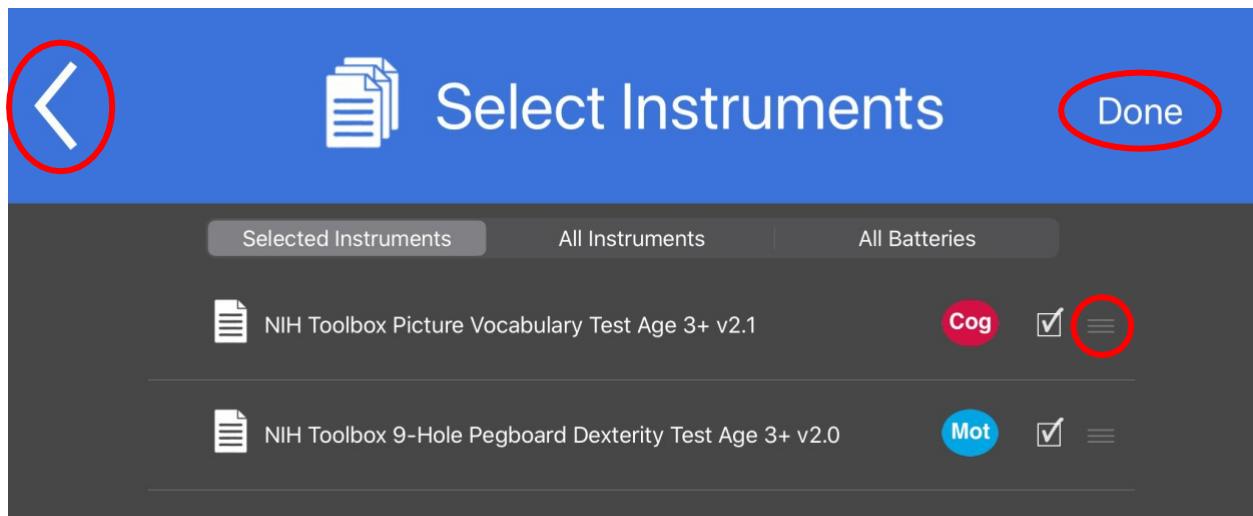
Selected instruments will move to the upper part of the screen and will be listed under Selected Instruments.

 **NIH Toolbox Touch Screen Tutorial Age 3+** is available and recommended for anyone not familiar with using an iPad or similar devices. It should be added as the very first instrument in the assessment.

 **NIH Toolbox Emotion Instructions (Adult/Child)** should be added immediately before the first NIH Toolbox Emotion instrument for the given participant. Preset batteries do include appropriate instructions, so instructions should only be added if the user is **not** selecting a preset emotion (adult/child) battery. **NIH Toolbox Emotion Instructions (Parent Report)** should be added immediately before the first NIH Toolbox Emotion instrument to be completed by parents about the given child. Preset batteries do include appropriate instructions, so instructions should only be added if the user is **not** selecting a preset emotion (parent report) battery. **NIH Toolbox Emotion Instructions** should also be used with NIH Toolbox Pain instruments.

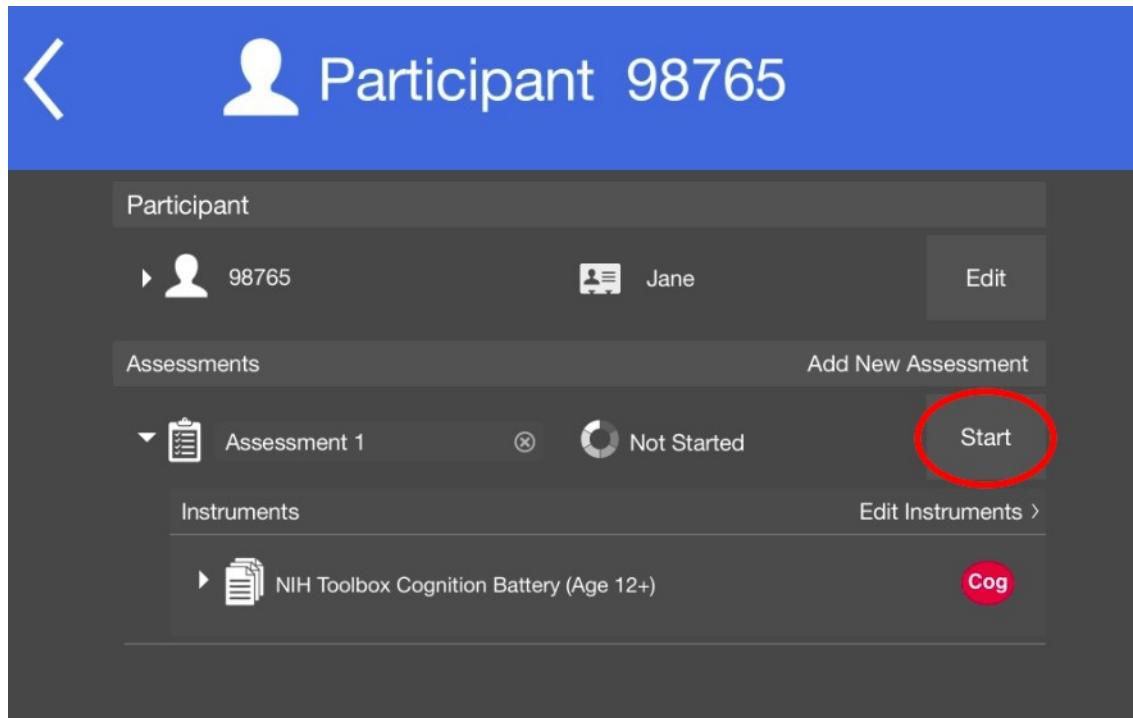
**Step 3: Reorder** selected instruments, if desired, by dragging them up or down, using the  symbol to the right of the instrument name.

Tap **Done** in the upper right corner of the screen or tap the arrow in the upper left corner to save your selections and to return to the previous screen.

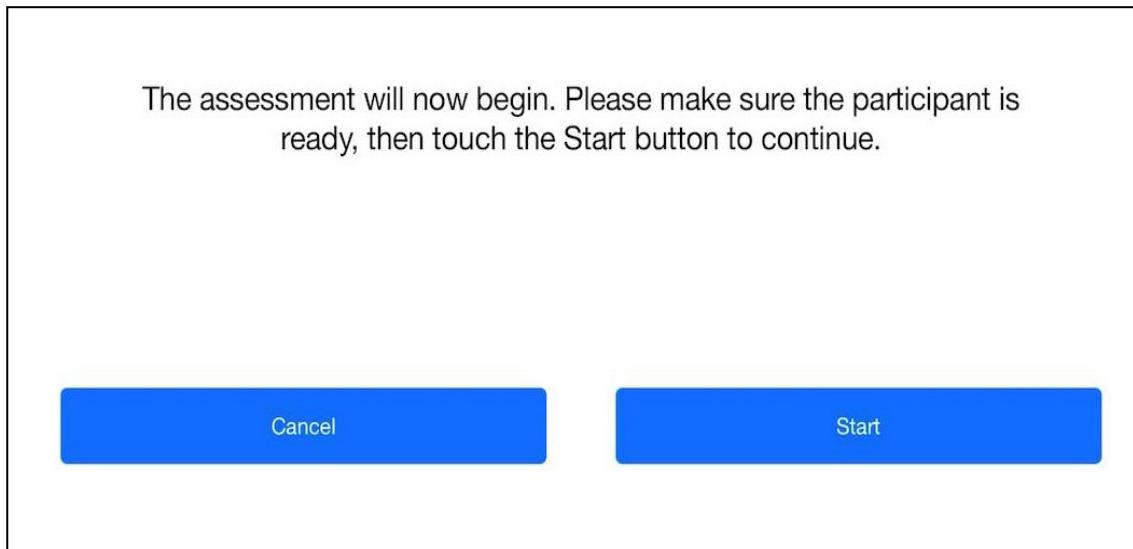


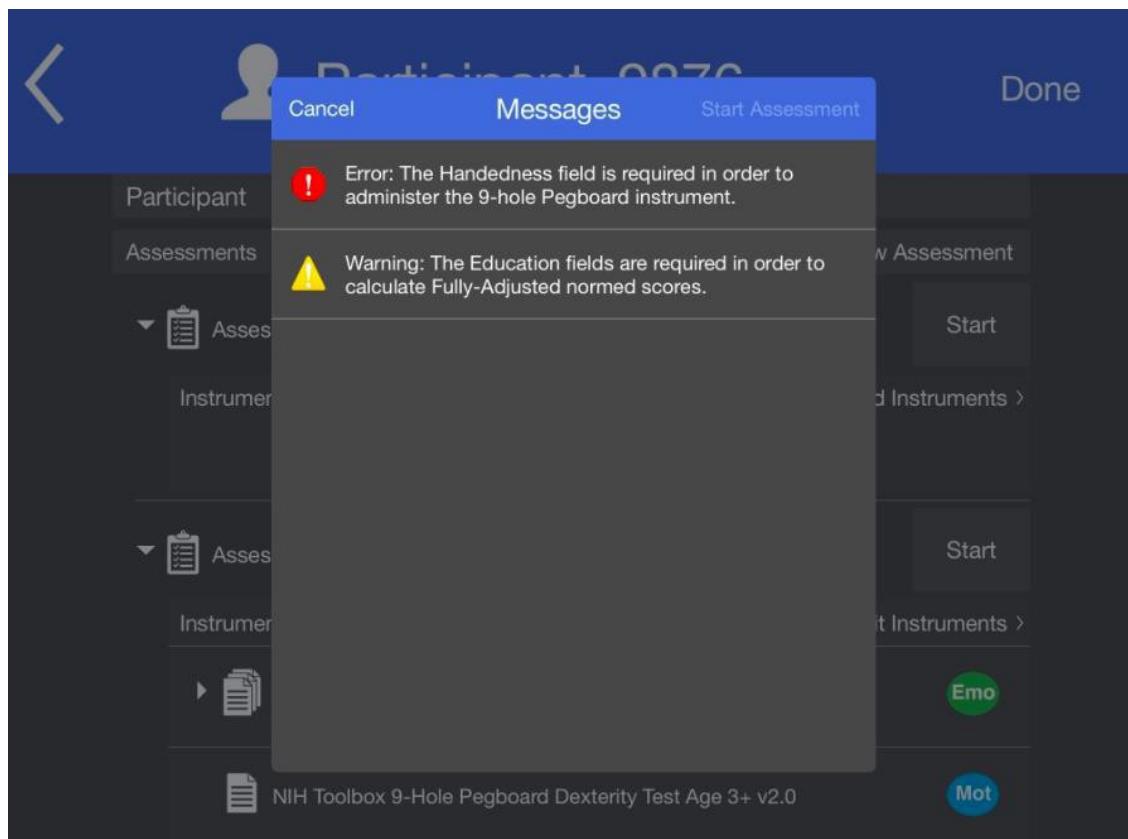
## **Start an Assessment**

Upon completing instrument selection, tap **Start** to launch the assessment.



At this time, users will be presented either with the assessment launch screen **or** with one or more Error or Warning messages alerting users about problems with their assessment.





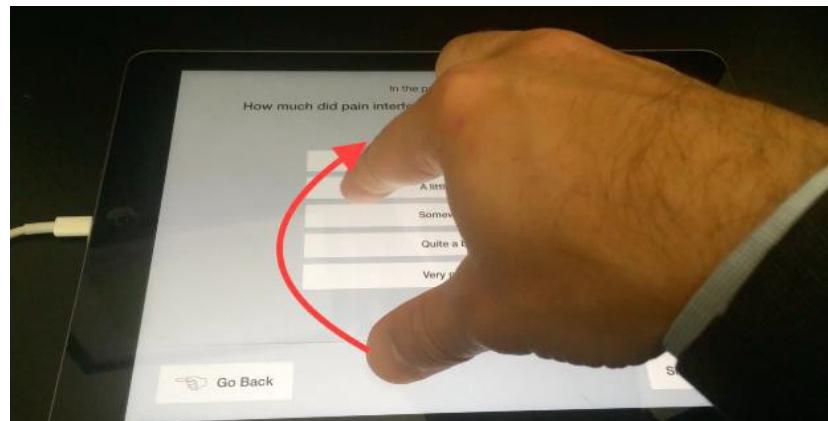
Error messages  inform users about problems that prevent them from launching the assessment. Users need to go back to the participant information screen and fix those problems before the assessment can be started.

Warning messages  inform users about missing information or characteristics of the assessment that users may want to revise before starting. It is possible either to go back to the New Assessment screen and change them or to launch the assessment without making changes.

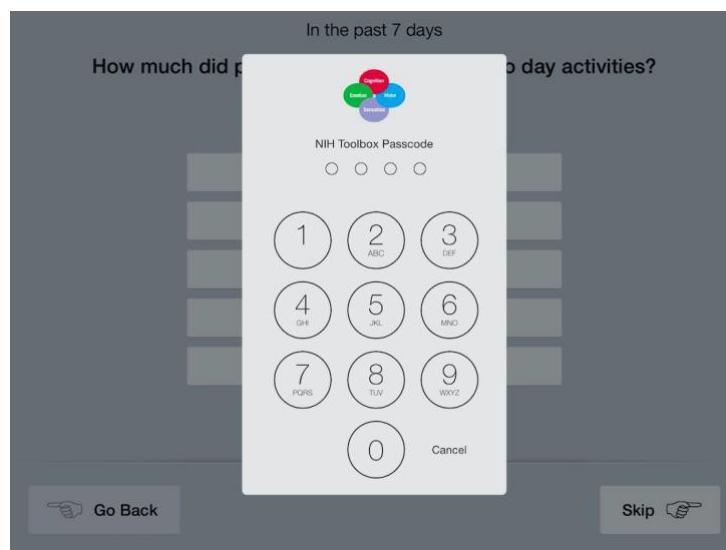
## ***Pause, Skip, Stop, Add Notes***

An assessment can be paused at any time after launch.

**Step 1:** Put two fingers on the screen and rotate one of them clockwise as if making a half-circle on the screen. This is called the 'administrator's gesture' or 'admin gesture'.



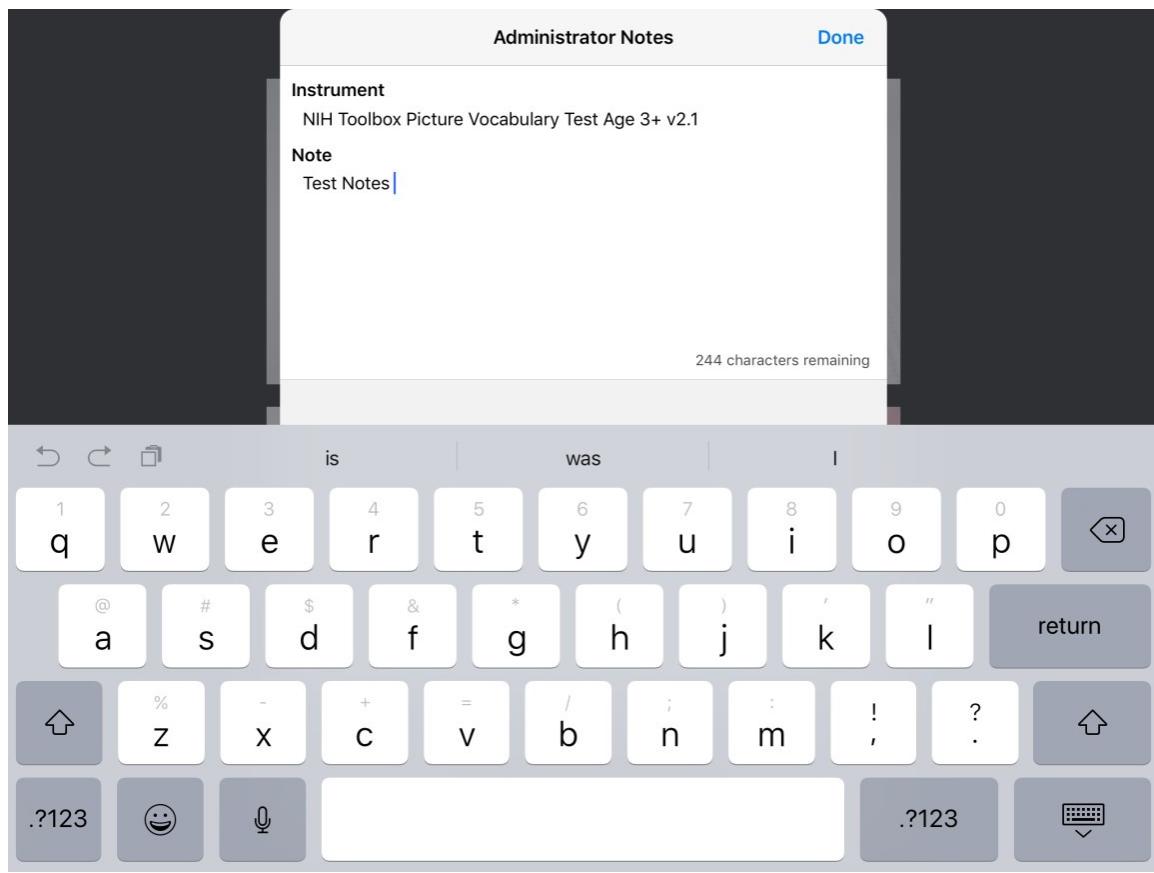
**Step 2:** Enter the administrator's passcode that was set up when the app was first launched.



**Step 3:** Select from the 4 options presented on the screen:

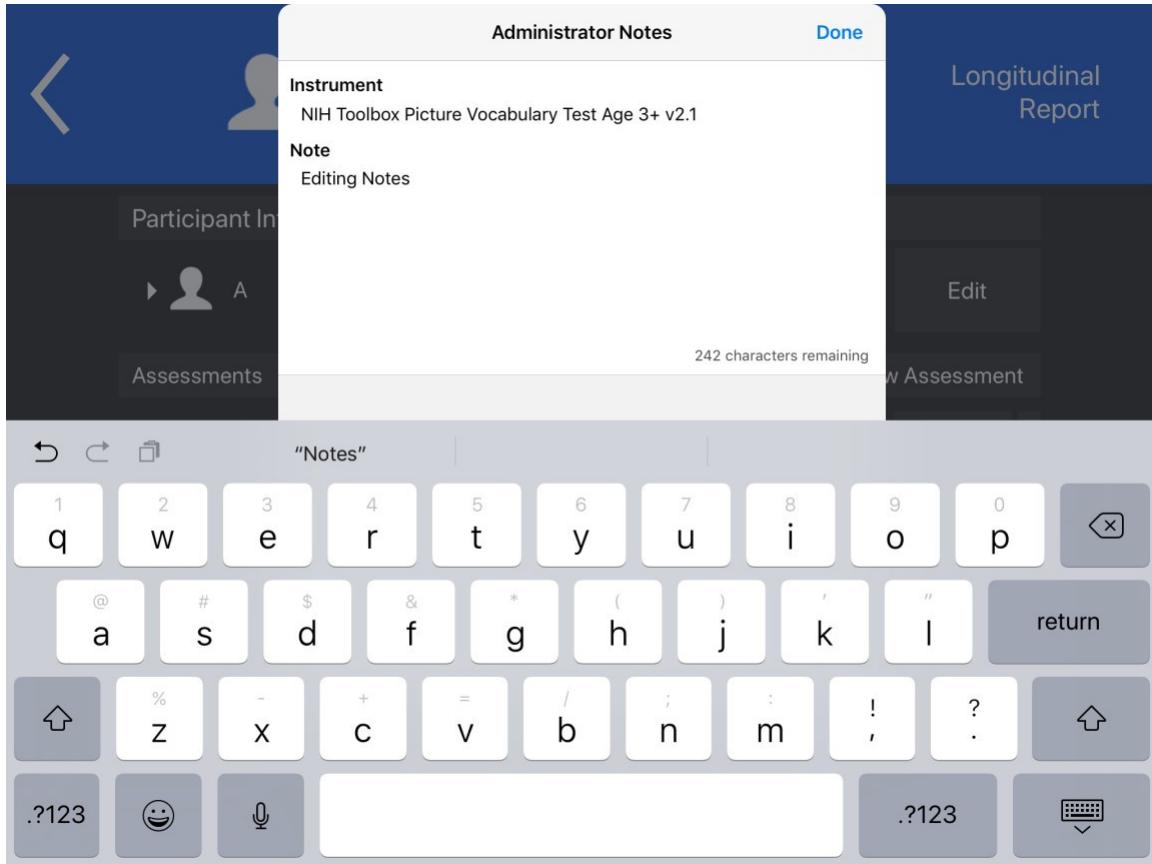
- Add/ Edit Instrument Notes
- Stop Assessment
- Skip Instrument
- Resume Instrument

**Add / Edit Instrument Notes** – If **Add / Edit Instrument Notes** is selected, the next screen shows the instrument name and has space for the note.



After the assessment, the examiner can view a note associated with an instrument.

After the instrument is completed, the examiner can also add or edit a note associated with an instrument.



**Stop Assessment** – If **Stop Assessment** is selected, users will be asked the reason for stopping:

- Safety Exclusion
- Participant/Respondent Refused
- No Time
- Physical Limitations
- Communication Problems
- Language Barrier
- Equipment Failure
- Ineligible
- Participant Ill/Emergency
- Target Respondent Unavailable
- Other

Select the reason that best describes why the assessment is being stopped and proceed to the main screen of the app. If **Other** is selected, users will be taken to a text screen where they will be required to enter another reason and then allowed to stop the assessment.

Different instruments may behave differently if **Resume Instrument** or **Stop Assessment** is selected. In most cases, users will be taken back to where they were

before pausing the assessment. In some cases (e.g., timed tests), users will be taken back to the beginning of the instrument. In select cases, an instrument may not be restarted once paused. Detailed rules for each test are available in [Appendix 4](#).

**Skip Instrument** – If **Skip Instrument** is selected, users will be asked the reason for skipping:

- Safety Exclusion
- Participant/Respondent Refused
- No Time
- Physical Limitations
- Communication Problems
- Language Barrier
- Equipment Failure
- Ineligible
- Participant Ill/Emergency
- Target Respondent Unavailable
- Other

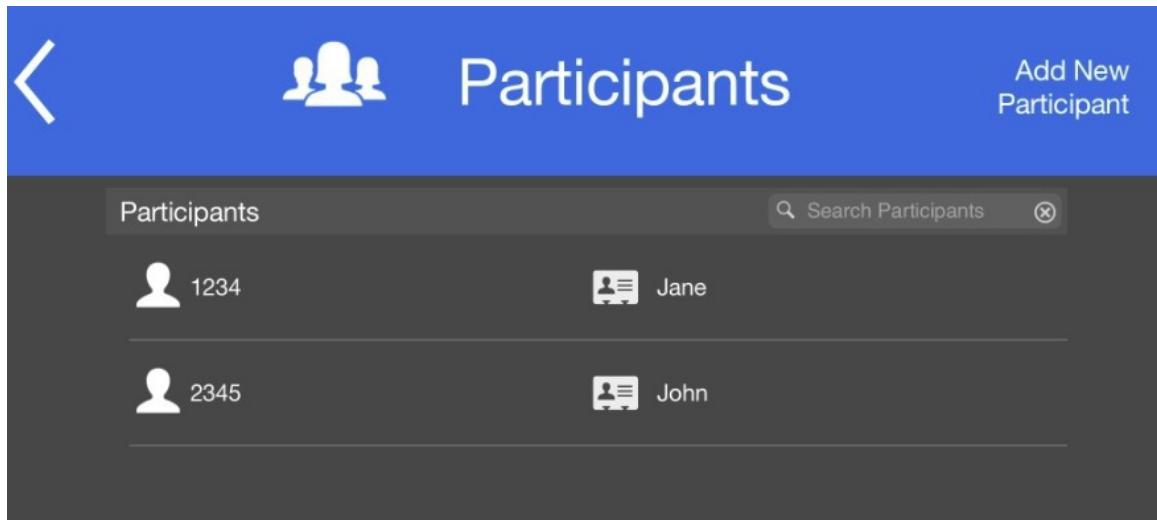
Once the reason that best describes why the instrument was skipped is selected, users will be taken to the beginning of the next instrument, or the end of the assessment, if this was the last instrument in their assessment. If **Other** is selected, users will be taken to a text screen where they will be required to enter another reason and then allowed to skip the instrument.

If an instrument is paused, skipped, or stopped, this information is recorded in the data export along with the reason indicated.

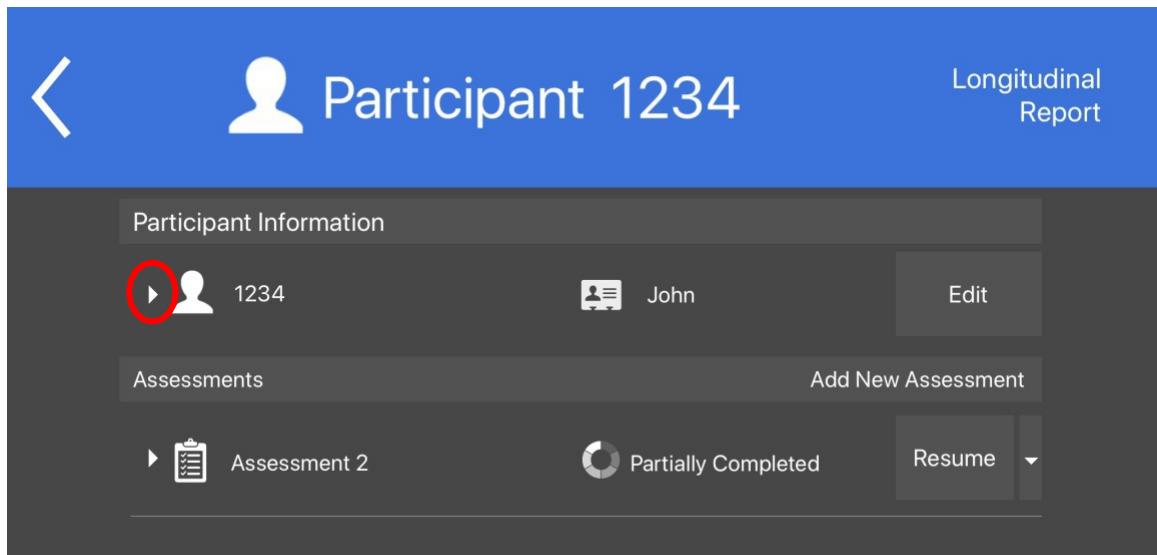
Stopped assessments can generally be resumed, but there are exceptions for specific instruments, as for pausing. Detailed rules for each test are available in [Appendix 4](#).

## ***View Existing Participants***

If the participant was previously created using the NIH Toolbox app on this iPad, you may also locate him/her by tapping Search Participants at the top right corner of the black part of the screen.



Once the participant is located, tap their ***Identifier*** or ***Name*** to open their record.



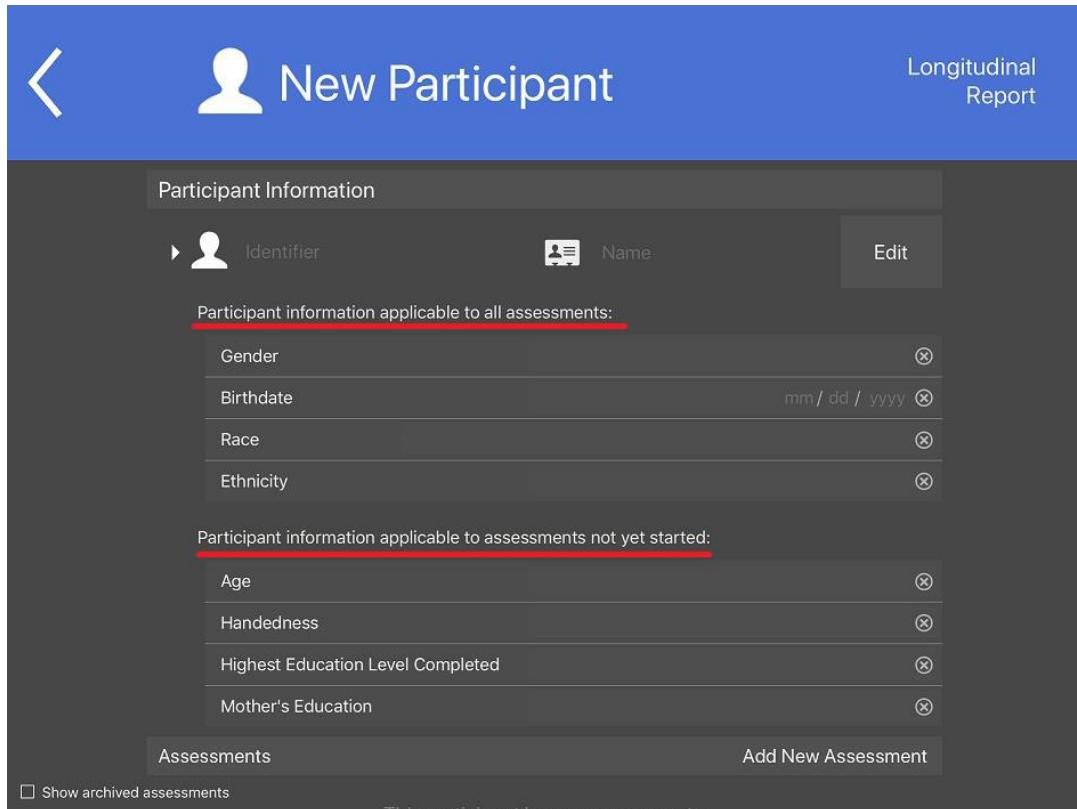
Tap the arrow to the left of the ***Identifier*** to view/edit participant's information.

## ***Editing Existing Participants***

Please note:

- Editing the top section of participant information will affect all assessments (i.e., completed assessments, started but not yet completed, and assessments that have not yet been started). If you make changes to the bottom section of participant information these changes will only be applied to assessments that have not yet been started.
- If you edit participant information, this change may trigger the rescore of existing data.

Once all the information is complete, return to the previous screen by tapping **Done** or the arrow at the screen's top left.

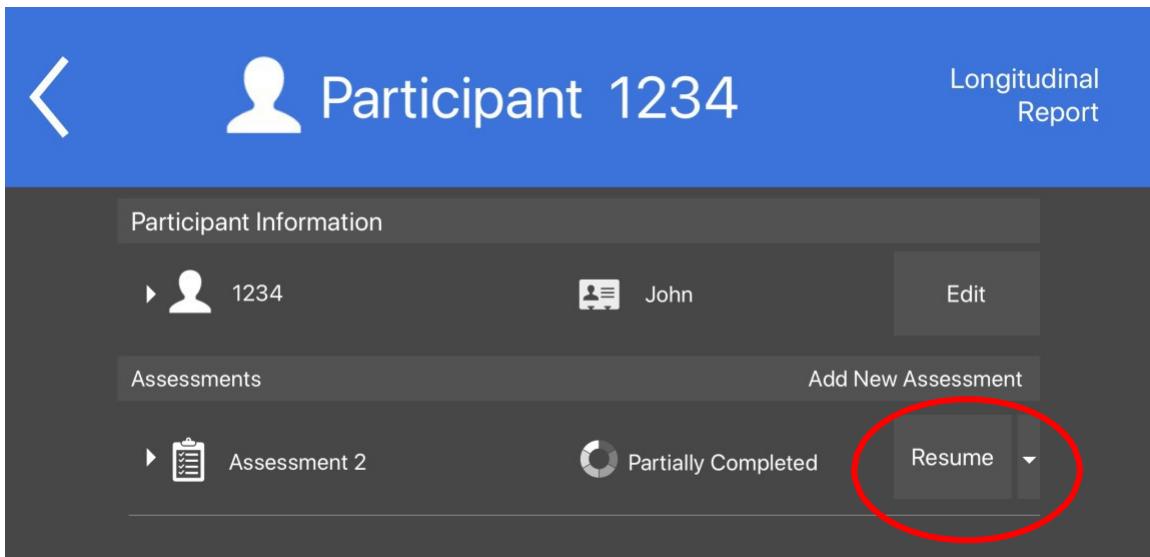


The screenshot shows the 'New Participant' screen with the following layout:

- Header:** 'New Participant' with a back arrow icon and 'Longitudinal Report' text.
- Participant Information:** A section with 'Identifier' and 'Name' fields, and an 'Edit' button.
- Participant information applicable to all assessments:** A list of fields with 'X' icons to remove them:
  - Gender
  - Birthdate (format: mm / dd / yyyy)
  - Race
  - Ethnicity
- Participant information applicable to assessments not yet started:** A list of fields with 'X' icons:
  - Age
  - Handedness
  - Highest Education Level Completed
  - Mother's Education
- Assessments:** A section with 'Add New Assessment' and a checkbox for 'Show archived assessments'.

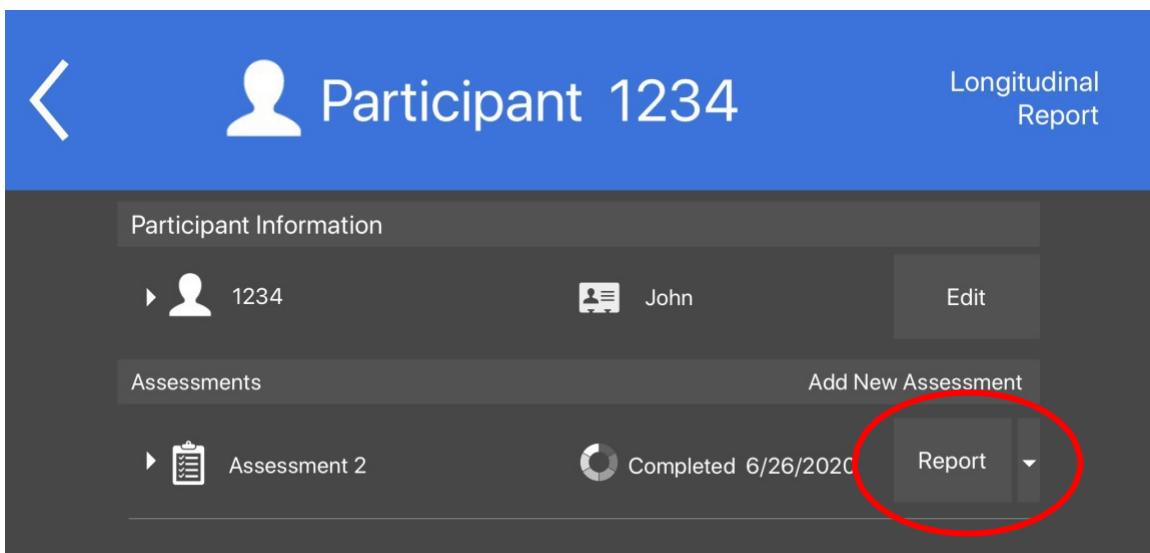
## ***Resume an Assessment***

All partially completed and not started (no items administered) assessments may be resumed (though individual instruments within them may have varying rules – see [Appendix 4](#)).



## ***Generate a report***

Once an assessment is completed, a simple report can be generated by tapping **Report**. Reports contain demographic information and scores for any tests that were given during that specific assessment.



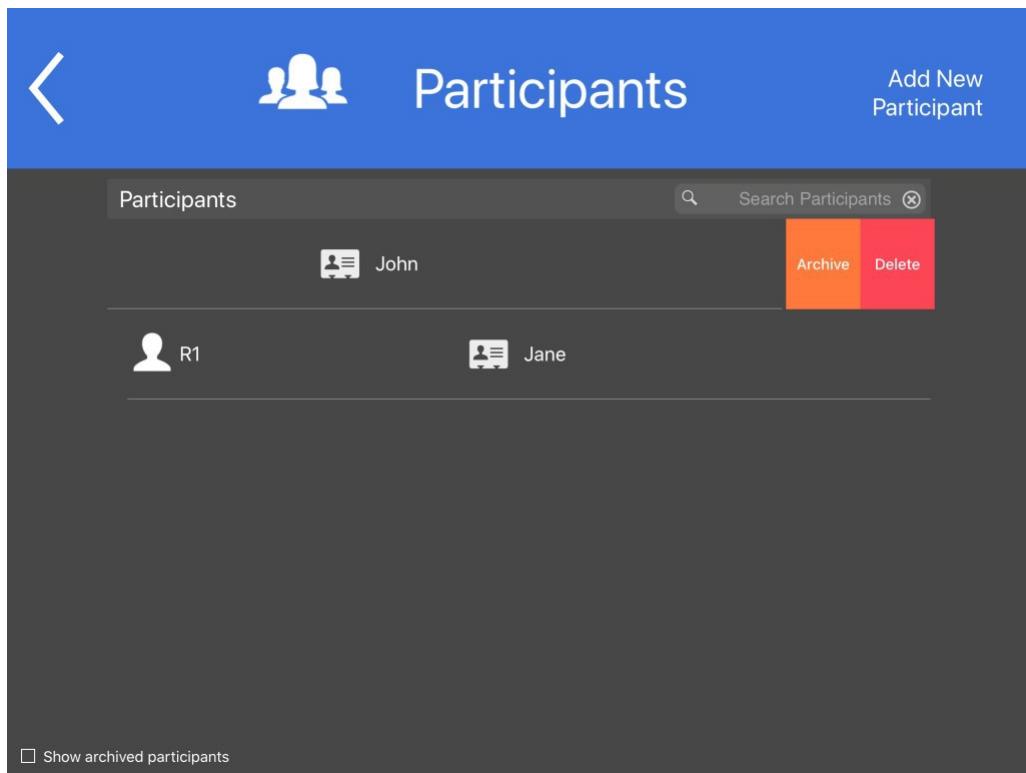
## ***Archiving Participants or Assessments***

If a participant or assessment has been created, but is not desired in the list of participants or assessments, the entry can be archived. This may be useful in managing data after demonstration, training or practice. If a participant or assessment is created in error, the archive function allows the user to remove it from the visible list.

If a participant or assessment is archived, it does NOT appear in the data exports when they are generated from within the app. Participants and assessments can be archived, or unarchived, at any time. If a participant is archived, the assessments that belong to that participant are also archived. If a participant is unarchived, the assessments that belong to that participant are also unarchived.

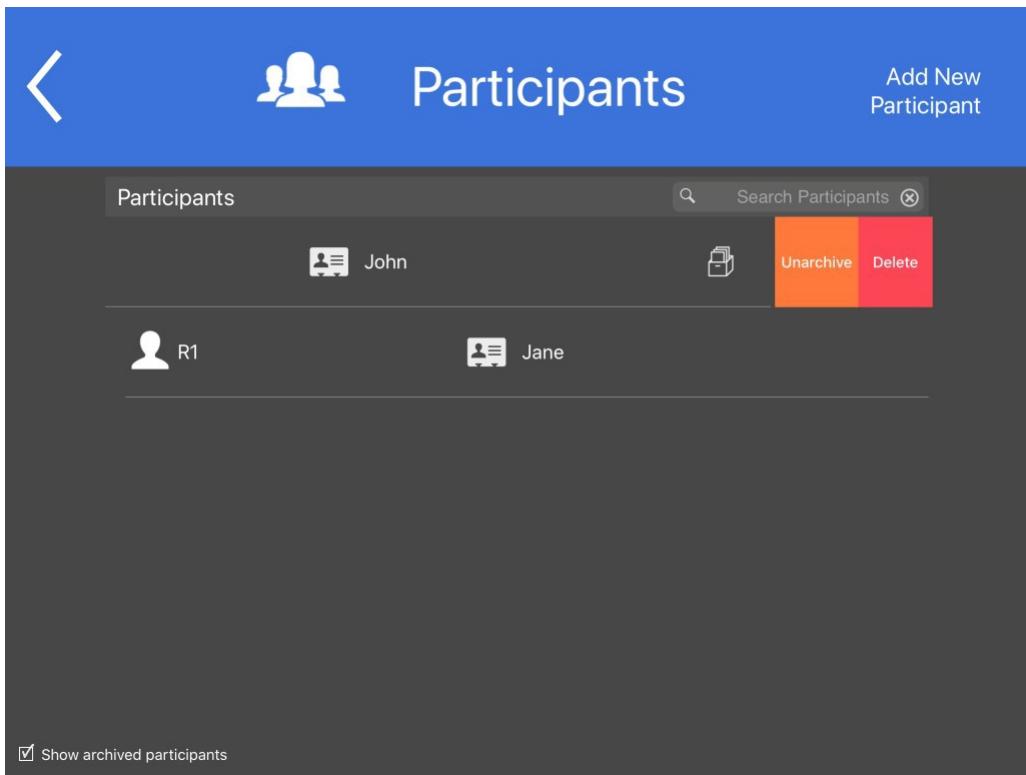
#### To archive a participant:

On the Participants screen, swipe the desired participant to the left. The **Archive** button will appear. Select **Archive**.



#### To unarchive a participant:

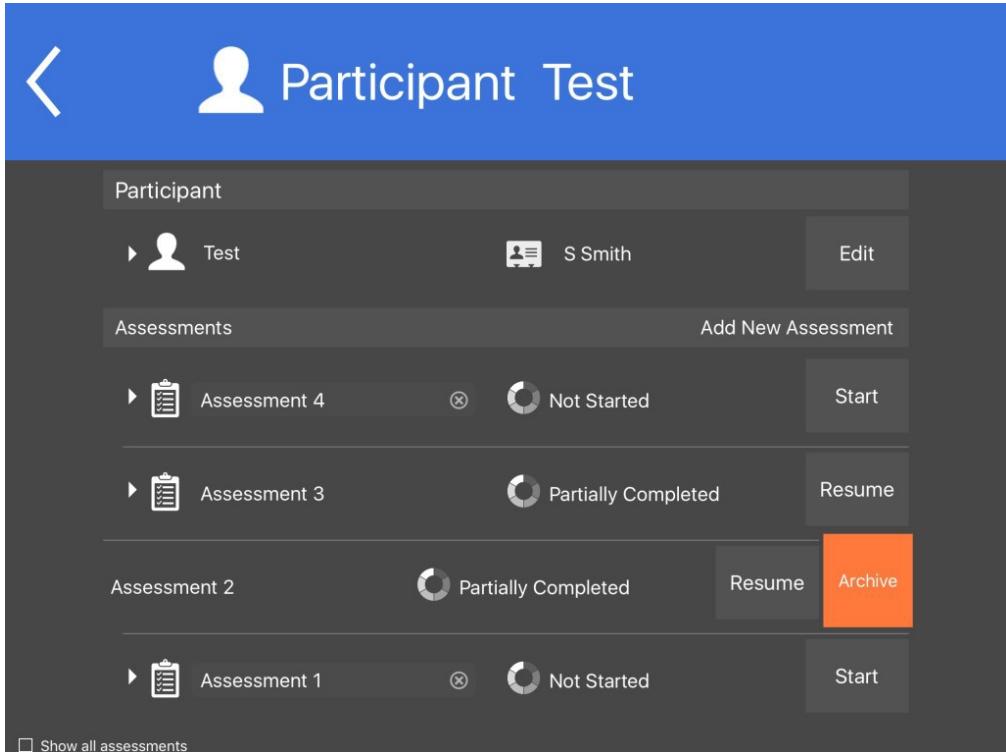
On the Participants Screen, select **Show archived participants** in the lower left corner of the screen. Archived participants will appear. Select **Unarchive** next to the desired participant.



The Participants screen shows a list of participants. At the top, there is a blue header with a back arrow, a participants icon, the title 'Participants', and a 'Add New Participant' button. Below the header is a search bar with the placeholder 'Search Participants'. The main list contains two entries: 'John' and 'Jane'. Each entry has a participant icon, the name, and a set of actions: 'Unarchive' (orange) and 'Delete' (red). At the bottom of the list, there is a checkbox labeled 'Show archived participants'.

#### To archive an assessment:

On the Participant screen, swipe the desired assessment to the left. The **Archive** button will appear. Select **Archive**.



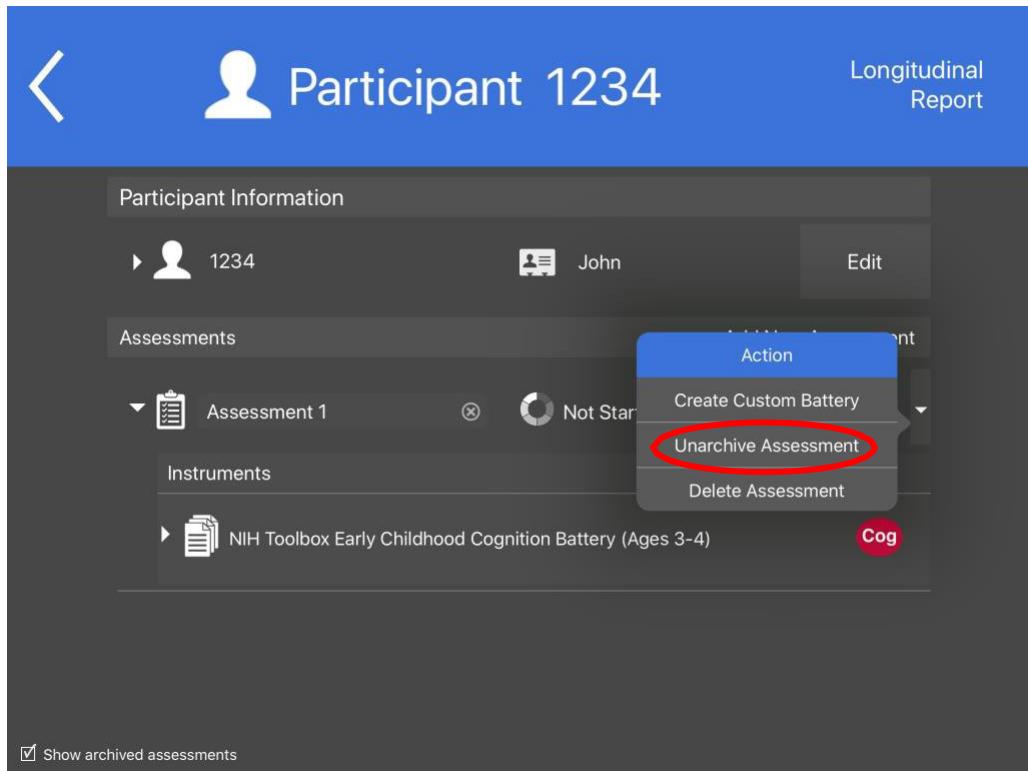
The Participant Test screen shows a participant named 'Test' and a list of assessments. At the top, there is a blue header with a back arrow, a participant icon, the title 'Participant Test', and an 'Edit' button. Below the header is a search bar with the placeholder 'Add New Assessment'. The list of assessments includes:

Assessment	Status	Action
Assessment 4	Not Started	Start
Assessment 3	Partially Completed	Resume
Assessment 2	Partially Completed	Resume
Assessment 1	Not Started	Start

At the bottom of the list, there is a checkbox labeled 'Show all assessments'.

**To unarchive an assessment:**

On the Participant screen, select **Show archived assessments** in the lower left corner of the screen. Archived assessments will appear. Select the arrow next to the assessment and choose **Unarchive Assessment**.

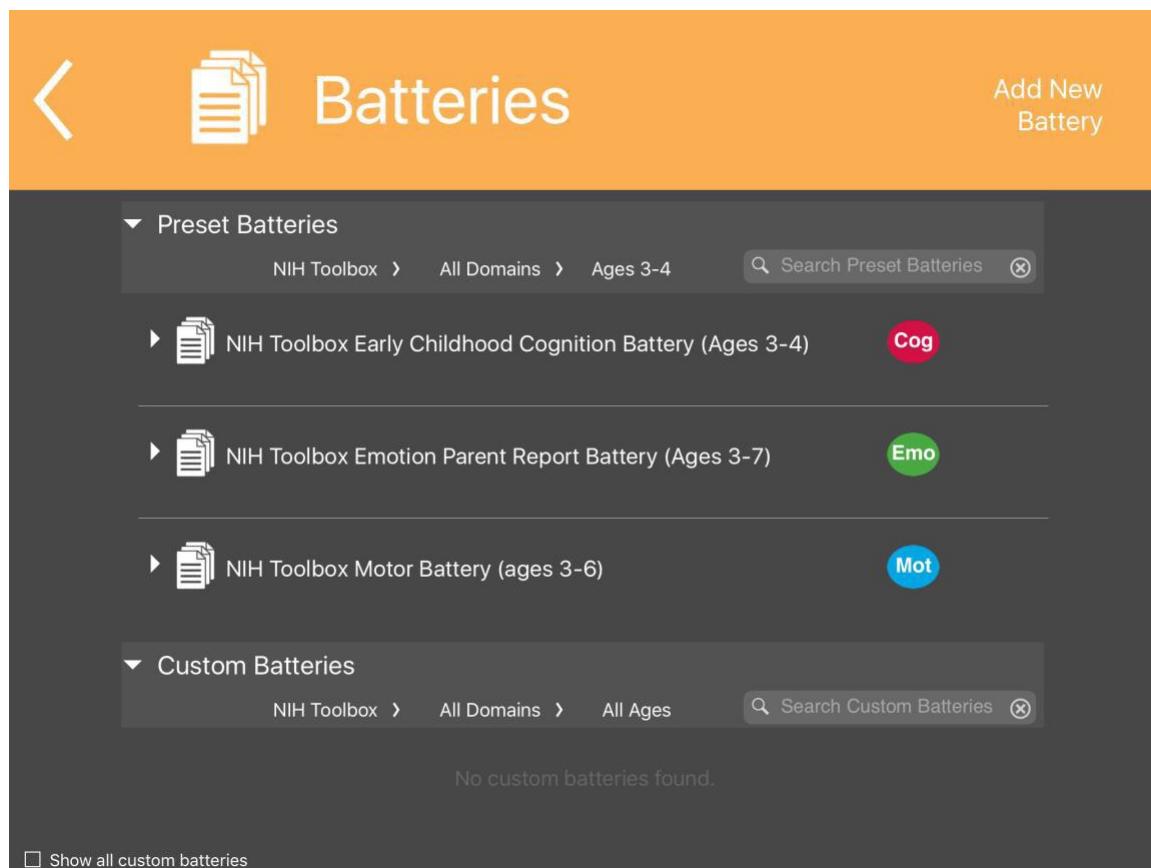


### B.4.3 Batteries

#### View Existing Batteries (Preset and Custom)

This is a quick way to view all the batteries available on this iPad and the instruments that comprise each.

**Step 1:** Tap the **Batteries** button.



You can filter which batteries and profiles you want displayed. If no custom battery has ever been created on this iPad, the Custom Batteries list will be empty.

## **Create a New Custom Battery**

**Step 1:** Tap **Create New Battery** in the upper right corner of the screen.

**Step 2:** Enter the new battery's name (required) and select instruments to be included in this battery by tapping “Add Instruments” and choosing the box next to the instrument.

The image consists of three vertically stacked screenshots of the NIH Toolbox mobile application. The top screenshot shows the 'New Battery' screen with a 'Battery Name' field (labeled 'Required') and an 'Instruments' section with a 'Add Instruments >' button. The middle screenshot shows the 'Select Instruments' screen with a list of available instruments, including 'NIH Toolbox Picture Vocabulary Test Age 3+ v2.1' and 'NIH Toolbox Oral Reading Recognition Test Age 3+ v2.1', both of which have a red 'Cog' icon and a checked checkbox. The bottom screenshot shows the 'New Battery' screen again, but with the 'Battery Name' field filled with 'Battery ABC' and the 'Instruments' section showing the selected instruments from the previous screen.

**New Battery**

Battery Name Required

Instruments Add Instruments >

No instruments selected.

**Select Instruments**

Selected Instruments All Instruments

NIH Toolbox > All Domains > All Ages > All Types >  Search

NIH Toolbox Picture Vocabulary Test Age 3+ v2.1 Cog

NIH Toolbox Oral Reading Recognition Test Age 3+ v2.1 Cog

**New Battery**

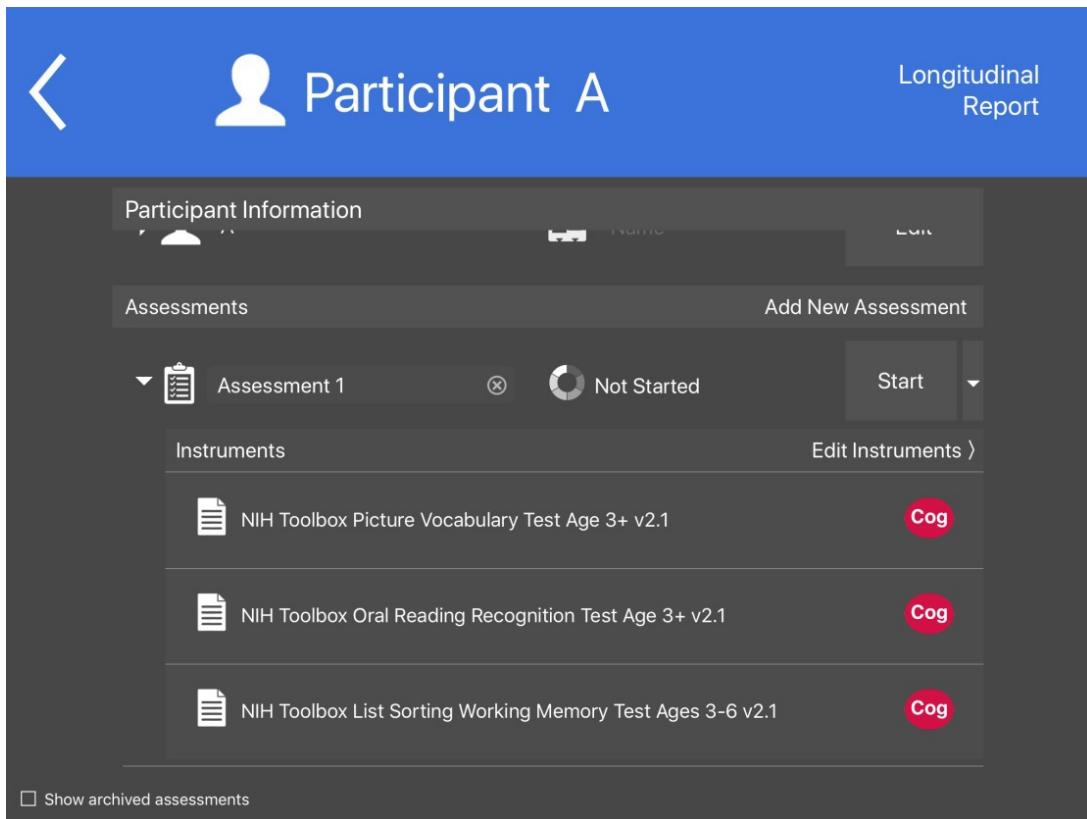
Battery Name Battery ABC

Instruments Edit Instruments >

NIH Toolbox Picture Vocabulary Test Age 3+ v2.1 Cog

NIH Toolbox Oral Reading Recognition Test Age 3+ v2.1 Cog

**Creation of custom battery out of instruments selected by instrument picker for an assessment:**



The screenshot shows the 'Participant A' interface. At the top, there is a blue header with a back arrow, a participant icon, the text 'Participant A', and a 'Longitudinal Report' button. Below the header, there are two tabs: 'Participant Information' and 'Assessments'. The 'Assessments' tab is selected, showing a list of assessments under 'Assessments' and a 'Add New Assessment' button. One assessment, 'Assessment 1', is listed as 'Not Started' with a 'Start' button. Below this, there is a section titled 'Instruments' with a 'Edit Instruments >' button. Three instruments are listed: 'NIH Toolbox Picture Vocabulary Test Age 3+ v2.1', 'NIH Toolbox Oral Reading Recognition Test Age 3+ v2.1', and 'NIH Toolbox List Sorting Working Memory Test Ages 3-6 v2.1', each with a 'Cog' button. At the bottom, there is a checkbox for 'Show archived assessments'.



# Participant A

## Participant Information

▶  A  Name Edit

### Assessments

▼  Assessment 1   Not Star Action

- [Create Custom Battery](#)
- [Archive Assessment](#)
- [Delete Assessment](#)

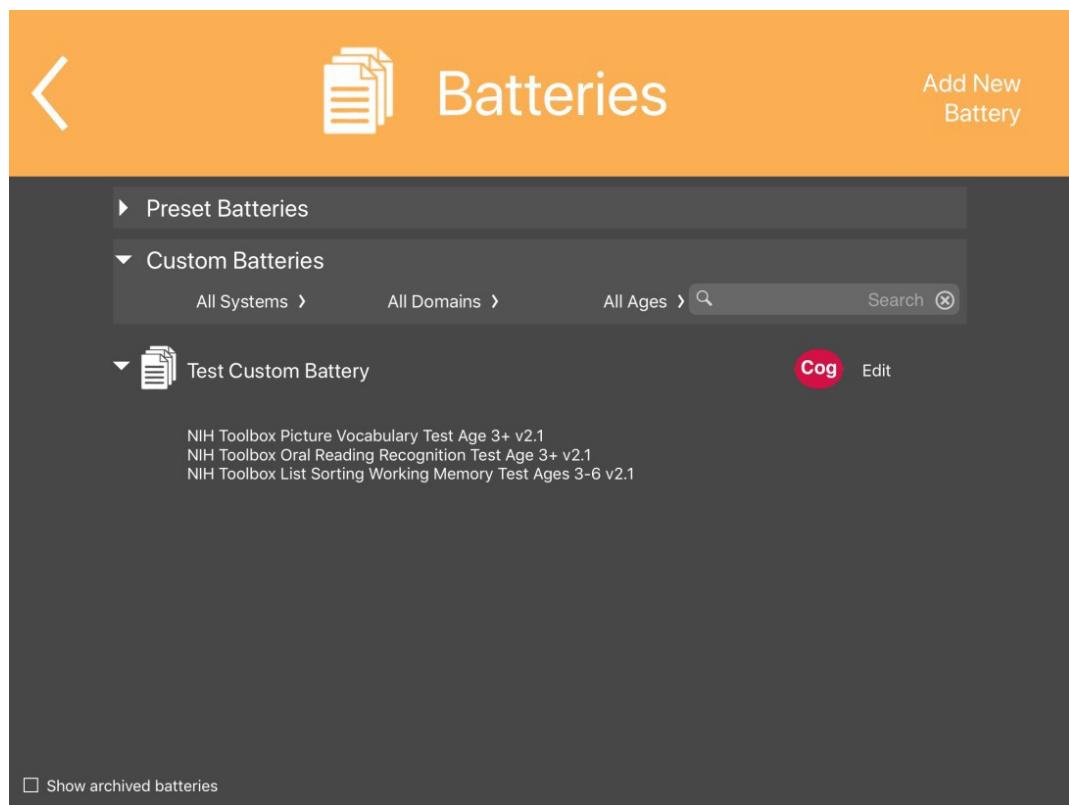
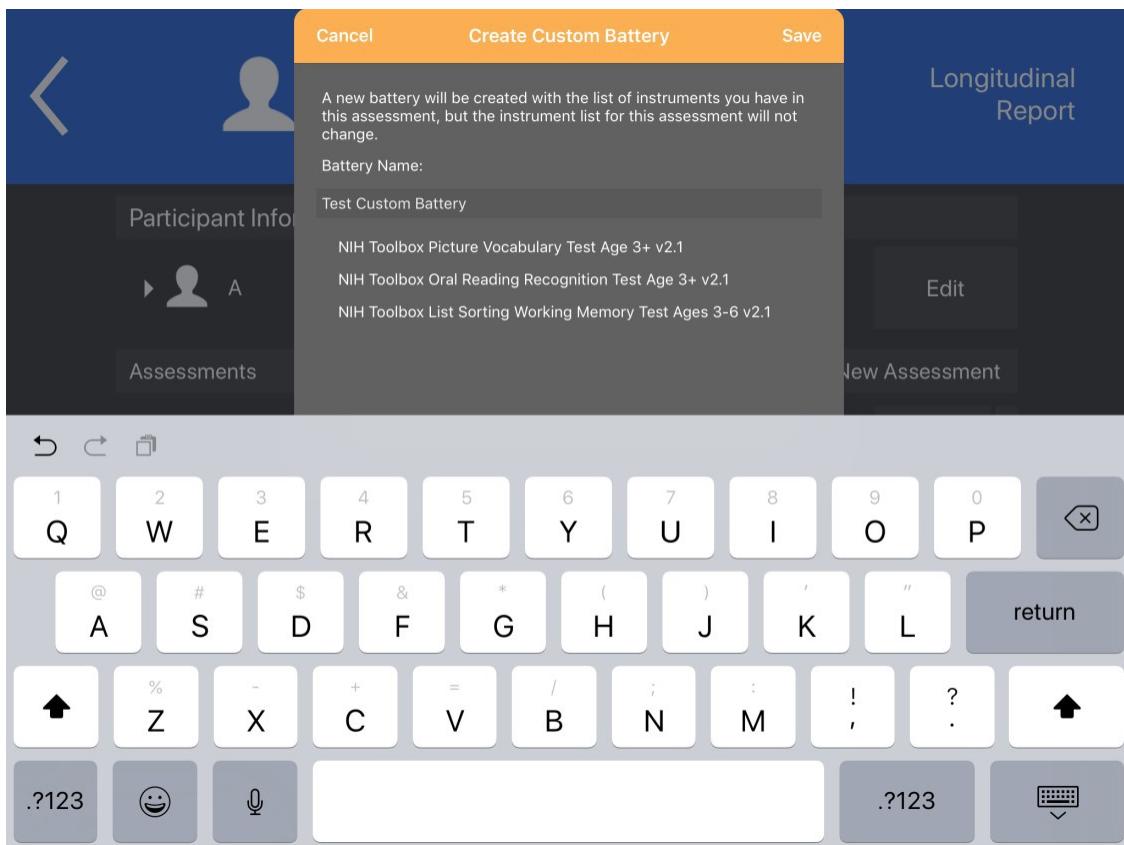
### Instruments

 NIH Toolbox Picture Vocabulary Test Age 3+ v2.1 

 NIH Toolbox Oral Reading Recognition Test Age 3+ v2.1 

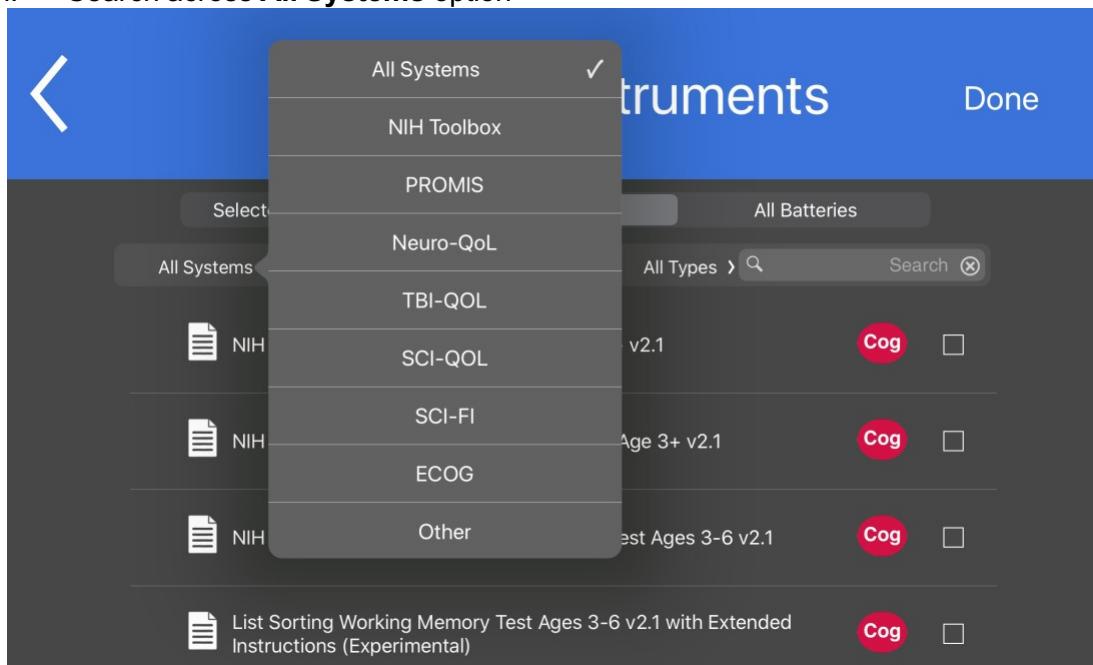
 NIH Toolbox List Sorting Working Memory Test Ages 3-6 v2.1 

Show archived assessments



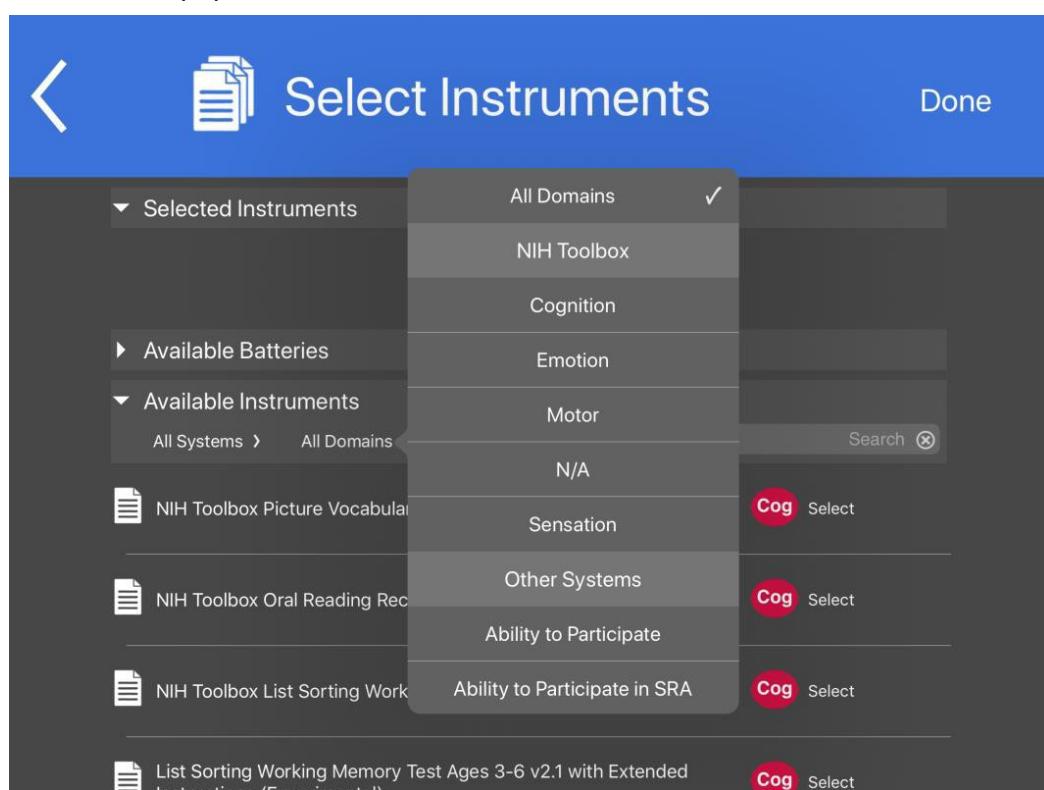
## Enhanced Instrument Search

### i. Search across **All Systems** option

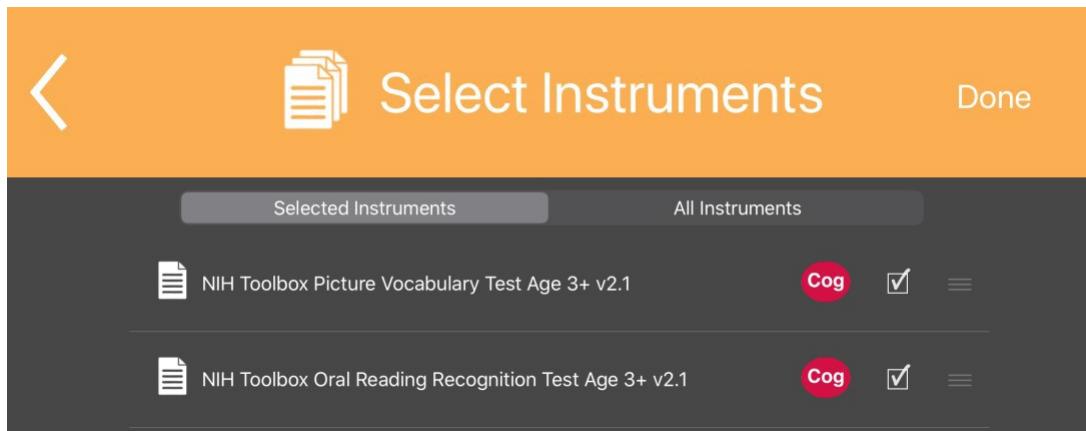


### ii. Domains and Subdomains

When the selected domain has subdomains, a popover will show up. Note that the popover won't dismiss until a row is selected. Or you can click outside the popover to dismiss the popover.



**Step 3: Reorder** the selected instruments by dragging them up or down, using the  symbol to the right of the instrument name.



Tap **Done** in the upper right corner of the screen or the arrow in the upper left corner to save the selection and return to the previous screen.

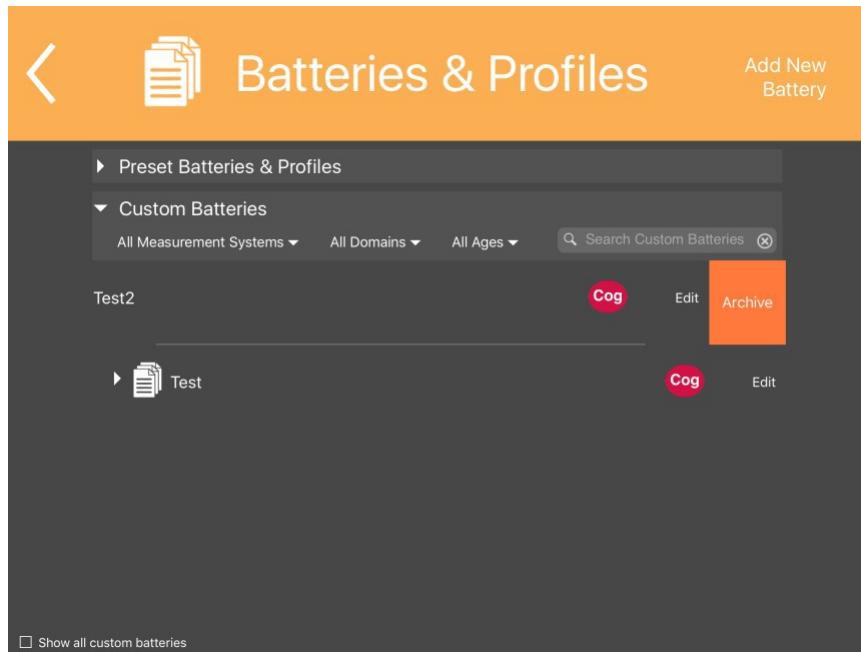
### ***Archiving Custom Batteries***

If a battery has been created, but is not desired in the list of ***Custom Batteries***, the entry can be archived. This may be useful in managing data after testing, training or practice. If a battery is created in error, the archive function allows the user to remove it from the visible list.

Batteries can be archived, or unarchived, at any time.

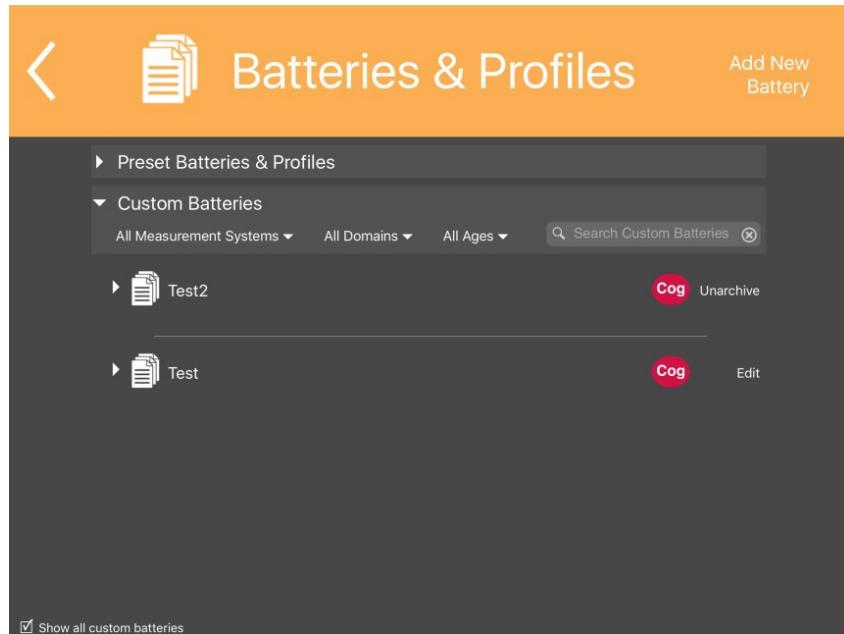
### To archive a battery:

On the **Batteries & Profiles** Screen, swipe the desired battery to the left. The orange **Archive** button will appear. Select **Archive**.



### To unarchive a battery:

On the **Batteries & Profiles** Screen, select **Show all custom batteries** in the lower left corner of the screen. Archived batteries will appear. Select **Unarchive** next to the desired battery.

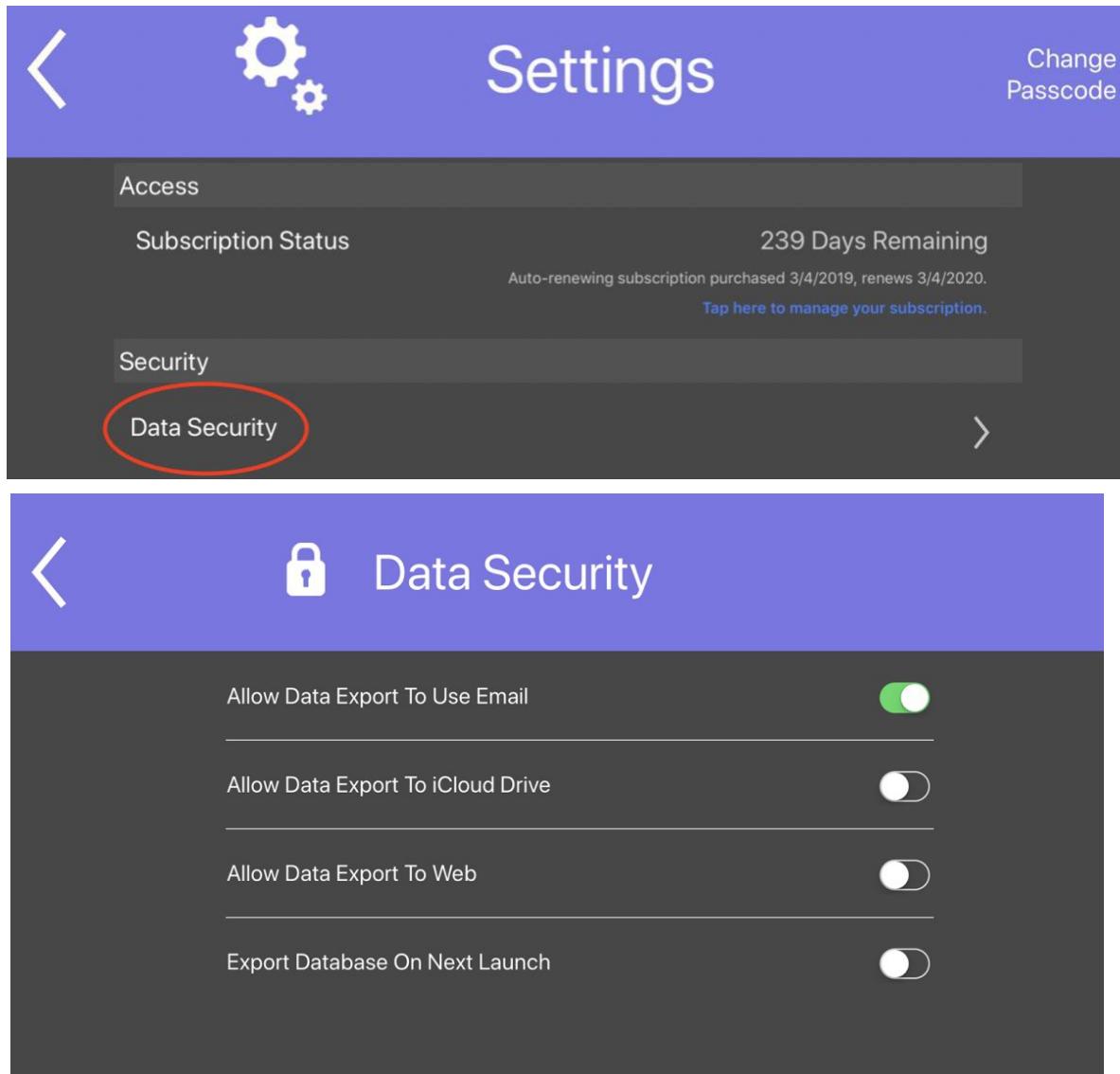


#### **B.4.4 App Settings**

- View and apply for **Access to Cognition** tests
- View subscription information (e.g., how much time is left on the subscription)
  - Manage Your Subscription (re-directs to subscription management subscription section of iPad's settings. View subscription info, edit and cancel subscription)
- Change the app data security settings (enable/disable data export via email and iCloud)
- Change the regional formatting
- Change the app passcode

##### **B.4.4.1 Data Security**

To change the data security settings, tap on **Data Security**, then update the settings:



Please see below setup instructions for **Data Export** methods:

### Option 1: E-mail

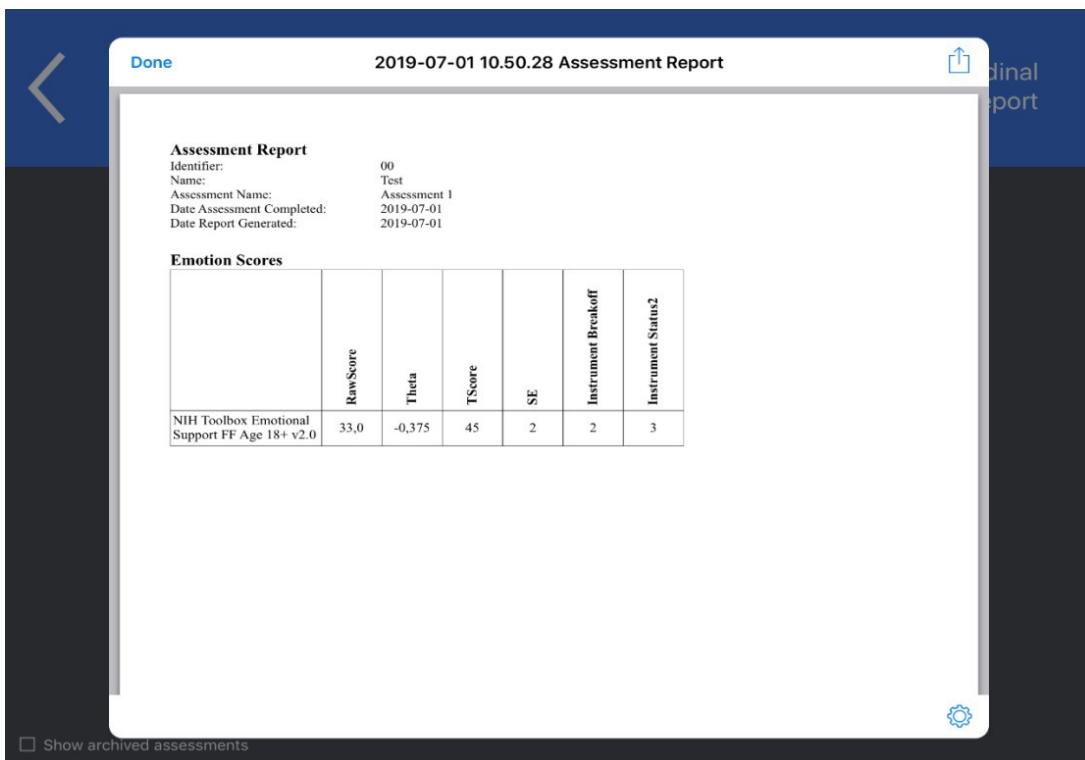
To use this option, users need to:

- Set up the Mail app on the iPad. Mail set-up instructions can be accessed here: <https://support.apple.com/en-us/HT201320>.
- Activate the ability to email files. Refer to the NIH Toolbox App Settings section for detailed instructions.

Once both of the above conditions are met, tap the **envelope** symbol next to the file to be sent via email. This will create a new email message. Enter the destination address and tap **Send**. This message will arrive from the email address that was used when Mail was set up on this iPad.

When emailing the data files, users should exercise caution and only email the data to secure email accounts (e.g., their institutional email).

#### i. Assessment Reports



Done 2019-07-01 10.50.28 Assessment Report

Assessment Report

Identifier:	00
Name:	Test
Assessment Name:	Assessment 1
Date Assessment Completed:	2019-07-01
Date Report Generated:	2019-07-01

Emotion Scores

NIH Toolbox Emotional Support FF Age 18+ v2.0	RawScore	Theta	TScore	SE	Instrument Breakoff	Instrument Status2
33,0	-0,375	45	2	2	3	

Show archived assessments

Done 2019-07-01 10.50.28 Assessment Report  

**Assessment Report**

Identifier:	00
Name:	Test
Assessment Name:	Assessment 1
Date Assessment Completed:	2019-07-01
Date Report Generated:	2019-07-01

**Emotion Scores**

	RawScore	Theta	TScore	SE	Instrument Breakoff	Instrument Status2
NIH Toolbox Emotional Support FF Age 18+ v2.0	33,0	-0,375	45	2	2	3

Show archived assessments 

[Email Encrypted PDF](#)  
[Email Unencrypted PDF](#)  
[Print](#)  
[Cancel](#)

Done   

**Assessment Report**

Identifier:	00
Name:	Test
Assessment Name:	Assessment 1
Date Assessment Completed:	2019-07-01
Date Report Generated:	2019-07-01

**Emotion Scores**

	RawScore	Theta	TScore	SE	Instrument Breakoff	Instrument Status2
NIH Toolbox Emotional Support FF Age 18+ v2.0	33,0	-0,375	45	2	2	3

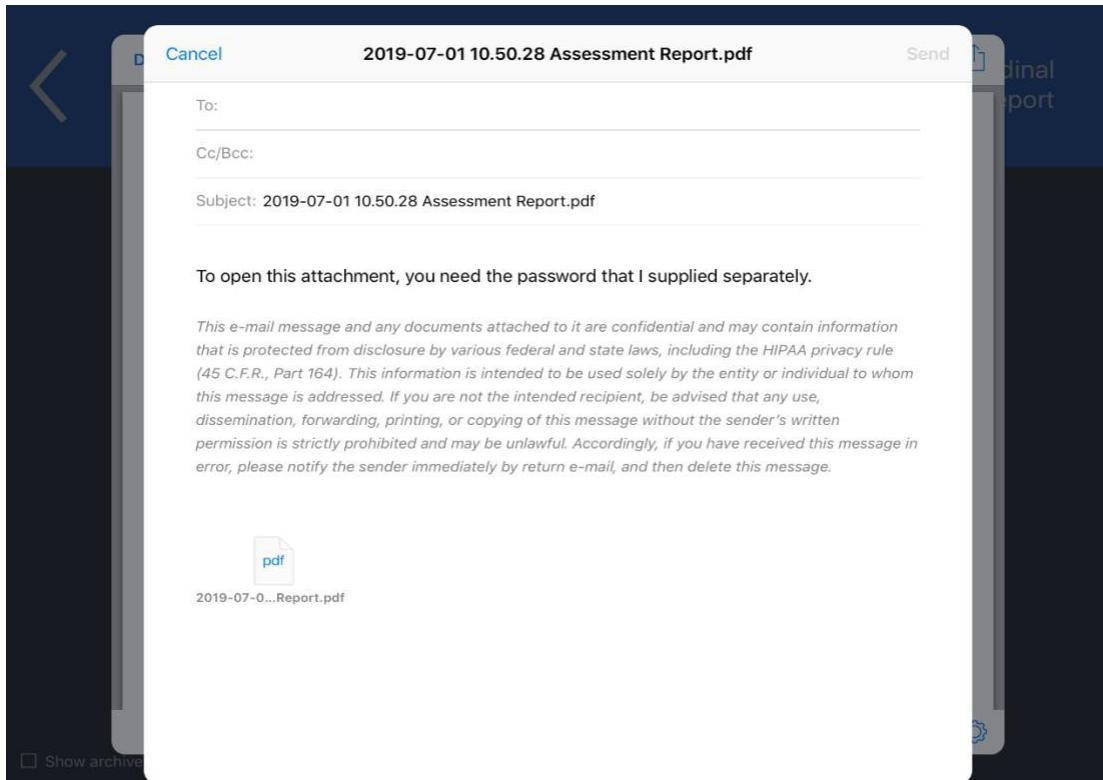
Please choose an encryption password for the attachment(s). Encryption passwords must include a mixture of upper case letters, lower case letters, and numbers, and must be at least 6 characters long.

You will need to communicate this encryption password to your intended recipient so they are able to open and view the attachment(s).

>Password:

Confirm password:





### Option 2: iCloud drive.

To use this option, users need to:

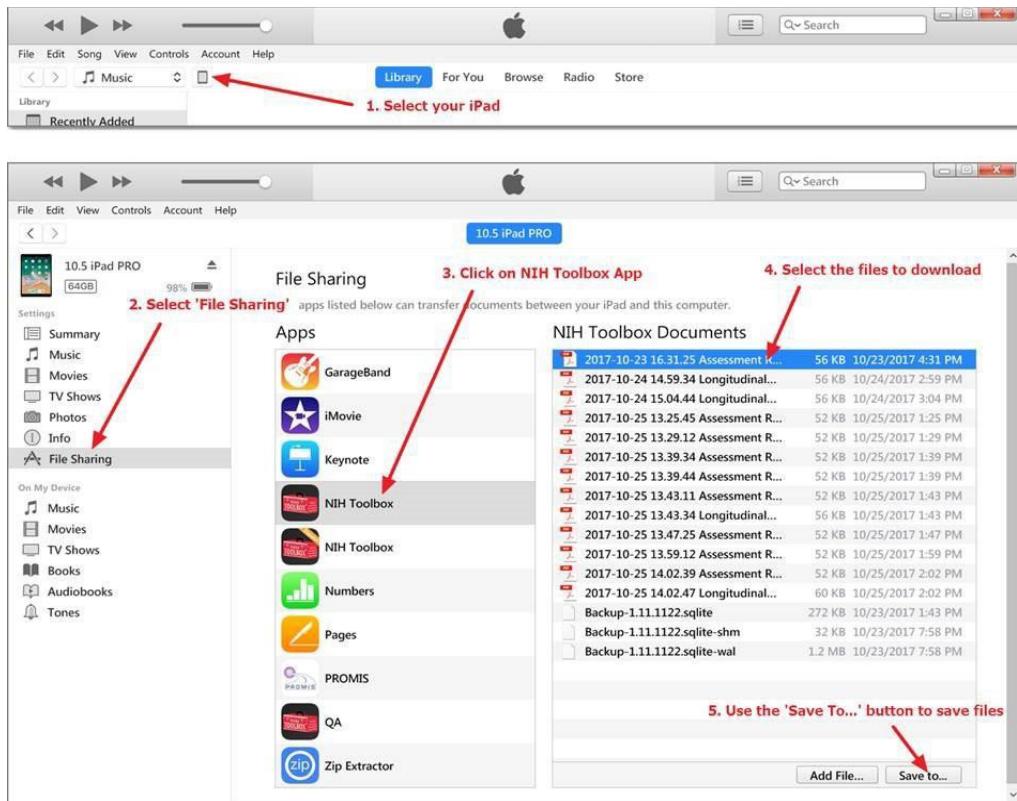
- Set up iCloud following the instructions at <https://www.apple.com/icloud/setup/ios.html>.
- Activate the ability to upload data files via iCloud, refer to the NIH Toolbox App Settings section for detailed instructions.

If iCloud is enabled on the iPad, all of the files generated by this app will be available in the iCloud Drive linked to the Apple ID used to install the app. These files can be accessed by logging into iCloud from any browser using the Apple ID associated with the app that generated the files.

### Option 3: File sharing via iTunes

After generating files on the Export Data screen, plug the iPad into a computer with the latest iTunes version 12.7 or later, and launch iTunes. We recommend to use the most up to date version of iTunes to get latest improvements from Apple.

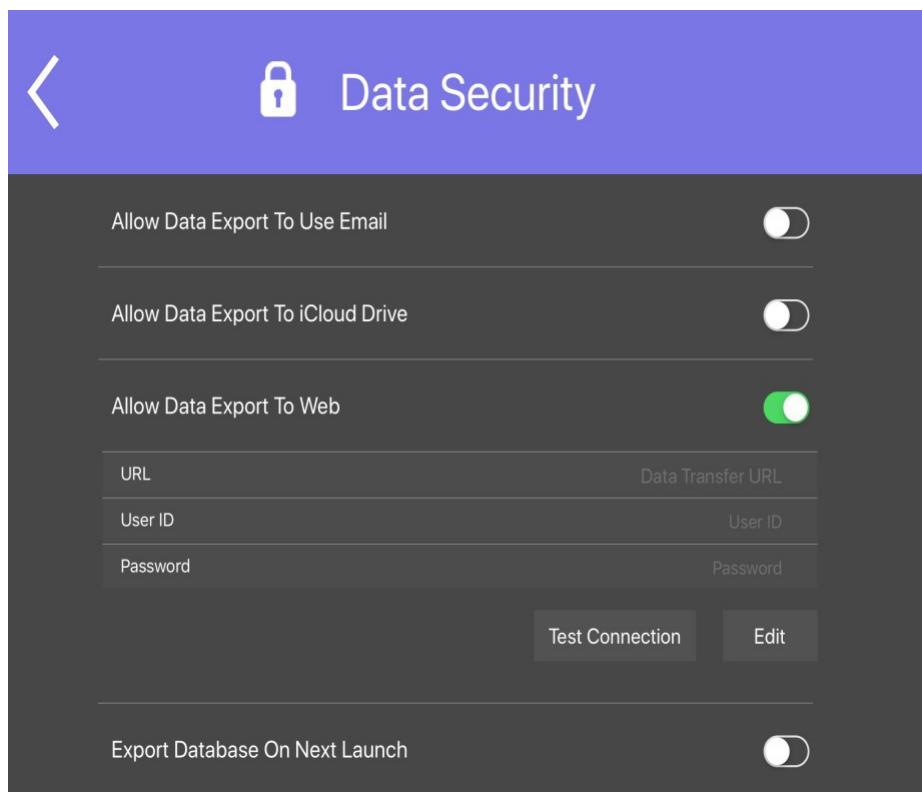
- In iTunes, when the iPad appears on the top line of icons, click it.
- There is 'Settings' menu right below the name of connected iPad. The very last option is called 'File Sharing'. Select it to get to the list of all installed apps where file sharing can be used.
- On the left panel called 'Apps', click on the NIH Toolbox app. The files that have been shared by the app will be shown on the right.
- Use the 'Save To...' button at the lower right to copy the file(s) from the iPad to the computer.



#### Option 4: Configurable web location

This option is intended for use with an existing web location for data centralization. Many research projects have a data coordinating center with the capability to set up such a system. For more information, check with your institution's IT resources.

Under **Data Security** settings (go to **Settings** screen), configure the data transfer URL, user ID and password. Test the connection at the time of set-up, to ensure smooth data transfer.



Sample webservice to be used for configuration and reference:

If Export to Web is enabled on the iPad, all of the data generated by this app will be sent via a web service to the URL set by the user.

Data export to web feature posts .csv files to a web location specified by the app user. Data export to web security is handled in the form of basic authentication. Web service should be set to accept basic authentication. Web service implementation should also acknowledge successful transfer of the file in the form of json object.

- Data upload webservice
  - o Form action: POST
  - o Form request parameters:
    - upload: optional. Data are attached to this variable.
  - o Form Response json object format:

```
{  
    "error":error_code, (error code of 0 indicates successfully transfer of file).  
    "message":"message" (optional)  
}
```

Sample of web service implementation in .NET (c#):

```
***** BASIC AUTHENTICATION ***/  
  
if (ctx.Request.HttpMethod == "OPTIONS")  
{  
    ctx.Response.ContentType = "text";  
    ctx.Response.ContentEncoding = Encoding.UTF8;  
    ctx.Response.AppendHeader("Content-Length", "0");  
    ctx.Response.AppendHeader("Connection", "keep-alive");  
    ctx.Response.AppendHeader("Access-Control-Allow-Origin", "*");  
    ctx.Response.AppendHeader("Access-Control-Allow-Headers", "Authorization, Origin, content-type, accept");  
    ctx.Response.AppendHeader("Access-Control-Allow-Credentials", "true");  
    ctx.Response.AppendHeader("Access-Control-Allow-Methods", "OPTIONS, GET, POST"); return;  
}  
  
if (ctx.Request.Headers["Authorization"] == null)  
{  
    ctx.Response.StatusCode = 401;  
    ctx.Response.AppendHeader("WWW-Authenticate", "Basic"); return;  
}  
  
//validate authentication  
if (!Authenticate.ValidateRequest(ctx.Request.Headers["Authorization"].ToString()))  
{  
    ctx.Response.StatusCode = 401;  
    return;  
}
```

```

    }

    //save file
    if (ctx.Request.HttpMethod.ToUpper() == "POST")
    {
        try
        {
            if (ctx.Request.Files.Count > 0)
            {
                HttpPostedFile myFile = ctx.Request.Files[0];
                if (myFile != null && myFile.ContentLength > 0)
                {
                    Stream fileContents = myFile.InputStream;
                    string fileName = Path.GetFileName(myFile.FileName);
                    string path = Path.Combine(ctx.Server.MapPath("~/UploadedData"), fileName);
                    myFile.SaveAs(path);
                    ctx.Response.ContentType = "application/json";
                    ctx.Response.Write("{\"error\":\"0\"}"); return;
                }
            }
            else
            {
                ctx.Response.StatusCode = 1;
                return;
            }
        }
        catch (Exception e)
        {
            ctx.Response.StatusCode = 1;
            return;
        }
    }
}

```

## Data Base Back Up

You may be asked to make a backup of your database to support troubleshooting and diagnosis of issues with this app. The procedure for backing up your data is as follows:

1. Select **Settings** on the main menu
2. Select **Data Security**. You may be prompted to enter your passcode.
3. Turn on the toggle labeled **Export Database On Next Launch**.
4. Press the home button to leave the app.
5. Re-launch the app.
6. Launch iTunes on your computer.
7. Connect your iPad to a computer using a USB cable.

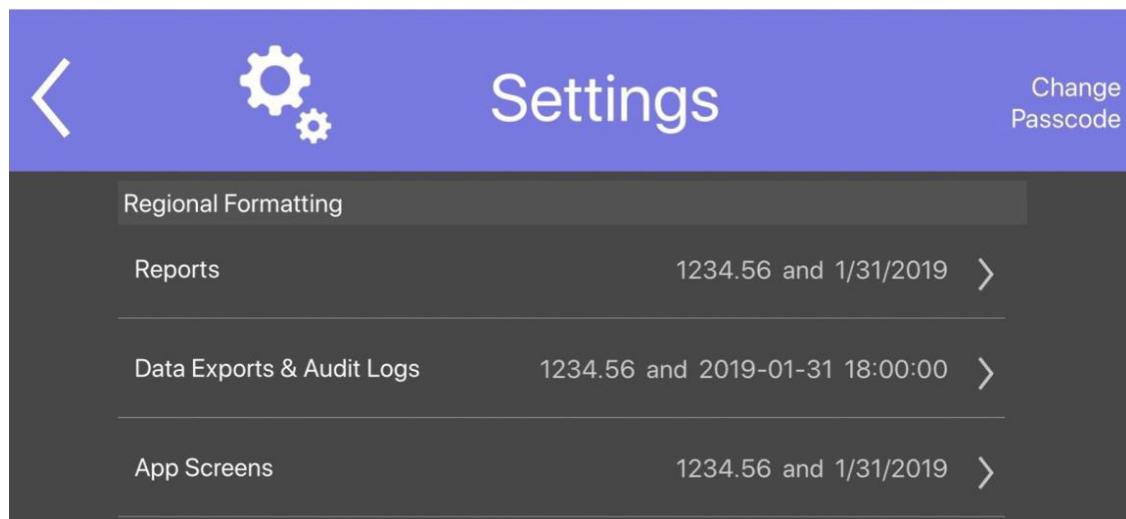
8. Select your iPad in iTunes (near the top left of the iTunes main window).
9. Select Apps at the left side of the screen.
10. Scroll to the bottom of the screen to the section titled File Sharing.
11. Find this app in the list of apps that support File Sharing and select it.
12. In the list of Documents on the right side of the screen you will see three files including todays date, for example, Backup-2017-03-01 12:00:00.sqlite, Backup-2017-03-01 12:00:00.sqlite-shm, and Backup-2017-03-01 12:00:00.sqlite-wal. Select these files and copy them to your computer by clicking the Save To... button at the bottom right of the Documents area.

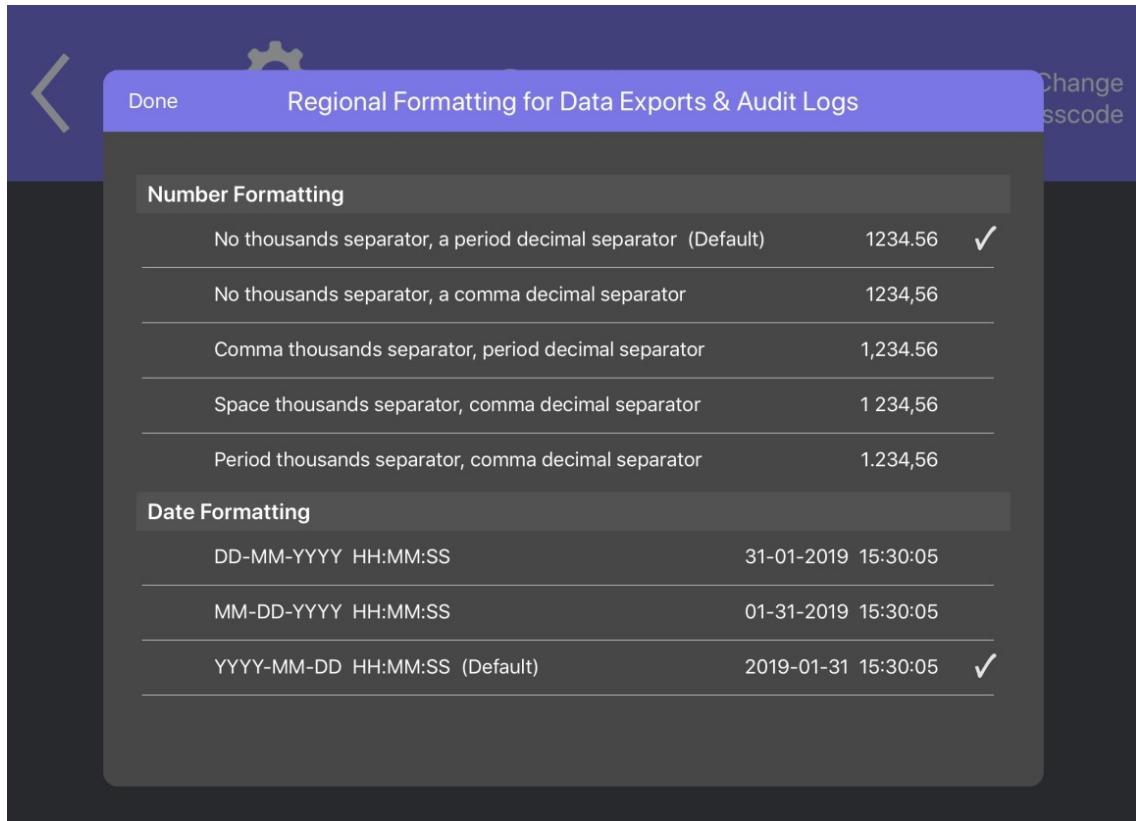
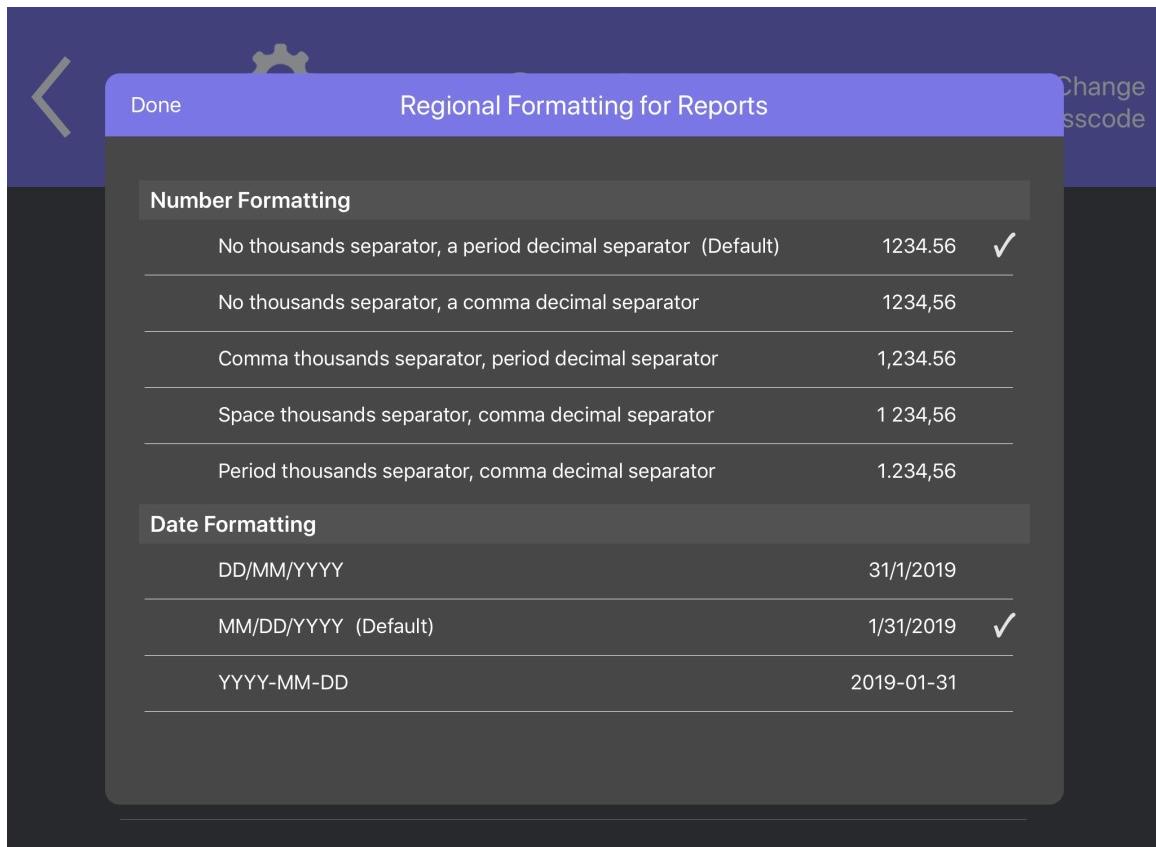
As a reminder this backup is for troubleshooting and diagnostic purposes. Backups may not be restored.

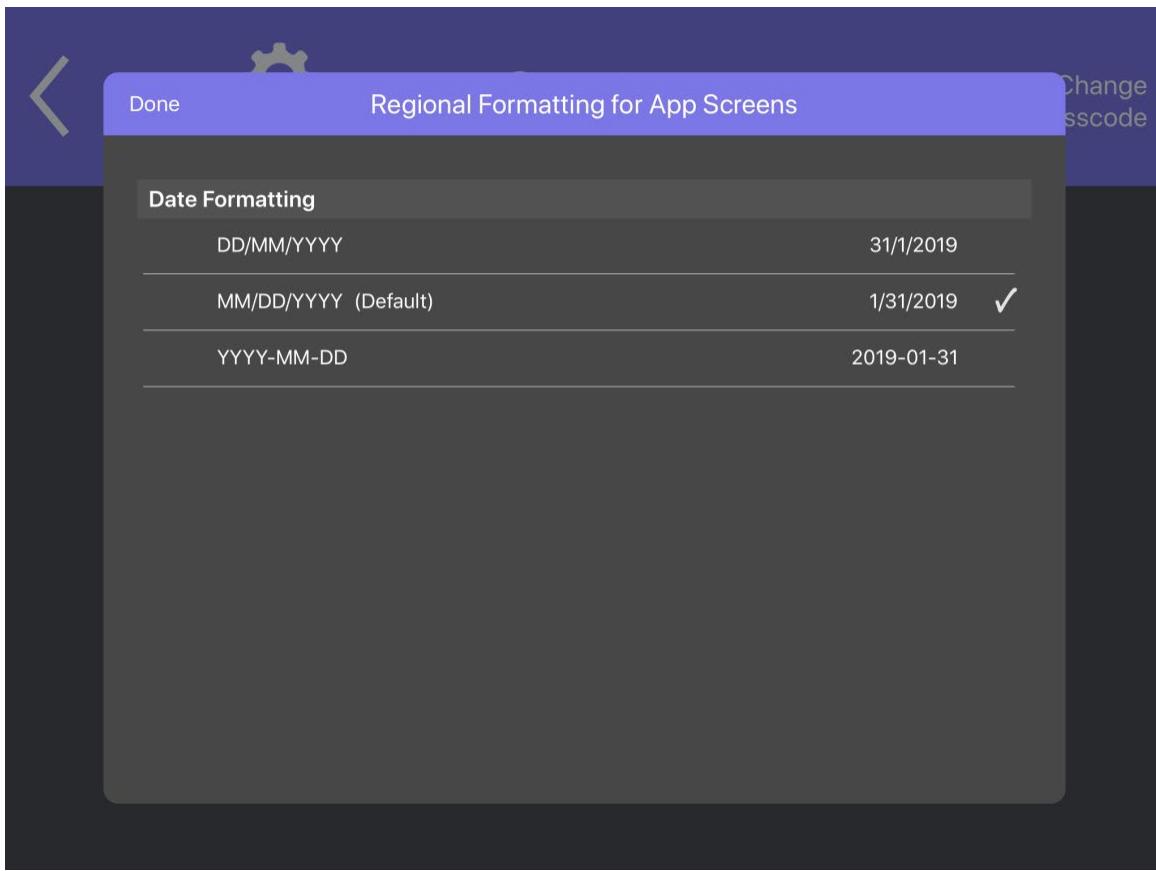
There is no need to turn off the **Export Database On Next Launch** feature. After a single backup is completed this feature is automatically turned off.

#### ***B.4.4.2 Regional Formatting***

To change the date and number formats for Reports, Data Exports, Audit Logs, and App Screens, tap on **Reports**, **Data Exports & Audit Logs**, or **App Screens**, then update the settings.







#### ***B.4.5 Export Data***

The Export Data button allows the user to export data collected on a given iPad. At any point when export is selected, it will contain all the data cumulatively collected on that iPad. There are four options to transfer data files from the iPad to another device (i.e., computer connected to a backup server): e-mail, iCloud drive, configurable web address and file sharing via iTunes (hard-wired). Only file sharing via iTunes is activated by default. To activate the ability to email files, upload them to iCloud or send them to a configurable web address, please update Data Security in the NIH Toolbox app Settings. Data security settings can be updated at any time: before or after data files were generated.

In order to export data in app version 1.23, three screens are presented: Select Assessments To Export (Step 1), Select Destination (Step 2), and Select Files (Step 3).

##### **Select Assessments To Export (Step 1):**

The “Select Assessments To Export (Step 1)” screen displays assessments available for export. Assessments which have never been exported previously are displayed by default. Each assessment contains the export status text “Previously Exported” or “Never Exported” beneath the assessment name. The user is given the option to select any or all assessments from a specific date range. The user may filter the assessments on export status, [i.e. “Never Exported”]

(default option), “Previously Exported”, or “All Assessments”]. Only the assessments that have never been exported before and have an assessment status of “Completed” or “In progress” are selected (checked) by default when “All Assessments” is selected, although previously exported assessments may be individually selected. The user can modify the filter to display “All Assessments” by tapping “x” in the export status filter.

The date range defaults to the last modified date of the earliest assessment for the “From” date, and the last modified date of the latest assessment for the “To” date. Tapping “x” in the “From” date filter resets the date to “1-1-2015” (the earliest possible date for the app). Tapping “x” in the “To” date filter resets the date to today’s date (the latest possible date).

The “Select All / Unselect All” button has the title “Unselect All” when all assessments are selected (checkboxes checked). If some or no assessments are selected, the title of the button is “Select All”.

If the user taps the “Show archived assessments” check box, archived assessments are added to the list of assessments for export. New to app version 1.22, archived assessments are indicated with the text “Archived” beneath the assessment status. Archived assessments will, by default, be checked (selected) if they have never been exported, and unchecked if they have been previously exported.

Tapping the “Continue” button, will display the “Select Destination (Step 2)” screen.

### **Select Destination (Step 2):**

The “Select Destination (Step 2)” screen gives the user the option of selecting the destination to which export files will be sent. There are four destination options available on this screen. If email, iCloud Upload, or Web Server Upload have not been enabled in the Data Security section of the app, these rows will be visible but not enabled. If the user selects any of these rows, they will be presented with a message that indicates the option is disabled and how to enable it, (e.g. “Email Is Disabled. Sending email from *NIH Toolbox*\* is disabled. To enable this feature go to the Settings screen in this app and choose Data Security. See Frequently Asked Questions for more information about email security.”)

\*The relevant app name will be used.

Destination options are mutually exclusive, (i.e. only one checkbox may be endorsed per data export). The iPad File Sharing option is the default, checked selection. The app will store selections from the previous export action and those selections will be endorsed the next time the user returns to the “Select Destination” screen. If all export options are disabled in the Data Security section, iPad File Sharing will become the selected option.

\*The relevant app name will be used.

When the Continue button is tapped, the user is presented with the “Select Files (Step 3)” screen. In those cases, the files are uploaded after the Continue button is tapped on the “Select Destination (Step 2)” screen.

### Select Files (Step 3):

Depending on which destination was selected from Step 2, the title of the Step 3 screen will vary.

- If the user selects iPad File Transfer, then the title is: "Select Files to Transfer (Step 3)"
- If the user selects email, then the title is: "Select Files to Send (Step 3)"
- If the user selects iCloud or Web Server then the title is: "Select Files to Upload (Step 3)"

The "Select Files (Step 3)" screen gives the user the option of selecting any combination of export files. There are six total files, three legacy files (available prior to 1.22 release) and three narrow structure files. The files are presented in the following order:

- [Time Stamp] Registration Data.csv
- [Time Stamp] Assessment Scores.csv
- [Time Stamp] Assessment Data.csv
- [Time Stamp] Narrow Structure Registration Data.csv
- [Time Stamp] Narrow Structure Assessment Scores.csv
- [Time Stamp] Narrow Structure Assessment Data.csv

Initially, the three legacy files are selected by default. If the user makes a different selection, those choices are stored for the next time the user returns to the screen.

The "Select All / Unselect All" button has the title "Unselect All" when all files are selected (checkboxes checked). If some or no files are selected, the title of the button is "Select All".

When the user taps the "Create Files" button, files which the user had selected are created. If no files are selected and the "Create Files" button is tapped, the message "No Files Selected. Please select a file." will be presented. After the user taps the "Create Files" button, the "Done" button becomes enabled and is fully visible. The "Done" button brings the user back to the main menu.

Only in the case of iPad File Sharing, the files are created and saved in the documents directory so that the user can access them.

After the files are created and successfully exported, a success message is presented in all cases except emailing which presents the email composer window. To complete the process of sending files via email, the user will be given several email options upon tapping the Create Files button. The options are whether to encrypt or not encrypt the files, obtain more information or to cancel the process. After the user makes an encryption selection, an applicable email address should be entered into the "To" section of the composer window and tap the up arrow in the upper right corner of the box to send the email.

To prevent the iPad from going to sleep during a large dataset export, the iPad's idle timer is disabled when the Create Files button is tapped. The iPad's idle timer is enabled when:

- The Done or Back button is tapped
- Any button is tapped on the email alert message which asks the user if he would like to encrypt the email
- When the user taps any alert message the iPad's idle timer is enabled (export success or error messages)

As of app version 1.22, a Data Dictionary button is available on the “Select Files (Step 3)” screen. Tapping this button will initiate the process of navigating the user away from the app to the webpage from which the Data Dictionary may be accessed. Once the button is tapped, a message will appear asking the user to confirm they would like to leave the app. Tapping ‘Cancel’ will stop the process, tapping ‘OK’ will open the webpage with the Data Dictionary link. If no internet connection is available, an error message will appear. The user may connect to the internet to complete the process.

## **Exports**

Beginning with app version 1.22, three narrow structure exports are available to the user in addition to the legacy exports (i.e., existing Assessment Data, Assessment Scores and Registration Data) files. Narrow structure files include: Narrow Structure Registration Data, Narrow Structure Assessment Data, and Narrow Structure Assessment Scores. These files are modeled on key-value tables of the export information. The main purpose of these exports is to aid analysts in the creation of filtered and/or pivoted datasets. The content of the exports is nearly the same as the other, default data exports. However, the structure of the file is different such that data attributes are stored as key-value pairs in unique rows. Also, content will only appear in the narrow exports if the database field is populated, i.e. there will be no blank value fields. It is recommended to use these narrow exports if values are being imported into another system or database.

### **File Format: Narrow Structure Registration Data**

The Narrow Structure Registration Data has the same columns as the legacy Registration Data Export File. There is no change to the structure of this export and only one content change—the addition of the Registration ID column. The complete list of columns in this export is:

- PIN
- RegistrationID
- DeviceID
- Name
- Age
- Education
- MothersEducation
- FathersEducation
- GuardiansEducation
- StartingLevelOverride
- Gender
- Handedness
- Race
- Ethnicity
- AssessmentName

### **File Format: Narrow Structure Assessment Scores**

The Narrow Structure Assessment Scores file has nine columns:

- PIN
- RegistrationID
- DeviceID
- AssessmentName
- InstrumentTitle
- InstrumentID
- TestName
- Key
- Value

The three new columns include RegistrationID, InstrumentID and TestName. The Registration ID is populated with the Participant UUID. The Instrument ID is populated with the Managed Instrument’s UUID. The Test Name is a shortened name of the instrument that links all instruments to an instrument group of a given type. For example, the instrument named “NIH

Toolbox Toolbox Picture Sequence Memory Test Age 8+ Form C v2.1" would have a corresponding Test Name of "Picture Sequence 2". Test Name column is blank for Composite Scores.

As of app version 1.22, all instruments have a Test Name assigned, but this is not enforced. If in the future an instrument is added that does not have a Test Name, it is not an error scenario.

The valid values for the Key column are:

- RawScore
- Theta
- Tscore
- SE
- ItemCount
- DateFinished
- Language
- ComputedScore
- UncorrectedStandardScore
- AgeCorrectedStandardScore
- FullyCorrectedTscore
- National PercentileAgeAdjusted
- UncorrectedStandardScore
- AgeCorrectedStandardScore
- NationalPercentileAgeAdjusted
- FullyCorrectedTscore
- AgeGenderCorrectedTscore
- UncorrectedStandardScoresDominant
- AgeCorrectedStandardScoresDominant
- NationalPercentileAgeAdjustedDominant
- FullyCorrectedTscoresDominant
- UncorrectedStandardScoresNonDominant
- AgeCorrectedStandardScoresNonDominant
- NationalPercentileAgeAdjustedNonDominant
- FullyCorrectedTscoresNonDominant
- UncorrectedStandardScoresQuinineWhole
- UncorrectedStandardScoresSaltWhole
- AgeCorrectedStandardScoresQuinineWhole
- NationalPercentileAgeAdjustedWholeMouthQuinine
- AgeCorrectedStandardScoresSaltWhole
- NationalPercentileAgeAdjustedWholeMouthSaltAlt
- FullyCorrectedTscoresQuinineWhole
- FullyCorrectedTscoresSaltWhole
- WholeMouthSalt
- WholeMouthQuinine
- DominantScore
- NonDominantScore
- StaticVisualAcuityLOGMAR
- StaticVisualAcuitySnellen
- DVARightDifferenceLOGMAR
- DVALeftDifferenceLOGMAR
- StandingBalanceRatioPosition2Position1
- StandingBalanceRatioPosition4Position1
- RawScoreRightEar
- RawScoreLeftEar
- ThresholdRightEar
- ThresholdLeftEar
- DextNumberCorrect
- DextNumberAttempted
- TotalDextRawScore
- TotalDextRawPercentile
- InstrumentBreakoff
- InstrumentStatus2
- InstrumentRCReason
- InstrumentRCReasonOther
- AppVersion
- iPadVersion
- FirmwareVersion

As of app version 1.22, instruments using a dichotomous CAT engine will no longer report a Tscore value. Impacted instruments are:

- NIH Toolbox Picture Vocabulary Test Age 3+ v2.0
- NIH Toolbox Picture Vocabulary Test Age 3+ v2.0 (Spanish for 18+)
- NIH Toolbox Picture Vocabulary Test Age 3+ v2.0 (Spanish for 3-17)
- NIH Toolbox Picture Vocabulary Test Age 3+ v2.1
- NIH Toolbox Oral Reading Recognition Test Age 3+ v2.0
- NIH Toolbox Oral Reading Recognition Test Age 3+ v2.0 (Spanish for 18+)
- NIH Toolbox Oral Reading Recognition Test Age 3+ v2.0 (Spanish for 3-17)
- NIH Toolbox Oral Reading Recognition Test Age 3+ v2.1

A key-value field will only be included in the export if there is a value in the database. In other words, there will be no blank value fields. If there is no value for a given key, the entire row is omitted from the export. The key names are:

### **File Format: Narrow Structure Assessment Data**

The Narrow Structure Assessment Data file has eleven columns:

- PIN
- RegistrationID
- DeviceID
- ResponseID
- ItemID
- AssessmentName
- InstrumentTitle
- TestName
- InstrumentID
- Key
- Value

The four new columns include RegistrationID, ResponseID, InstrumentID and TestName. The Registration ID is populated with the Participant's UUID. Response ID is populated with the Item's UUID. As of app version 1.22, all instruments have a Test Name assigned, but this is not enforced. If in the future an instrument is added that does not have a Test Name, it is not an error scenario.

The Key Column might have any of the following key data. As with the Narrow Structure Assessment Scores export, a key-value field will only be included in the export if there is a value in the database. In other words, there will be no blank value fields. If there is no value for a given key, the entire row is omitted from the export. The key names are:

- InstrumentOrder
- InstrumentSection
- ItemOrder
- Locale
- Response
- Score
- Theta
- TScore
- SE
- DataType
- Position
- ResponseTime
- DateCreated
- InstrumentStartedTimestamp
- InstrumentEndedTimestamp
- AppVersion
- iPadVersion
- FirmwareVersion

## Select Assessments To Export (Step 1)

Assessments

Show

- All Assessments
- Previously Exported
- Never Exported

2019  Search To 12/10/2019

 Assessment 118	Never Exported	 FNAME-A	 Completed 12/10/2019	<input checked="" type="checkbox"/>
 Assessment 117	Never Exported	 FNAME-N	 Completed 12/10/2019	<input checked="" type="checkbox"/>
 Assessment 116	Never Exported	 FNAME-N	 Completed 12/10/2019	<input checked="" type="checkbox"/>
 Assessment 115	Never Exported	 FNAME-B	 Completed 12/10/2019	<input checked="" type="checkbox"/>
 Assessment 114	Never Exported	 FNAME-A	 Completed 12/10/2019	<input checked="" type="checkbox"/>

Show archived assessments

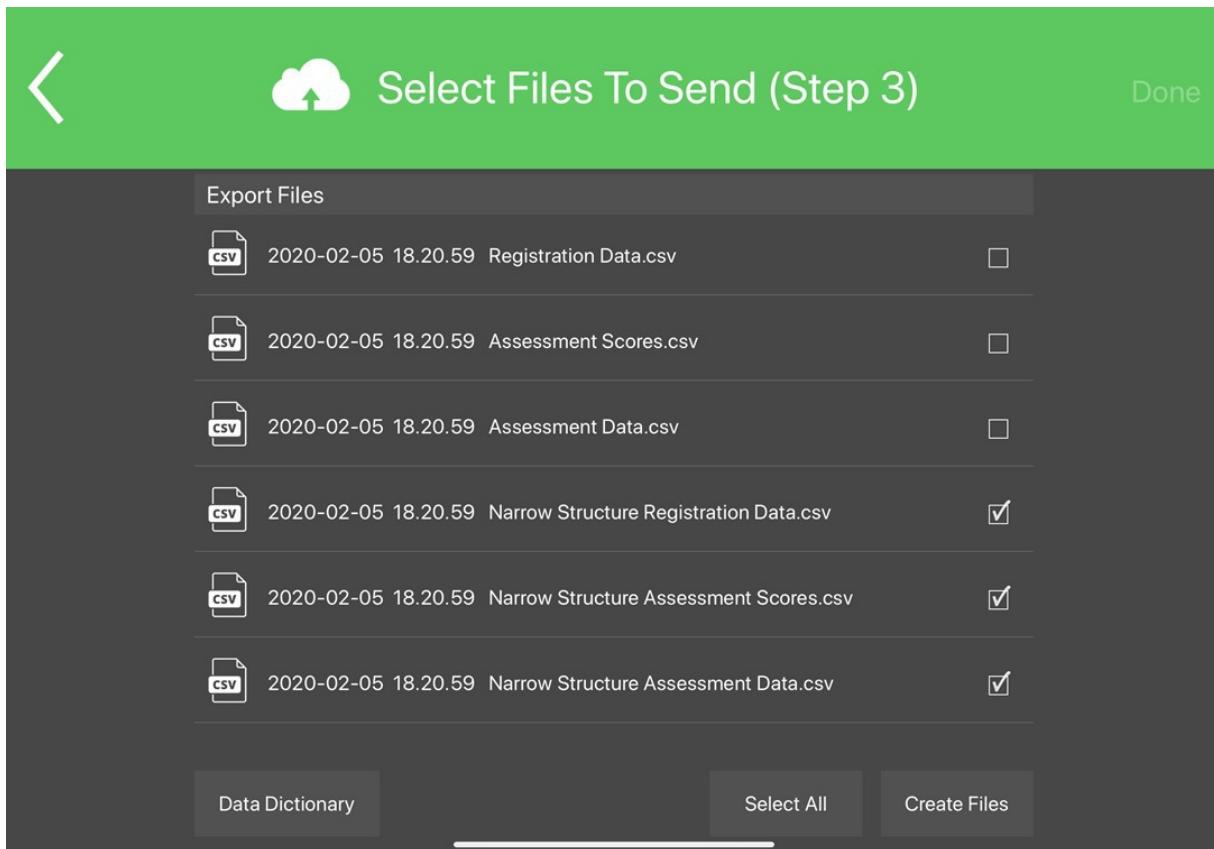
Select All  Continue >

## Select Destination (Step 2)

Export Destinations

 Transfer to your computer using iPad File Sharing...	<input type="checkbox"/>
 Send via email...	<input checked="" type="checkbox"/>
 Upload to iCloud...	<input type="checkbox"/>
 Upload to a web server...	<input type="checkbox"/>

Continue >



### ***Data Safeguards***

Data stored on this iPad are protected by a number of safeguards. These include:

1. The passcode set for this iPad
2. The passcode set for the NIH Toolbox app
3. Requiring the administrator to enter the app passcode at the end of an assessment, before returning to the home screen

iCloud Security and Privacy policies can be found on Apple's website.

### ***B.4.6 App Help & Support***

Tap on question mark icon located at the bottom right corner of Home screen to:

- View Getting Started tips
- View What's New In This Version
- View Scoring Adjustment Information
- View Audit Logs
- View Frequently Asked Questions (FAQ)
- View Knowledge Base
- View Contact Support

- View Terms and Conditions
- View Privacy Policy
- View diagnostic information that may be needed when contacting Support

## Audit Logs

There are three Audit Logs available for a user: the **Participant Audit Log**, the **Rescore Audit Log**, and the **Battery Audit Log**. These audit logs can be used to identify all records that have been changed and where those changes occurred.

**Participant Audit Log** – Contains audit entries identifying when a participant snapshot is first created and when a participant snapshot is modified. It creates a record of the demographic field values before and after the edits (i.e., old and new demographic data).

Participant Audit Logs are sorted by PIN, DateCreated and DateModified with the latest (rescored) record on top and the “before-rescore” record under it.

**Rescore Audit Log** – Includes changes related to any rescore of data (old and new updated scores). This Audit Log includes records for every measure (instrument) affected by scoring adjustment functionality and/or rescore of data caused by changes made to demographic information (i.e., “demographic rescore”).

This Audit log is sorted by first, PIN and next, Measure/Instrument name. All instrument-level records are displayed in pairs: the most recent record on top and the “before-rescore” record underneath it. Composite scores, however, are only included in rescored (new) records.

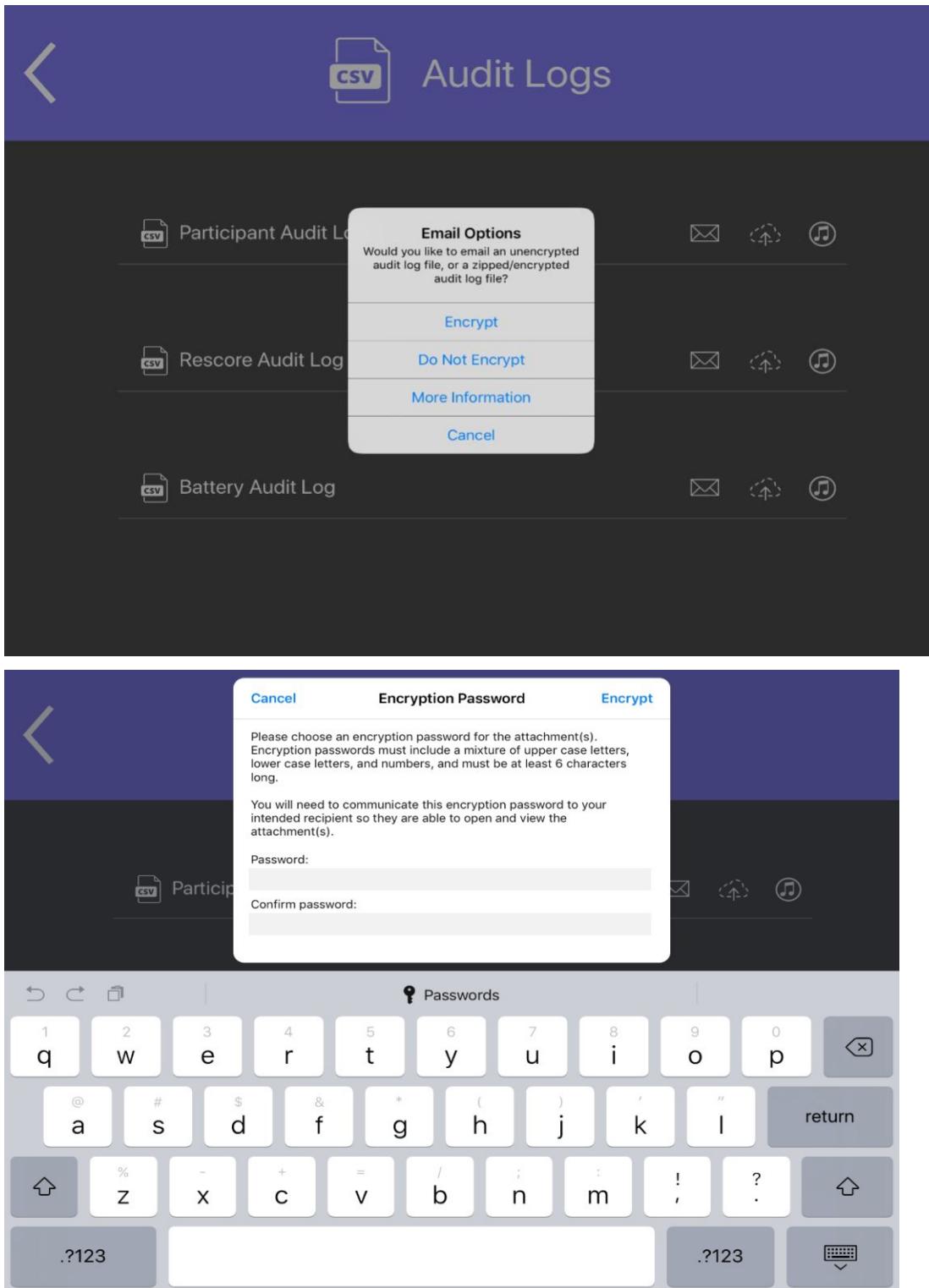
The Rescore Audit Log is not designed to be used in analysis, but as a record of the changes in scores that were made 1) during the automatic rescore procedures that were performed in order to improve equivalency between the web platform and the iOS app; and/or 2) due to the demographic rescore caused by editing the participant information for a participant with completed assessments. When reviewing the audit log please note that you will see BOTH the old data and the new rescored data. The records are paired, with the new, rescored data on top and the old record directly underneath. The only exception being the rescored composite scores, where you will only find the new rescored records (v1.1) in the Rescore audit log.

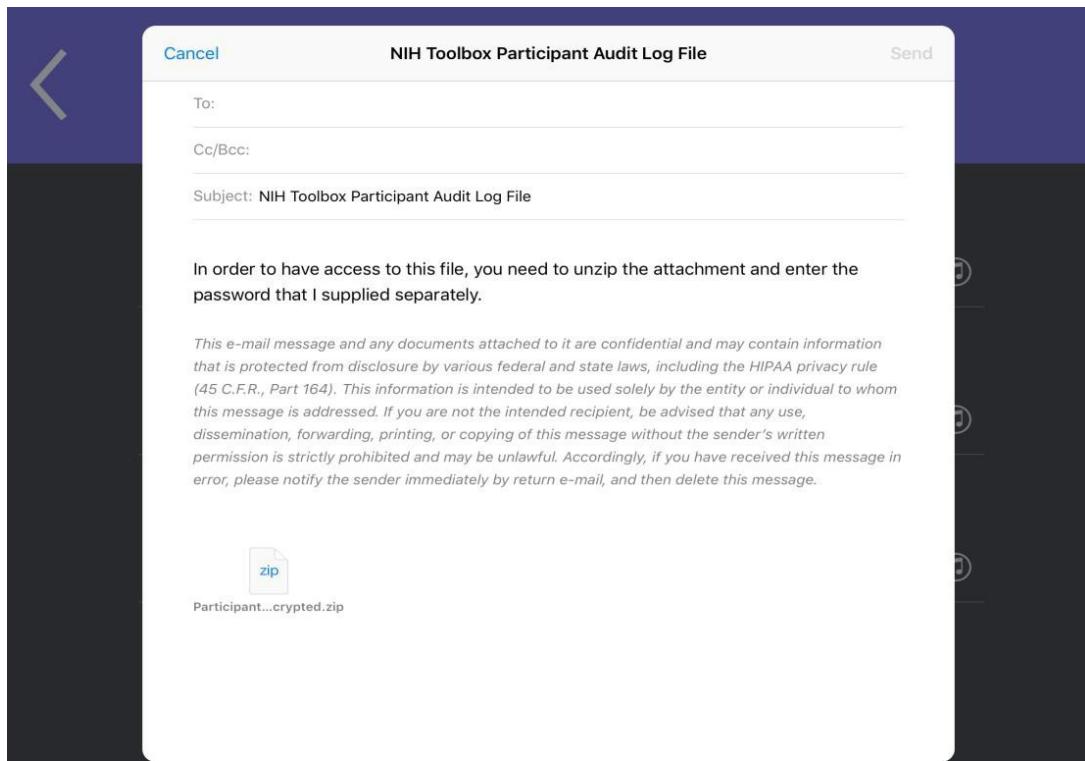
**Battery Audit Log** – The Battery Audit Log will display the custom batteries that have been updated due to replacement of retired instruments with new versions or due to presence of retired instrument(s) in a custom battery. Please see FAQ “What instruments have been retired?”.

The **Audit Logs** section can be found on the **Help & Support** screen. The Audit Log files (“Participant Audit Log.csv”, “Rescore Audit Log.csv”, and “Battery Audit Log.csv”) have the following export options: **Email**, **Upload to iCloud**, and **Upload to iTunes**. However, **Email** and **Upload to iCloud** options are disabled by default. Users can enable those options via the **Data Security** section of **Settings** screen.

For additional information, please see FAQ in the apps.

## Encryption of Audit Logs





## C. Administering NIH Toolbox

This section contains information about each of the four NIH Toolbox domains: Cognition, Emotion, Motor and Sensation, as well as descriptions of individual instruments, the equipment and materials needed for their administration, and age-specific instructions for administering them.

It is recommended that the iPad be placed in a case both for its protection and so that the angle of the iPad can be placed at multiple positions, to ensure participant comfort. Positioning the iPad so that it is at an angle of about 60 degrees from the table works best. However, if that setup is not effective for the participant, the examiner should adjust the angle so that it is most comfortable, while still being easily visible and accessible to touch. Placing the iPad flat on the table is generally not recommended. Please note that selected tests (e.g., visual acuity) require that the iPad be placed perpendicular to the table and at eye level for the participant; using an iPad “easel” or something similar may be used for this and all other tests if preferred. See [Appendix 5](#) for more information on suggested equipment.

 When an examiner administers an instrument to a participant within the app, the first screen they will see is a title screen that contains the instrument name or a shortened version of the name. Please note that the name displayed on this screen often does not exactly match the full name of the instrument displayed when the user/examiner is selecting measures to be administered as part of an assessment. [Appendix 6](#) contains a key to these abbreviations. The first column in the appendix shows the title screen as it is displayed at the start of the instrument, and the second column gives the corresponding full name of the instrument as it appears for selection elsewhere in the app.

 A detailed list of equipment and materials needed to administer the entire NIH Toolbox can be found in [Appendix 5](#).

### C.1 NIH Toolbox Touch Screen Tutorial

NIH Toolbox Touch Screen Tutorial 3+ is available and recommended for anyone not familiar with using an iPad or similar device. It is particularly useful for young children and older adults who may need reassurance that they are able to complete the assessment competently. If used, it should be added as the very first instrument in the assessment.

#### **Description**

This series of screens is designed to help participants to use the iPad and specifically the touch screen.

To help the participant get comfortable with the touch screen, the examiner may want to demonstrate, move the participant's finger, or, in other ways, encourage the participant to do the required actions.

The task is introduced with the Title Screen: *NIH Toolbox Touch Screen Tutorial 3+*. At the bottom of the screen is a button ***Touch and Hold Here to Continue***. Touch and hold that button to begin the tutorial.

Read the next screen to the participant: **First, you will practice touching pictures on the screen.** When finished reading, touch the button at the bottom of the screen that says: ***Touch and Hold Here to Continue***.

Read: **Touch the flower on the screen.** After participant touches the flower, the next screen appears. If participant does not touch the flower, the flower remains on the screen.

Read: **Good! Now we are going to do some more.** Touch the button at the bottom of the screen that says: ***Touch and Hold Here to Continue***.

Read: **Now, touch the star.** After participant touches the star, the next screen appears. If participant does not touch the star, the star remains on the screen.

Read: **Good! Let's do one more.** Touch the button at the bottom of the screen that says: ***Touch and Hold Here to Continue***.

Read: **Now, touch the apple.** After participant touches the apple, the next screen appears. If participant does not touch the apple, the apple remains on the screen.

Read: **Good! Now, you are ready to continue.** When finished reading, touch the button at the bottom of the screen that says: ***Touch and Hold Here to Continue***.

## C.2 Cognition Domain

Cognition refers to the mental processes involved in gaining knowledge and comprehension such as thinking, knowing, remembering, judging, and problem solving. These higher-level functions of the brain encompass language, imagination, perception, and the planning and execution of complex behaviors.

 There is an Early Childhood Cognition Battery designed for ages 3-6 and a Cognition Battery for ages 7-85, or you can create a custom battery.

### Early Childhood Cognition Battery

NIH Toolbox instrument development focused special attention on assessing young children to ensure that all tests and surveys given would be developmentally appropriate for ages 3-6. The Early Childhood Cognition Battery includes instruments to assess the following constructs: Attention, Episodic Memory, Executive Function and Language.

### Cognition Battery

The NIH Toolbox Cognition Battery is recommended for ages 7+. It consists of instruments that assess the following constructs: Executive Function, Attention, Episodic Memory, Language, Processing Speed, and Working Memory.

 Cognition instruments are not available for immediate use in the app. To access these instruments, a user must submit a short application for approval. Users who have been approved to use NIH Toolbox Cognition instruments in Assessment Center (web-based version of NIH Toolbox) will be approved without submitting any additional information. New users will be asked to submit credentials demonstrating they have the appropriate knowledge, skills, training and experience to responsibly use NIH Toolbox measures, or are working under the supervision of someone qualified to use those measures.

Application instructions can be found in the app, when touching the “lock” icon next to any cognition instrument. Once approved, a user will receive a code via email to enter on their iPad, and instruments can then be immediately administered. The user will also receive other restricted materials at that time (e.g., NIH Toolbox Oral Reading Recognition Test Pronunciation Guide and the NIH Toolbox List Sorting Working Memory Examiner Answer Sheet).

*For more information about access to cognition instruments, please contact [help@nihtoolbox.org](mailto:help@nihtoolbox.org).*

Cognition Battery Constructs	Definition
Executive Function	The capacity to plan, organize and monitor the execution of behaviors that are strategically directed in a goal-oriented manner. The NIH Toolbox focuses on two components: 1. Inhibition of automatic response tendencies that may interfere with achieving a goal, which is measured by the <a href="#">NIH Toolbox Flanker Inhibitory Control and Attention Test</a> ; and 2. Set shifting, or the capacity for switching among multiple aspects of a strategy or task, which is measured by the <a href="#">NIH Toolbox Dimensional Change Card Sort Test</a>

<b>Attention</b>	The allocation of one's limited capacities to deal with an abundance of environmental stimulation. It is measured by the <a href="#">NIH Toolbox Flanker Inhibitory Control and Attention Test</a> .
<b>Episodic Memory</b>	The acquisition, storage and retrieval of new information. It involves conscious recollection of information learned within a context. It is measured by the <a href="#">NIH Toolbox Picture Sequence Memory Test</a> .
<b>Language</b>	A set of mental processes that translate thought into symbols (words, gestures) that can be shared among individuals for purposes of communication. The NIH Toolbox focuses on two aspects of language: 1. Vocabulary knowledge, measured by the <a href="#">NIH Toolbox Picture Vocabulary Test</a> ; and 2. Oral reading (decoding) skills, measured by the <a href="#">NIH Toolbox Oral Reading Recognition Test</a> .
<b>Processing Speed</b>	The amount of time it takes to mentally process a set amount of information, or the amount of information that can be processed within a certain unit of time. It is a measure that reflects mental efficiency, and is measured by the <a href="#">NIH Toolbox Pattern Comparison Processing Speed Test</a> .
<b>Working Memory</b>	The capacity of an individual to hold information in a short-term buffer and manipulate the information. It is measured by <a href="#">the NIH Toolbox List Sorting Working Memory Test</a> .

Cognition Battery Instruments	Ages	Time to Administer (minutes)
NIH Toolbox Picture Vocabulary Test	3-85*	4
NIH Toolbox Flanker Inhibitory Control and Attention Test	3-85*	3
NIH Toolbox List Sorting Working Memory Test	7-85	7
NIH Toolbox Dimensional Change Card Sort Test	3-85*	4
NIH Toolbox Pattern Comparison Processing Speed Test	7-85	3
NIH Toolbox Picture Sequence Memory Test	3-85*	7
NIH Toolbox Oral Reading Recognition Test	7-85	3

\*Part of the NIH Toolbox Early Childhood Cognition Battery

In addition to the instruments available as part of the cognition battery (which may also be administered individually), there are Supplemental instruments that may be administered to participants – either in addition to or, more likely, in lieu of cognition battery instruments assessing the same construct. These supplemental instruments generally extend the age range or the “floor” of these constructs downward. More information about these instruments is available below.

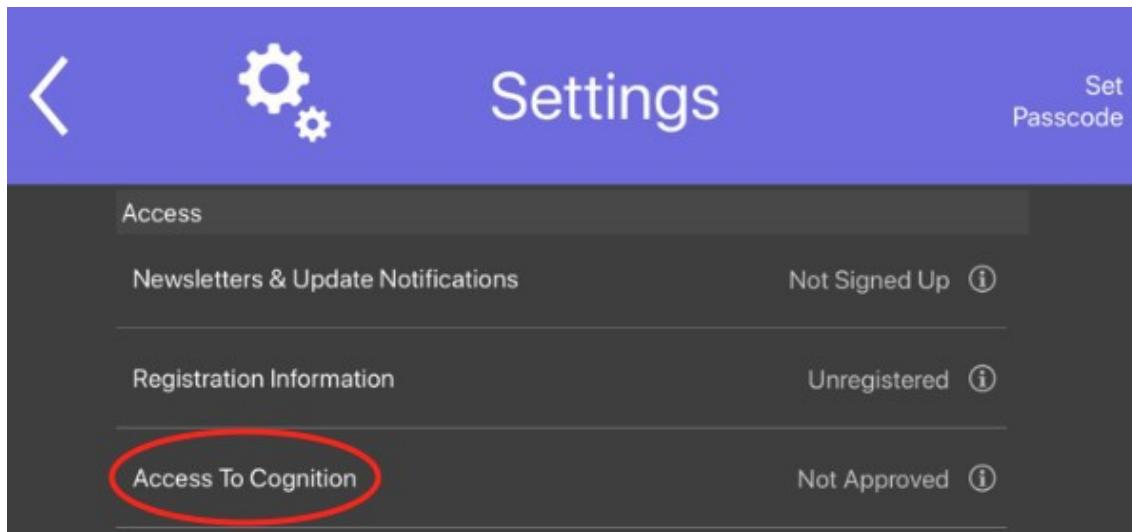
Cognition Supplemental Instruments	Ages	Time to Administer (minutes)
NIH Toolbox Pattern Comparison Processing Speed Test	3-6	3
NIH Toolbox Flanker Inhibitory Control and Attention Test with Developmental Extension (Experimental)	3-7	7
NIH Toolbox Dimensional Change Card Sort Test with Developmental Extension (Experimental)	3-7	8
NIH Toolbox List Sorting Working Memory Test	3-6	7
NIH Toolbox Oral Symbol Digit Test	8-85	3
NIH Toolbox Auditory Verbal Learning Test (Rey)	8-85	3

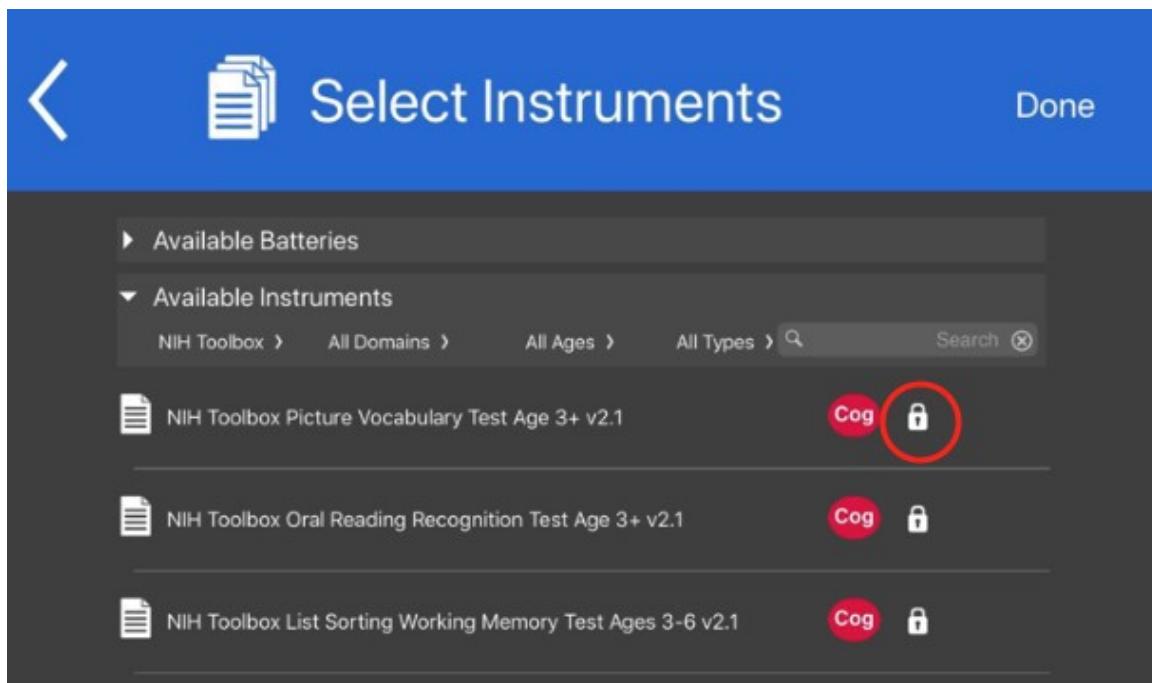
 The “**Time to Administer (minutes)**” column gives users an idea of how long each test might take; however, please note that testing times could vary based on how prepared the test administrator is going into the session, individual differences among participants, and/or other unplanned activities that may occur during testing.

### Accessing Cognition Instruments

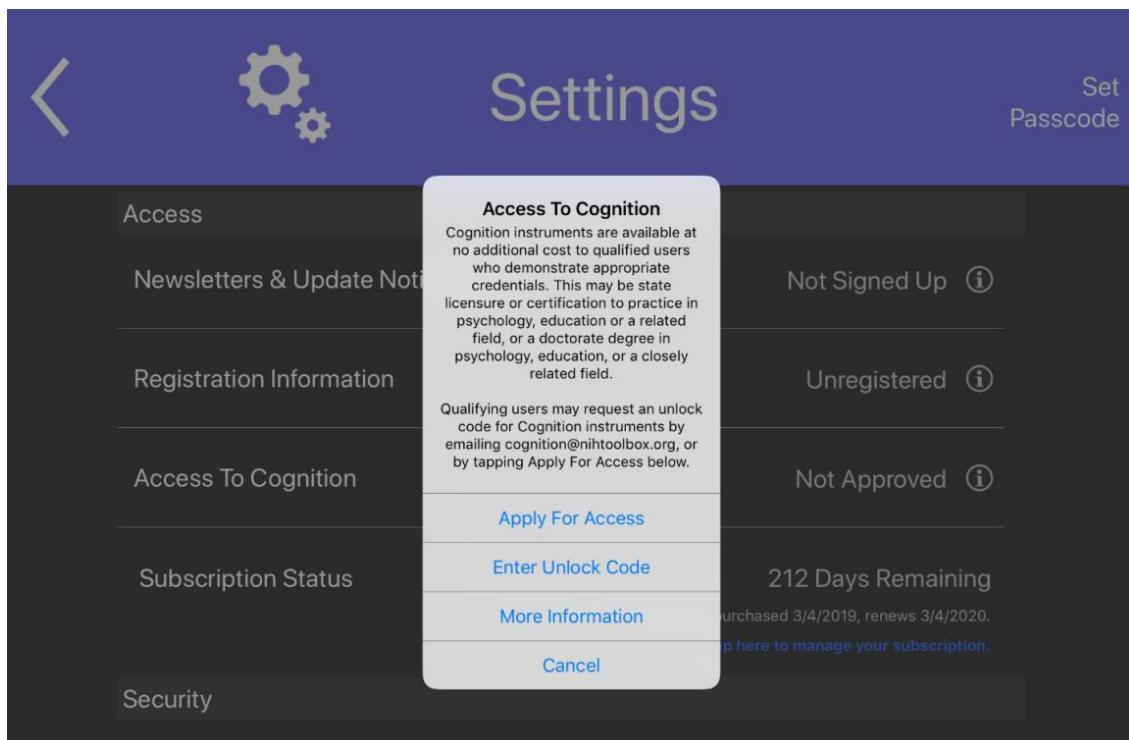
Cognition Unlock governs access to instruments within the Cognition domain, which can be found in the ‘NIH Toolbox’ or ‘Other’ measurement system. These instruments will be shown with a lock symbol instead of a **Select** button on the **Select Instruments** screen prior to the user entering a Cognition Unlock code.

In order to unlock the access to the Cognition measures the user must go to the **Settings** screen or tap on the lock symbol that is next to cognition measures in the **Select Instruments** screen.

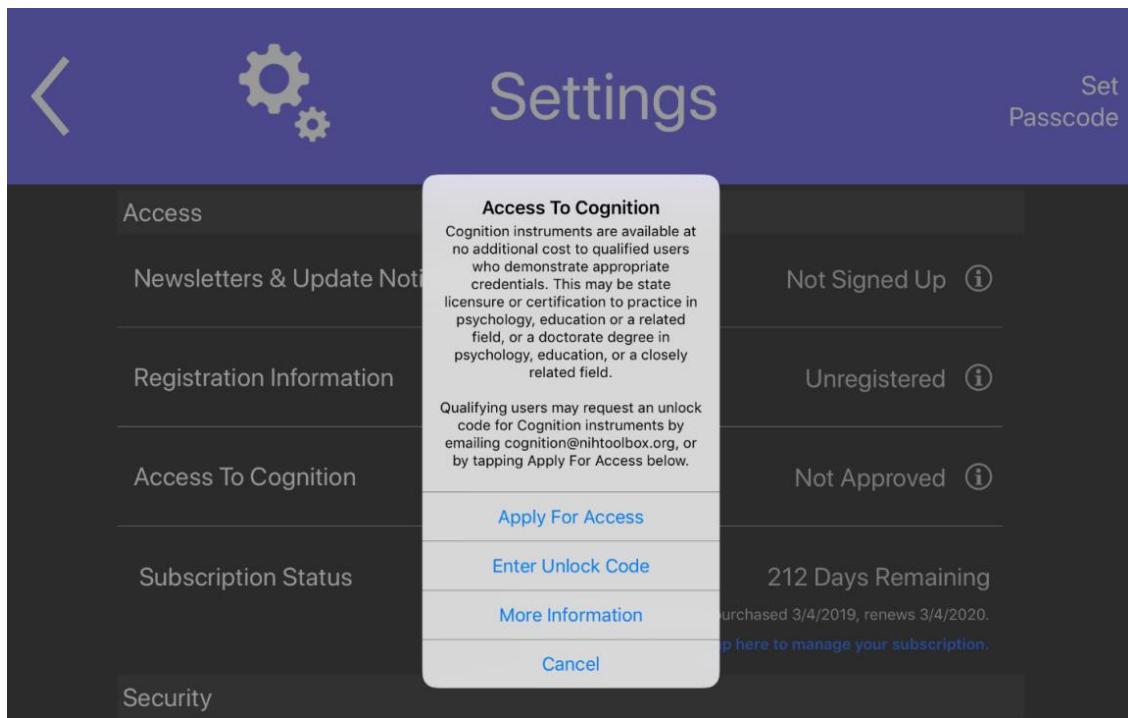


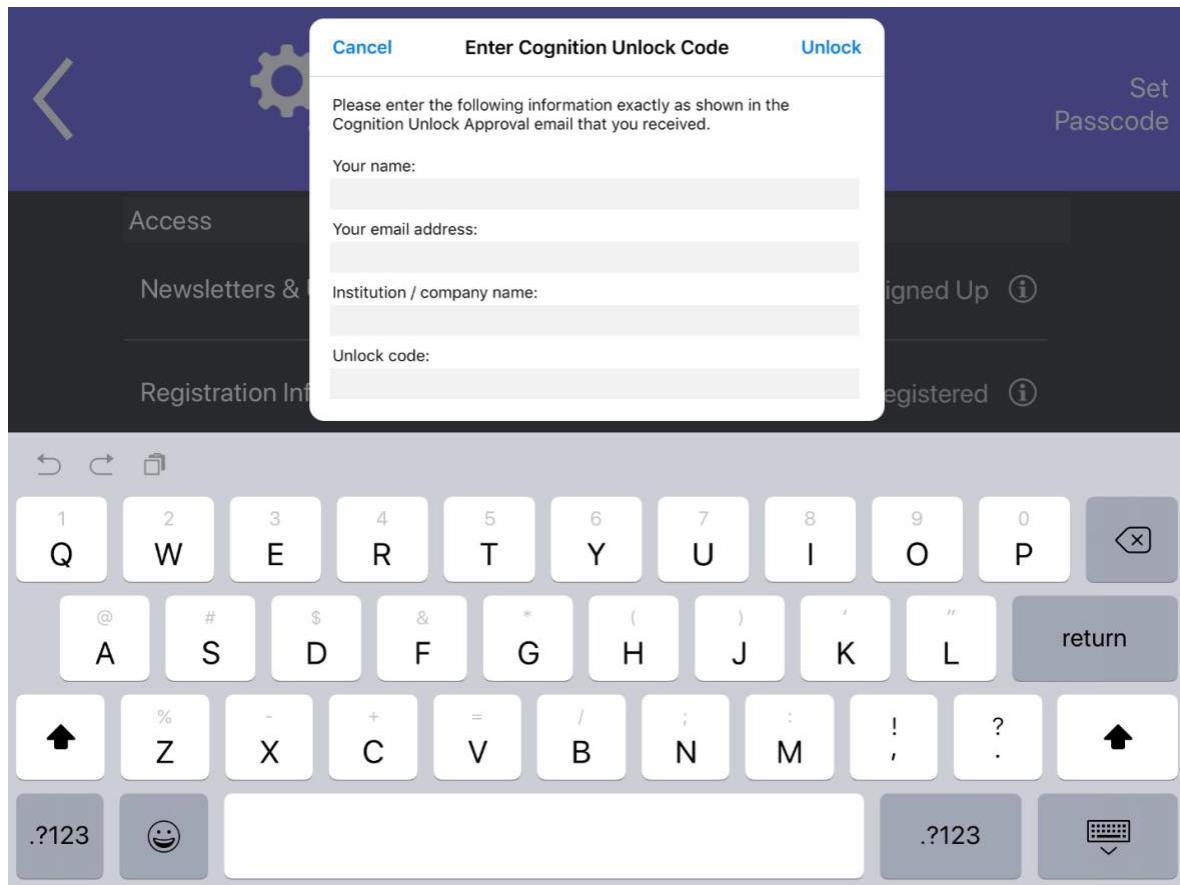


After tapping *Access to Cognition* or the lock symbol that is next to Cognition measures, a popup will appear. Tap the *Apply for Access* button to submit a Cognition Unlock request.



Once the request is submitted and approved by the NIH Toolbox support team, the user must enter the credentials for Cognition Unlock into the following screen.





The same Cognition Unlock code can be applied on multiple devices.

### **C.2.1 NIH Toolbox Picture Vocabulary Test**

The NIH Toolbox Picture Vocabulary Test is a measure of receptive vocabulary administered in a computer-adaptive test (CAT) format.

#### **Equipment and materials needed:**

- iPad

The participant is presented with four pictures on the iPad screen and an audio recording saying a word. The participant is instructed to touch the picture that most closely shows the meaning of the word. After the participant makes a choice, another set of pictures automatically appears with the next item and associated audio file.

Because the test uses a variable-length CAT, some participants see fewer items than others. The specific words presented depend on the participant's performance. The number of items presented depends on age and performance; for most participants, the measure will last approximately 5 minutes and will contain about 25 items. The computer will administer each item one by one, in an untimed fashion, until the test is completed.

The test uses age (for participants younger than 18) and education (for participants 18 and older) to determine which items it initially presents. There is, however, an override in the participant information screen. If an examiner feels that a participant should begin the test at a level higher or lower than that determined by his/her education and age, the examiner should use this feature. Using the override may shorten the test. It is important to note that even if the override is not used, the test will eventually arrive at the same score whether the examiner used the override or not.

#### **General Instructions:**

1. The opening/introductory instructions and the introductions to the test items are printed **on the iPad screen** and are read to the participants; all other instructions are pre-recorded.
2. The introduction and test instructions differ somewhat for younger and older participants. The required version will appear automatically for the examiner to read.
3. Before beginning, make sure the volume is loud enough so that participants can hear the pre-recorded feedback and the presentation of the words.
4. If the participant says he/she does not understand the word after several repetitions, the examiner, if present, may say the word **one more time**.

If there is an examiner present and a participant has difficulty touching the screen, the participant may point and the examiner can touch the screen. In this case, the examiner should say something like the following to the participant: **You can point to your choice and then I will touch the screen for you.**

### **C.2.1.1 NIH Toolbox Picture Vocabulary Test Instructions Age 3+**

The task is introduced with the Title Screen: *NIH Toolbox PVT 3+*. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

The next screen is slightly different for participants ages 3-6 and those ages 7+. The two screens are printed below.

#### Ages 3-6:

Say: **Let's look at some pictures. You'll hear a word and see four pictures on the screen. Touch the picture that means the same as the word that was said. Some words will be easy and some will be harder. Answer as best as you can. If you need to hear a word again, I can play it again.**

**If you think you made a mistake and want to change your last answer, I can bring back that word and pictures. Are you ready to play?**

When participant is ready, touch button that says *Touch and Hold Here to Continue*.

#### Ages 7+:

Say: **You are going to be asked the meaning of some words. For each item, you will hear a word and see four pictures on the screen. Touch the picture that you think best matches the meaning of the word that was said. If you are not sure, make your best guess. If you need to hear the word again, touch the button that has a picture of an EAR, also called the PLAY AGAIN button. After you touch a picture, you will hear a new word and see more pictures.**

**You will keep hearing words and touching pictures until you are done. If you want to change your last answer, touch the button with the HAND that says GO BACK. The pictures you just saw will reappear and you will hear the word again. Touch your choice, and then more words and pictures will appear. Tell me when you are ready to start.**

When participant is ready, touch button that says *Touch and Hold Here to Continue*.

#### Practice item 1:

An audio recording says: **Let's try one for practice: Banana. Touch the picture of Banana.**

If correct, the audio recording says: **That's right!** The program will automatically go to the next practice item.

If incorrect, the Banana picture will light up and an audio recording will say: **This is a banana. Let's try again.**

The examiner should allow the participant up to three chances to answer this practice item correctly.

After three unsuccessful attempts by the participant, the examiner should touch the picture of the banana and say: This is a banana. The next practice item will appear automatically.

Practice item 2:

An audio recording says: **Let's try another one: Spoon. Touch the picture of Spoon.**

If correct, an audio recording says: **That's right!**

If incorrect, the Spoon picture will light up and an audio recording will say: **This is a spoon.**  
**Let's try again.**

The examiner should allow the participant up to three chances to answer this practice item correctly.

After three unsuccessful attempts by the participant, the examiner should touch the picture of the spoon and say: This is a spoon.

The introduction to the test items will appear automatically.

Test items

The introductory screen to the test items is slightly different for participants ages 3-6 and those ages 7+. The two screens are printed below.

Ages 3-6:

Read: **Now, let's try some more. Remember, you will hear a voice say a word and then you will see four pictures. One of the pictures will show what the word means. Touch that picture and you will hear a new word and see four more pictures. Any questions?**

When participant is ready, touch button that says **Touch and Hold Here to Continue.**

Ages 7+:

Read: **Now, you're going to do some more. Remember, you will hear a word and then you will see four pictures. One of the pictures will show what the word means. Touch that picture and you will hear a new word and see four more pictures. Again, touch the picture that shows what the word means. If you don't know, make your best guess. Any questions?**

When participant is ready, touch button that says **Touch and Hold Here to Continue.**

An audio recording will introduce each word with the instructions: **Touch...** (for participants ages 3-6) and just the **Word** (for participants ages 7+). The items will continue in this format until the test is completed.

**Remember:** If a participant has difficulty touching the screen, he/she may point and the examiner can touch the screen. In this case, the examiner should say something like the following to the participant: **You can point to your choice and then I will touch the screen for you.** If the participant says that he/she does not understand the word after several repetitions, the examiner may say the word ONCE MORE.

### C.2.2 NIH Toolbox Flanker Inhibitory Control and Attention Test

The NIH Toolbox Flanker Inhibitory Control and Attention Test is a measure of inhibitory control and attention. The Flanker requires the participant to focus on a particular stimulus while inhibiting attention to the stimuli flanking it.

#### Equipment and materials needed:

- iPad
- Home base

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

Younger participants first see a fish flanked by two other fish on each side. If they perform well enough, they continue to a version with an arrow flanked by other arrows on each side.

Older participants (ages 8-85 years) are always presented with arrows instead of fish.

All participants are instructed to choose one of two buttons on the screen that corresponds to the direction in which the MIDDLE fish or arrow is pointing.

On congruent trials, all the fish or arrows are pointing in the same direction. On incongruent trials, the flanking fish or arrows are pointing in the opposite direction of the middle fish or arrow. Congruent and incongruent trials are mixed.

The word *middle* appears on the screen for all participants; for younger participants (ages 3-11), an audio recording also says "MIDDLE," to remind participants where to focus (a star in the middle of the screen).

All the instructions are on the iPad screen. The examiner reads them to and/or with the participant and points out the relevant aspects of the stimuli on the screen.

There are two versions of this measure for ages 3-7. The first is the standard NIH Toolbox Flanker test for ages 3-7. The second is an experimental version (with "developmental extension," or DEXT) that was designed to extend the range of assessment downward, for those participants who have difficulty understanding the standard task. Both versions yield a score for the standard measure, and the DEXT version provides simple raw scores and percentages for the experimental items.

#### Standard administration (all ages):

##### Practice items

In this version, all participants are first presented with four practice trials. If the participant responds incorrectly, an audio recording provides feedback and highlights the correct choice. Similarly, a separate audio file plays each time the participant gets a practice item correct. Participants must get at least three out of four practice trials correct to advance to the test items. If these participants get fewer than three out of four practice trials correct, they can complete up to two more sets of four practice trials, with the same cutoff to advance to the test trials.

If the participant does not respond after five seconds to a practice trial, prompt him/her to do so by saying: **Choose one of the buttons.**

## Test Trials

One block of 20 test trials is used for all participants; 3-7-year-olds have fish stimuli and ages 8+ have arrow stimuli.

If a participant ages 3-7 misses no more than one congruent and one incongruent item on the fish trials, he/she will also receive a set of 20 arrow trials.

**Training for home base precedes the arrow trials for both the 3-7 and 8+ year olds.**

### **Developmental Extension (DEXT ages 3-7):**

In this version, participants are given five practice trials. If the participant responds incorrectly, an audio recording provides feedback and highlights the correct choice. Similarly, a separate audio file plays each time the participant gets a practice item correct.

A participant must succeed in 4 out of 5 practice trials to move on.

If a participant does succeed, the test administration continues in the same manner as the standard administration described above.

If he/she does not succeed on the practice trials, he/she is directed to the developmental extension of this measure. In addition, participants will be directed to the developmental extension if they do not achieve at least 75% correct on congruent fish trials OR at least 25% correct on incongruent fish trials. The logic underlying the developmental extension is detailed in the test instructions (FLANKER 3-7 DEXT).

### **Age-specific test instructions:**

[NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 3-7](#)

[NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 3-7 with Developmental Extension \(DEXT\)](#)

[NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 8-11](#)

[NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 12+](#)

### C.2.2.1 NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 3-7

This table outlines the item content read by as well as the actions for the examiner.

iPad screen written content		Examiner (E) Action
<b>Title Screen</b>	NIH Toolbox FL 3-7	E touches and holds button to continue.
<b>PRACTICE Introduction</b>	Here is a Fish! This is the TAIL -> [fish] <- This is the MOUTH. The fish is pointing this way, the same way the fish is swimming.	E points to screen; then touches and holds button to continue.
	Here the MIDDLE fish is circled. Can you point to the MIDDLE fish?	Child points; E touches and holds button to continue.
	Where is the MIDDLE fish here?	Child points; E touches and holds button to continue.
	Look at all the fish!!! The fish in the MIDDLE is hungry.	E touches and holds button to continue.
	To feed the MIDDLE fish, choose the button that matches the way the MIDDLE fish is pointing.	E demonstrates using index finger to touch arrow button.
	Here the MIDDLE fish is pointing this way, so I'll choose this button.	E demonstrates touching arrow button.
	If the MIDDLE fish is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the fish point the same way. Sometimes the MIDDLE fish points a different way, like this: [incongruent fish].  You should always choose the button that matches the way the MIDDLE fish is pointing. You will hear the word MIDDLE to remind you.	E points; then chooses arrow button.
	Here, the MIDDLE fish is pointing this way, so I'll choose this button.	E points; then chooses arrow button.
	Here, the MIDDLE fish is pointing this way, so I'll choose this button.	E points; then chooses arrow button.
<b>Transition to practice items</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
<b>Practice Items set 1</b>	4 practice items	
<b>More practice, if less than 3 out of 4 correct on set 1</b>	Let's practice some more. If the MIDDLE fish is pointing this way, choose this button.	E points; then chooses arrow button.
	If the MIDDLE fish is pointing this way, choose this button.	E points; then chooses arrow button.

iPad screen written content		Examiner (E) Action
<b>Transition to more practice items</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
<b>Practice Items set 2</b>	4 practice items	
<b>More practice, if less than 3 out of 4 correct on set 2</b>	Let's practice some more. If the MIDDLE fish is pointing this way, choose this button.	E points; then chooses arrow button.
	If the MIDDLE fish is pointing this way, choose this button.	E points, then chooses arrow button.
<b>Transition to more practice items</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
<b>Practice Items set 3</b>	4 practice items	
<b>Test ends, if less than 3 out of 4 correct on set 3</b>		
<b>Test items transition</b>	Now you're ready to do this without me. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
<b>Test items</b>	20 test items (fish)	
<b>Test ends, if less than 90% success on fish</b>		
<b>Home Base training, if 90% or greater success on fish</b>	Now you will do the same thing, but you will see arrows instead of fish. But first we are going to learn about Home Base. This is your Home Base. Put your finger on the Home Base and wait for the next picture.  In this game, put your finger back on Home Base after each answer.	E reads screen and points to the home base; then touches and holds button to continue.
	Like before, choose the button that matches the way the middle arrow is pointing.	E points; then chooses arrow button.
	Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way.  You should always choose the button that matches the way the MIDDLE arrow is pointing.	E reads screen, points to the arrows, and demonstrates touching arrow button.
<b>More test items (arrows)</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.  Remember; put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
	20 test items (arrows)	

### C.2.2.2 NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 3-7 with Developmental Extension (DEXT)

This table outlines the item content read by and the actions to be performed by the examiner and the child.

iPad screen written content		Child (C) & Examiner (E) Actions
<b>Title Screen</b>	NIH Toolbox FL 3-7 DEXT	E touches and holds button to continue.
<b>PRACTICE Introduction</b>	Here is a Fish! This is the TAIL -> [fish] <- This is the MOUTH. The fish is pointing this way, the same way the fish is swimming.	E points to screen; then touches and holds button to continue.
	Here the MIDDLE fish is circled. Can you point to the MIDDLE fish?	Child points; E touches and holds button to continue.
	Where is the MIDDLE fish here?	Child points; E touches and holds button to continue.
	Look at all the fish!!! The fish in the MIDDLE is hungry.	E touches and holds button to continue.
	To feed the MIDDLE fish, choose the button that matches the way the MIDDLE fish is pointing.	E demonstrates using index finger to touch arrow button.
	Here the MIDDLE fish is pointing this way, so I'll choose this button.	E demonstrates touching arrow button.
	If the MIDDLE fish is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the fish point the same way. Sometimes the MIDDLE fish points a different way, like this: [incongruent fish]. You should always choose the button that matches the way the MIDDLE fish is pointing.	E points; then chooses arrow button.
	Here, the MIDDLE fish is pointing this way, so I'll choose this button.	E points; then chooses arrow button.
	Here, the MIDDLE fish is pointing this way, so I'll choose this button.	E points; then chooses arrow button.
<b>Transition to practice items</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.
<b>Practice items</b>	5 practice items	
<b>If less than 4 out of 5 correct</b>	Moves to developmental extension	
<b>Test items transition</b>	Now you're ready to do this without me. Keep your eyes on the star ★ in the middle of the screen.	E reads screen; then touches and holds button to continue.

iPad screen written content		Child (C) & Examiner (E) Actions
Test items	20 test items (fish)	
If < 9 congruent trials correct OR < 2 incongruent trials correct	Moves to developmental extension	
If correct on >= 11 congruent AND on >= 7 incongruent (no more than 1 incorrect of each)	<p>Now you will do the same thing, but you will see arrows instead of fish. But first we are going to learn about Home Base. This is your Home Base.</p> <p>Put your finger on Home Base and wait for the next picture.</p> <p>In this game, put your finger back on Home Base after each answer.</p>	E reads screen and points to the home base; then touches and holds button to continue.
	Like before, choose the button that matches the way the middle arrow is pointing.	E points; then chooses arrow button.
	<p>Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way.</p> <p>You should always choose the button that matches the way the MIDDLE arrow is pointing.</p>	E reads screen, points to the arrows, and demonstrates touching arrow button.
More test items (arrows)	<p>Now you try.</p> <p>Keep your eyes on the star  in the middle of the screen. Try to answer as fast as you can.</p> <p>Remember: Put your finger back on Home Base after you answer.</p>	E reads screen; then touches and holds button to continue.
	20 test items (arrows)	

Developmental Extension		
	iPad screen written content	Child (C) & Examiner (E) Actions
DEXT Screen 1 – Demo Trial 1	Let's try some more! Here is a Fish. This Fish is HUNGRY! To feed the HUNGRY Fish, we have to touch the button pointing the same way that the HUNGRY Fish is swimming (Right button is flashing after 5 seconds)	E reads screen and then E touches right arrow. Screen won't advance until correct arrow is touched. When correct arrow is touched, bubbles sound plays and iPad says: <b>Mmm, thank you.</b>
	Touch and hold here to continue screen appears.	E touches and holds button to continue.
DEXT Screen 2 – Practice Trial 1	Now it's your turn. Feed the HUNGRY Fish by touching the button that points	E reads screen. Child touches an arrow. If incorrect, iPad says: <b>Let's try again.</b> Repeats until correct arrow is touched. If

Developmental Extension		
	iPad screen written content	Child (C) & Examiner (E) Actions
	the same way the HUNGRY Fish is swimming.	correct, bubbles sound plays and iPad says: <b>Mmm, thank you.</b>
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
<b>DEXT Screen 3 – Transition</b>	Let's try some more.	E reads screen; then E touches and holds button to continue.
<b>DEXT Screens 4-8</b>	5 practice items with fish bowl on screen	
<b>DEXT Screen 9 – Demo Trial 2</b>	Here's another HUNGRY Fish. We don't see the food, but it's still there. I am going to touch the button pointing the same way the hungry fish is swimming.	E reads screen and then E touches left arrow. Screen won't advance until correct arrow is touched. When correct, bubbles sound plays and iPad says: <b>Mmm, thank you.</b>
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
<b>DEXT Screen 10 – Practice Trial 2</b>	Now it's your turn. Touch the button that's pointing the same way this Fish is swimming.	E reads screen. Child touches an arrow. If incorrect, iPad says: <b>Let's try again.</b> Repeats until correct arrow is touched. If correct, bubbles sound plays and iPad says: <b>Mmm, thank you.</b>
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
<b>DEXT Screen 11 – Transition</b>	Let's try some more!	E reads screen and then E touches and holds button to continue.
<b>DEXT Screens 12-16</b>	5 practice items without fish bowl	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves to new item after 10 seconds.
<b>If less than 4 of 5 correct on screens 12-16, test is discontinued.</b>		
<b>If 4 or more correct, test continues to Screen 17</b>		
<b>DEXT Screen 17 – Demo Trial 3</b>	Look at this! The hungry Fish has friends. These fish friends are NOT hungry, only the MIDDLE Fish is hungry. Watch me while I touch the button that is pointing the same way that the hungry MIDDLE Fish is swimming!	E reads screen and then E touches right arrow. When correct arrow is touched, bubbles sound plays and iPad says: <b>Mmm, thank you.</b>
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
<b>DEXT Screen 18 – Practice Trial 3</b>	Now it's your turn to feed the hungry MIDDLE fish. I want you to touch the button pointing the same way the MIDDLE Fish is swimming.	E reads screen. C touches an arrow. If incorrect, iPad says: <b>Let's try again.</b> Repeats until correct. If correct, bubbles

Developmental Extension		
	iPad screen written content	Child (C) & Examiner (E) Actions
		sound plays and iPad says: <b>Mmm, thank you.</b>
	Touch and hold here to continue appears on screen.	E touches and holds button to continue.
<b>DEXT Screen 19 – Transition</b>	Now you try. Keep your eyes on the star in the middle of the screen.	E reads screen and then E touches and holds button to continue.
<b>DEXT Screens 20-24</b>	5 items (Spacing/Size/Color block)	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves on to new item after 10 seconds.
<b>DEXT Screens 25-29</b>	5 items (Size/Color block)	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves on to new item after 10 seconds.
<b>DEXT Screens 30-34</b>	5 items (Color block)	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves on to new item after 10 seconds.
<b>DEXT Screens 35-39</b>	5 items (Toolbox Flanker Fish block)	If either arrow is touched, bubbles sound plays. If neither arrow is touched, moves on to new item after 10 seconds.
After screen 39, DEXT ends.		

### C.2.2.3 NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions Ages 8-11

This table outlines the item content read by as well as the actions for the examiner.

iPad screen written content		Examiner (E) Action
<b>Title Screen</b>	NIH Toolbox FL 8-11	E touches and holds button to continue.
<b>Home Base Introductions</b>	In this task, you will see a row of arrows pointing different ways. But first, we are going to learn about Home Base. This is your Home Base. Put your finger on Home Base and wait for the next picture.	E reads screen and points to the home base; then touches and holds button to continue.
<b>Practice Introduction</b>	You will see a row of arrows. You should choose the button that matches the way the MIDDLE arrow is pointing.	E points to left arrow and demonstrates touching the correct arrow.

iPad screen written content		Examiner (E) Action
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way, like this [picture of incongruent arrows]. You should always choose the button that matches the way the MIDDLE arrow is pointing.	E reads screen, points to the arrows, and demonstrates touching arrow button.
<b>Transition to practice items</b>	Now you try. Keep your eyes on the star. Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
<b>Practice Items set 1</b>	4 practice items	
<b>More practice, if less than 3 out of 4 correct on set 1</b>	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose that button.	E demonstrates touching arrow button.
<b>Transition to more practice items</b>	Now you try. Keep your eyes on the star. Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
<b>Practice Items set 2</b>	4 practice items	
<b>More practice, if less than 3 out of 4 correct on set 2</b>	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose that button.	E demonstrates touching arrow button.
<b>Transition to more practice items</b>	Now you try. Keep your eyes on the star. Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.

iPad screen written content		Examiner (E) Action
<b>Practice Items</b>	4 practice items	
<b>set 3</b>		
<b>Test ends, if less than 3 out of 4 correct on set 3</b>		
<b>Test Items Introduction</b>	<p>Now you're ready to do this without me.        Keep your eyes on the star. Answer as fast as you can without making mistakes.        If you make a mistake, just keep going!        Remember, put your finger back on Home Base after you answer.</p>	E reads screen; then touches and holds button to continue.
<b>Test items</b>	20 items (arrows)	



#### C.2.2.4 NIH Toolbox Flanker Inhibitory Control and Attention Test Instructions

##### Ages 12+

This table outlines the item content read by as well as the actions for the examiner.

iPad screen written content		Examiner (E) Action
<b>Title Screen</b>	NIH Toolbox FL 12+	E touches and holds button to continue.
<b>Home Base Introductions</b>	In this task, you will see a row of arrows pointing different ways. But first, we are going to learn about Home Base. This is your Home Base. Put your finger on Home Base and wait for the next picture.	E reads screen and points to the home base; then touches and holds button to continue.
<b>Practice Introduction</b>	You will see a row of arrows. You should choose the button that matches the way the MIDDLE arrow is pointing.	E points to left arrow and demonstrates touching the correct arrow.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
	Sometimes all the arrows will point the same way. Sometimes the middle arrow will point a different way, like this. You should always choose the button that matches the way the MIDDLE arrow is pointing. You will see the word MIDDLE to remind you.	E reads screen, points to the arrows, and demonstrates touching arrow button.
<b>Transition to practice items</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
<b>Practice Items set 1</b>	4 practice items	
<b>More practice, if less than 3 out of 4 correct on set 1</b>	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.
<b>Transition to more practice items</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Remember, put your finger back on Home Base after you answer.	E reads screen; then touches and holds button to continue.
<b>Practice Items set 2</b>	4 practice items	
<b>More practice, if less than 3 out of 4 correct on set 2</b>	Let's practice some more. If the MIDDLE arrow is pointing this way, choose this button.	E reads screen and demonstrates touching arrow button.
	If the MIDDLE arrow is pointing this way, choose this button.	E demonstrates touching arrow button.

iPad screen written content		Examiner (E) Action
<b>Transition to more practice items</b>	<p>Now you try.</p> <p>Keep your eyes on the star.★ Answer as fast as you can without making mistakes.</p> <p>If you make a mistake, just keep going!</p> <p>Remember, put your finger back on Home Base after you answer.</p>	E reads screen; then touches and holds button to continue.
<b>Practice Items set 3</b>	4 practice items	
<b>Test ends, if less than 3 out of 4 correct on set 3</b>		
<b>Test Items Introduction</b>	<p>Now you're ready to do this without me.</p> <p>Keep your eyes on the star.★ Answer as fast as you can without making mistakes.</p> <p>If you make a mistake, just keep going!</p> <p>Remember, put your finger back on Home Base after you answer.</p>	E reads screen; then touches and holds button to continue.
<b>Test items</b>	20 items (arrows)	

### **C.2.3 NIH Toolbox List Sorting Working Memory Test**

This task assesses working memory and requires the participant to recall and sequence different visually and orally presented stimuli. Pictures of different foods and animals are displayed with both an accompanying audio recording and written text that name the item. The participant is asked to say the items back to the examiner in size order from smallest to largest.

#### **Equipment and materials needed:**

- iPad
- Bluetooth wireless keyboard
- NIH Toolbox List Sorting Working Memory Examiner Answer Sheet

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

#### **Setting up Bluetooth Wireless Keyboard:**

- Go to the Settings app of the iPad and make sure Bluetooth is turned on.
- Make sure the keyboard is in discovery mode by pressing the round button at the top right end of the keyboard and the small green light to the left of the button begins flashing.
- Select the Keyboard when it appears on the My Devices list on the iPad.
- When a pop up window appears on the iPad screen, follow the instructions and enter the required code on the keyboard.

The usual keyboard on the iPad will not work when the external keyboard is working. To turn off the external keyboard, press the round button at the top right end of the keyboard, move at least 15 meters from the iPad with the keyboard, or touch the “information” button on the iPad and touch “forget this device.”

#### **Using the Keyboard**

Once the participant answers (gives the list of objects), the examiner types **1** if the response (list) is correct or **0** if the response (list) is incorrect.

For the practice items, after choosing **1** or **0**, the examiner presses the spacebar to move on to the next item (list of objects). There is feedback presented by the prerecorded voice and repeated trials for errors.

For the test items, after the examiner chooses **1** or **0**, the question: **Are you ready?** appears on the screen. The examiner presses the spacebar to move on to the next item (list of objects) after the participant answers the question affirmatively. The examiner can change an entered response (1 or 0) prior to pressing the spacebar. Once the spacebar is pressed, the examiner can not go back to the previous item.

Ctrl + Shift on the Keyboard is equivalent to the gesture used to STOP an administration on the iPad. Like the iPad, when Ctrl + Shift is entered on the keyboard, a login screen will pop up and ask for the password of the user who started the assessment. As described earlier, three options will appear: resume, skip, and stop.

#### **There are two different conditions: 1-List and 2-List.**

In the **1-List condition**, participants are required to order a series of objects (either food or animals) in size order from smallest to largest. The test begins with a two object item. The

participant must succeed at one of the first two object items to continue. (See the discontinue rules below).

In the 2-List condition, participants are presented *both* food and animals and are first asked to say the food objects in size order, and then the animal objects in size order.

In each condition, participants ages 7-85 have two practice items; both items are presented in a “flashing” mode.

Because the participant answers orally, this measure cannot be self-administered. An examiner must record on a wireless keyboard whether each response is correct; specifically, after the participant answers (gives the list of objects), the examiner types **1** if the response (list) is correct or **0** if the response (list) is incorrect.

For the practice items, after choosing **1** or **0**, the examiner presses the **spacebar** to move on to the next item (list of objects). There is feedback presented by a prerecorded voice and there are repeated trials for errors.

For the test items, after the examiner chooses **1** or **0**, the question: **Are you ready?** appears on the screen. Once confirming that the participant is ready and attending, the examiner presses the **spacebar** to move on to the next item (list of objects).

For the examiner, there is a code at the bottom right side of the iPad screen to indicate which item is being administered. The examiner should use this code to look up the correct response on the NIH Toolbox List Sorting Working Memory Examiner Answer Sheet, and then score the item using the keyboard (**1** or **0** and pressing the spacebar).

### **Introduction:**

For an item to be marked correct, the participant must name all the stimuli in the correct order without any intrusions. A participant may change his/her response. It is also acceptable for a participant to give a synonym for either a food item or an animal. For example, in English, responses such as these should be marked as correct: puppy for dog, bunny for rabbit, and lamb for sheep.

### Several discontinue rules are embedded in the software:

- If a participant does not complete a practice item correctly, the test itself is not administered.
- If a participant has incorrect responses on both parts of a test item, the test condition being administered (1-List or 2-List) is discontinued.
- If the participant has a score of 1 point as the sum of the two sets of 2-stimulus items (*pig-mouse* and *bird-cow*; *banana-watermelon* and *apple-blueberry*) and a score of 0 points on the set of 3-stimulus items (*pumpkin-strawberry-banana* and *dog-horse-rabbit*) in the 1-list condition, the test is discontinued and the 2-list condition is *not* administered.
- If the participant has a score of 0 points as the sum of the two sets of 2-stimulus items (*pig-mouse* and *bird-cow*; *banana-watermelon* and *apple-blueberry*), the test is discontinued and the 2-list condition is *not* administered.

 Throughout the test, the examiner may need to remind the participant: **It is important to pay attention to the size of the objects on the screen** (not what they may have experienced) **when putting things in size order from smallest to biggest.**

If necessary, examiners can provide short breaks between items. It is also acceptable during the 2-List condition to remind participants of the rules (e.g., tell me the foods first, then the animals).

### **C.2.3.1 NIH Toolbox List Sorting Working Memory Test Instructions Ages 3-6**

Before beginning the test, the wireless keyboard should be paired by Bluetooth with the iPad, if this has not already been done. While administering this measure, the examiner needs to be able to view the iPad and have the keyboard and Examiner Answer Sheet easily accessible for scoring child responses.

The task is introduced with the Title Screen: *NIH Toolbox LS 3-6*. To check the Bluetooth connection, the examiner is asked at the bottom of the page to: Press Spacebar to Continue. Touching the spacebar begins the test. If the spacebar does not work, try repairing the keyboard or changing the batteries in the keyboard.

For this age group, each practice item has multiple questions. Letters designate the question (e.g., A, B). Children have two opportunities to answer each question correctly. If the child does not answer correctly after two opportunities, the test is discontinued.

#### **1-List Condition**

Read the screen: **Now, we're going to look at things that are different sizes. Some of the things are small and some things are big (use hand gestures). Your job is to tell me what is smallest and what is biggest. Let's start by looking at some pictures of animals together. Press Spacebar to continue.**

#### **1-List Practice Item 1:**

An audio recording with an accompanying animation says: **This is a DOG** (examiner points to dog on screen) **and this is a HORSE** (examiner points to horse).

**Question A:** The audio recording continues: **Which animal is the smaller animal?** If child does not respond, after 10 seconds, the audio recording says again with animation: **Which is smaller, the DOG or the HORSE?**

Correct Response: If child says DOG, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say DOG, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. See, the DOG is smaller than the HORSE** (point out relative sizes using gestures). **Now, say the smaller animal.** If child says DOG, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know smaller animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question B:** The item plays again and the audio recording says: **Now, say the bigger animal.**

Correct Response: If child says HORSE, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say HORSE, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. The HORSE is bigger than the DOG** (point out relative sizes). **Now, say the bigger animal.** If child says HORSE, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically goes to next question.

If child does not know bigger animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**1-List Practice Item 2:**

Read the screen: **Now, we are going to do some more.** Press spacebar to continue.

An audio recording with an accompanying animation says: **This is a RABBIT** (point to RABBIT); **this is a SHEEP** (point); **and this is an ELEPHANT** (point).

**Question A:** The audio recording continues: **Say the smallest animal.**

Correct Response: If child says RABBIT, examiner presses 1 and then the spacebar.

The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say RABBIT, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again.**

**The RABBIT is smaller than the SHEEP** (point), **and the RABBIT is smaller than the ELEPHANT** (point). **The RABBIT is the smallest animal.** **Now you say the smallest animal.** If child says RABBIT, examiner presses 1 and then the spacebar.

The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know smallest animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question B:** The item plays again and the audio recording continues: **Now say the NEXT biggest animal.**

Correct Response: If child says SHEEP, examiner presses 1 and then the spacebar.

The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say SHEEP, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again.**

**The SHEEP is bigger than the RABBIT** (point) **and the SHEEP is smaller than the ELEPHANT** (point). **We know that the RABBIT is the smallest animal; say the next biggest animal.** If child says SHEEP, examiner presses 1 and then the spacebar. The audio recording says: Good job. The iPad automatically moves to the next question.

If child does not know next biggest animal after two trials, press 0 and then press spacebar. Test will be discontinued.

**Question C:** The item plays again and the audio recording continues: **Now say the biggest animal.**

Correct Response: If child says ELEPHANT, examiner presses 1 and then the spacebar.

The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say ELEPHANT, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again.**

**See, the ELEPHANT is bigger than the RABBIT** (point), **and the ELEPHANT is bigger than the SHEEP** (point). **We know that the RABBIT is the smallest animal, and the SHEEP is the next biggest animal; say the biggest animal.** If

child says ELEPHANT, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

If child does not know biggest animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

#### 1-List Practice Item 3:

Read the screen: **Now we are going to do some more. This time, you're only going to see one picture at a time. You have to remember what you see and tell me the smaller and then the bigger animal. Let's start by looking together. Press Spacebar to continue.**

**Question A:** The item plays. When the screen is blank, the audio recording says: **Now, say the smaller animal.**

Correct Response: If child says DOG, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say DOG, examiner presses 0 and then the spacebar. The item plays again, and when the screen goes blank, the audio recording says: **Let's try that again. The DOG is smaller than the HORSE. Now, say the smaller animal.** If child says DOG, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

If child does not know smaller animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question B:** The item plays again. When the screen is blank, the audio recording says: **Now, say the bigger animal.**

Correct Response: If child says HORSE, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say HORSE, examiner presses 0 and then the spacebar. The item plays again. When the screen goes blank, the audio recording says: **Let's try that again. The DOG is smaller than the HORSE. Now, say the bigger animal.** If child says HORSE, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

If child does not know bigger animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

#### 1-List Practice Item 4:

Read the screen: **Now we are going to do some more. Are you ready? Press Spacebar to continue.**

An audio recording with an accompanying animation says: **This is a RABBIT (point to RABBIT); this is a SHEEP (point); and this is an ELEPHANT (point).**

**Question A:** When the screen is blank, the audio recording says: **Say the smallest animal.**

Correct Response: If child says RABBIT, examiner presses 1 and then the spacebar.

The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say RABBIT, examiner presses 0 and then the spacebar. The item plays again. When the screen goes blank, the audio recording says: **Let's try that again. The RABBIT is smaller than the SHEEP** (point), **and the RABBIT is smaller than the ELEPHANT** (point). **The RABBIT is the smallest animal. Now you say the smallest animal**. If child says RABBIT, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

If child does not know smallest animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question B:** The item plays again. When screen goes blank, the audio recording says: **Now say the next biggest animal**.

Correct Response: If child says SHEEP, examiner presses 1 and then the spacebar.

The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say SHEEP, examiner presses 0 and then the spacebar. The item plays again. When the screen goes blank, the audio recording says: **Let's try that again. The SHEEP is bigger than the RABBIT** (point) **and the SHEEP is smaller than the ELEPHANT** (point). **We know that the RABBIT is the smallest animal; say the next biggest animal**. If child says SHEEP, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

If child does not know next biggest animal after two trials, press 0 and then press spacebar. Test will be discontinued.

**Question C:** The item plays again. When the screen goes blank, the audio recording says: **Now, say the biggest animal**.

Correct Response: If child says ELEPHANT, examiner presses 1 and then the spacebar.

The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say ELEPHANT, examiner presses 0 and then the spacebar. The item plays again. When the screen goes blank, the audio recording says: **Let's try that again. The ELEPHANT is bigger than the RABBIT** (point), **and the ELEPHANT is bigger than the SHEEP** (point). **We know that the RABBIT is the smallest animal, and the SHEEP is the next biggest animal; say the biggest animal**. If child says ELEPHANT, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

If child does not know biggest animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

The 1-List practice items are summarized below:

<b>P1 Presentation: Horse Dog (on screen)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q-A1	Smaller?	If Dog, press 1; If Horse, press 0	If 1, goes to Q-B1; If 0, goes to Q-A2
Q-A2	Smaller?	If Dog, press 1; If Horse, press 0	If 1, goes to Q-B1; If 0, test discontinued
Q-B1	Bigger?	If Horse, press 1; If Dog, press 0	If 1, goes to P2; If 0, goes to Q-B2
Q-B2	Bigger?	If Horse, press 1; If Dog, press 0	If 1, goes to P2; If 0, test discontinued
<b>P2 Presentation: Elephant Rabbit Sheep (on screen)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q-A1	Smallest?	If Rabbit, press 1; If Elephant or Sheep, press 0	If 1, goes to Q-B1; If 0, goes to Q-A2
Q-A2	Smallest?	If Rabbit, press 1; If Elephant or Sheep, press 0	If 1, goes to Q-B1; If 0, test discontinued
Q-B1	Next Biggest?	If Sheep, press 1; If Rabbit or Elephant, press 0	If 1, goes to Q-C1; If 0, goes to Q-B2
Q-B2	Next Biggest?	If Sheep, press 1; If Rabbit or Elephant, press 0	If 1, goes to Q-C1; If 0, test discontinued
Q-C1	Biggest?	If Elephant, press 1; If Rabbit or Sheep, press 0	If 1, goes to P3; If 0, goes to Q-C2
Q-C2	Biggest?	If Elephant, press 1; If Rabbit or Sheep, press 0	If 1, goes to P3; If 0, test discontinued
<b>P3 Presentation: Dog Horse (flashing)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q-A1	Smaller?	If Dog, press 1; If Horse, press 0	If 1, goes to Q-B1; If 0, goes to Q-A2
Q-A2	Smaller?	If Dog, press 1; If Horse, press 0	If 1, goes to Q-B1; If 0, test discontinued
Q-B1	Bigger?	If Horse, press 1; If Dog, press 0	If 1, goes to P4; If 0, goes to Q-B2
Q-B2	Bigger?	If Horse, press 1; If Dog, press 0	If 1, goes to P4; If 0, test discontinued
<b>P4 Presentation: Elephant Rabbit Sheep (flashing)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q-A1	Smallest?	If Rabbit, press 1; If Elephant or Sheep, press 0	If 1, goes to Q-B1; If 0, goes to Q-A2
Q-A2	Smallest?	If Rabbit, press 1; If Elephant or Sheep, press 0	If 1, goes to Q-B1; If 0, test discontinued
Q-B1	Next Biggest?	If Sheep, press 1; If Rabbit or Elephant, press 0	If 1, goes to Q-C1; If 0, goes to Q-B2
Q-B2	Next Biggest?	If Sheep, press 1; If Rabbit or Elephant, press 0	If 1, goes to Q-C1; If 0, test discontinued
Q-C1	Biggest?	If Elephant, press 1; If Rabbit or Sheep, press 0	If 1, goes to 1-list test items; If 0, goes to Q-C2
Q-C2	Biggest?	If Elephant, press 1; If Rabbit or Sheep, press 0	If 1, goes to 1-list test items; If 0, test discontinued

## **1-List Test Items:**

Read the screen: **Let's look at some more pictures. Remember, after you see the pictures you will see a blank screen. Once you see this blank screen, I want you to tell me what you just saw in size order from smallest to biggest. It is important to pay attention to the size of the object on the screen when putting things in size order from smallest to biggest. Are you ready?**

Press the **spacebar** to continue and the presentation of the 1-List test items will begin.

After the examiner chooses **1** or **0**, the question-- **Are you ready?** -- appears on the screen. Once confirming that the child is ready and attending, the examiner presses the **spacebar** to move on to the next item (list of objects).

**Note:** For the examiner, there is a code at the bottom right side of the iPad screen to indicate which item is being administered. The examiner should use this code to look up the correct response on the Examiner Answer Sheet, and then score the item using the keyboard (1 or 0).

## **2-List Condition**

**REVIEW:** The 2-List practice items have the same format. First, the examiner asks for the food from smallest to largest and then for the animals from smallest to largest. If the answer is correct, the examiner moves on to the next question. If the child answers incorrectly, there is another opportunity to answer correctly. The practice items are detailed below.

Read the screen: **We're going to look at more pictures. This time, you will see both food and animals in a set of pictures. I'd like you to tell me the food first, and then the animals, in size order from smallest to biggest. It is important to pay attention to the size of the object on the screen when putting things in size order from smallest to biggest. Let's start by looking at some more pictures together.** Press **Spacebar** to continue.

### **2-List Practice Item 1:**

An audio recording with an accompanying animation says: **This is a BEAR and this is a BANANA.**

**Question A:** The audio recording continues: **Which one is a food.**

Correct Response: If child says BANANA, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say BANANA, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. The BEAR is an animal; the BANANA is a food. Now you say the food.** If child answers BANANA, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know food after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question B:** The item plays again and the audio recording continues: **Now, say the animal.**

Correct Response: If child says BEAR, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say BEAR, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again**. **The BANANA is a food; the BEAR is an animal. Say the animal**. If child answers BEAR, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

If child does not know animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

#### 2-List Practice Item 2:

An audio recording with an accompanying animation says: **This is a PINEAPPLE** (point); **this is a FROG** (point); **and this is a TIGER** (point).

**Question A:** The audio recording continues: **Now, say the food**.

Correct Response: If child says PINEAPPLE, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say PINEAPPLE, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again**. **The FROG and TIGER are animals and the PINEAPPLE is a food** (point). **Now, say the food**. If child says PINEAPPLE, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

If child does not know the food after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question B:** The item plays again and the audio recording continues: **Say the smaller animal**.

Correct Response: If child says FROG, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say FROG, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again**. **The FROG and TIGER are animals, and the FROG is smaller than the TIGER** (point). **The FROG is the smaller animal. Now, say the smaller animal**. If child says FROG, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question

If child does not know smaller animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question C:** The item plays again and the audio recording continues: **Say the bigger animal**.

Correct Response: If child says TIGER, examiner presses 1 and then the spacebar. The audio recording says: **Good job**. The iPad automatically moves to the next question.

Incorrect Response: If child does not say TIGER, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again**.

**The FROG and TIGER are animals, and the TIGER is bigger than the FROG** (point). **The FROG is the smaller animal, and the TIGER is the bigger animal.** **Now you say the bigger animal.** If child says TIGER, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know bigger animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

#### 2-List Practice Item 3:

Read the screen: **Now we are going to do some more. This time, we're only going to see one picture at a time. You are going to have to remember what you saw AND tell me the food first, then the animal. Let's start by looking together. Press spacebar to continue.**

**Question A:** The item plays. When screen goes blank, the audio recording says: **Say the food.**

Correct Response: If child says BANANA, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say BANANA, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. You saw a BANANA and a BEAR; the BANANA is a food and the BEAR is an animal. Now, you say the food.** If child says BANANA, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know food after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question B:** The item plays again. When screen goes blank, the audio recording continues: **Now, say the animal.**

Correct Response: If child says BEAR, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say BEAR, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. The BANANA is a food; the BEAR is an animal. Now, you say the animal.** If child answers BEAR, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question C:** After the child *correctly* identifies the food and the animal separately, the item plays once again. When the screen goes blank, the audio recording says: **Now, say the food, then the animal.**

Correct Response: If child says BANANA, BEAR, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child says BEAR, BANANA or some other incorrect pair of words, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. The BEAR is an animal; the BANANA is a food. Now, say the food, then the animal.** If child says BANANA, BEAR, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know the food, then the animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

## 2-List Practice Item 4:

Read the screen: **Now we are going to do some more. Are you ready? Press spacebar to continue.**

**Question A:** The item plays. When screen goes blank, the audio recording says: **Say the food.**

Correct Response: If child says PINEAPPLE, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say PINEAPPLE, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. You saw a PINEAPPLE, a FROG and a TIGER. The FROG and TIGER are animals and the PINEAPPLE is a food. Now, say the food.** If child says PINEAPPLE, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know the food after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question B:** The item plays again. When screen goes blank, the audio recording continues: **Say the smaller animal.**

Correct Response: If child says FROG, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say FROG, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. The FROG and TIGER are animals and the FROG is smaller than the TIGER. The FROG is the smaller animal. Now, you say the smaller animal.** If child says FROG, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know the smaller animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question C:** The item plays again. When screen goes blank, the audio recording continues: **Now, say the bigger animal.**

Correct Response: If child says TIGER, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child does not say TIGER, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. You saw a PINEAPPLE, a FROG and a TIGER; the FROG and TIGER are**

**animals and the TIGER is bigger than the FROG. The TIGER is the bigger animal. Now, you say the bigger animal.** If child says TIGER, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know the bigger animal after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**Question D:** After the child *correctly* identifies the food and the animal separately, the item plays once again. When the screen goes blank, the audio recording says: **Now, say the food first and then the animals in size order.**

Correct Response: If child says PINEAPPLE, FROG, TIGER, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

Incorrect Response: If child gives the wrong order, examiner presses 0 and then the spacebar. The item plays again and the audio recording says: **Let's try that again. You saw a PINEAPPLE, a FROG and a TIGER; the FROG and TIGER are animals and the TIGER is bigger than the FROG. Now, say the food in size order starting with the smallest food, and then the animals in size order, from smallest to biggest.** If child says PINEAPPLE, FROG, TIGER, examiner presses 1 and then the spacebar. The audio recording says: **Good job.** The iPad automatically moves to the next question.

If child does not know the food first, then the animals in size order after two trials, examiner presses 0 and then the spacebar. Test will be discontinued.

**The 2-List practice items are summarized below:**

<b>P1 Presentation: Bear Banana (on screen)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q-A1	Food?	If Banana, press 1; If Bear, press 0	If 1, goes to Q-B1; If 0, goes to Q-A2
Q-A2	Food?	If Banana, press 1; If Bear, press 0	If 1, goes to Q-B1; If 0, test discontinued
Q-B1	Animal?	If Bear, press 1; If Banana, press 0	If 1, goes to P2; If 0, goes to Q-B2
Q-B2	Animal?	If Bear, press 1; If Banana, press 0	If 1, goes to P2; If 0, test discontinued

<b>P2 Presentation: Frog Pineapple Tiger (on screen)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q-A1	Food?	If Pineapple, press 1; If Frog or Tiger, press 0	If 1, goes to Q-B1; If 0, goes to Q-A2
Q-A2	Food?	If Pineapple, press 1; If Frog or Tiger, press 0	If 1, goes to Q-B1; If 0, test discontinued
Q-B1	Smaller animal?	If Frog, press 1; If Pineapple or Tiger, press 0	If 1, goes to Q-C1; If 0, goes to Q-B2
Q-B2	Smaller animal?	If Frog, press 1; If Pineapple or Tiger, press 0	If 1, goes to Q-C1; If 0, test discontinued
Q-C1	Bigger animal?	If Tiger, press 1; If Frog or Pineapple, press 0	If 1, goes to P3; If 0, goes to Q-C2

Q-C2	Bigger animal?	If Tiger, press 1; If Frog or Pineapple, press 0	If 1, goes to P3; If 0, test discontinued
<b>P3</b>	<b>Presentation: Bear Banana (flashing)</b>		
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q-A1	Food?	If Banana, press 1; If Bear, press 0	If 1, goes to Q-B1; If 0, goes to Q-A2
Q-A2	Food?	If Banana, press 1; If Bear, press 0	If 1, goes to Q-B1; If 0, test discontinued
Q-B1	Animal?	If Bear, press 1; If Banana, press 0	If 1, goes to P2; If 0, goes to Q-B2
Q-B2	Animal?	If Bear, press 1; If Banana, press 0	If 1, goes to P2; If 0, test discontinued
<b>P4</b>	<b>Presentation: Frog Pineapple Tiger (flashing)</b>		
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q-A1	Food?	If Pineapple, press 1; If Frog or Tiger, press 0	If 1, goes to Q-B1; If 0, goes to Q-A2
Q-A2	Food?	If Pineapple, press 1; If Frog or Tiger, press 0	If 1, goes to Q-B1; If 0, test discontinued
Q-B1	Smaller animal?	If Frog, press 1; If Pineapple or Tiger, press 0	If 1, goes to Q-C1; If 0, goes to Q-B2
Q-B2	Smaller animal?	If Frog, press 1; If Pineapple or Tiger, press 0	If 1, goes to Q-C1; If 0, test discontinued
Q-C1	Bigger animal?	If Tiger, press 1; If Frog or Pineapple, press 0	If 1, goes to P3; If 0, goes to Q-C2
Q-C2	Bigger animal?	If Tiger, press 1; If Frog or Pineapple, press 0	If 1, goes to P3; If 0, test discontinued
Q-D1	Food, then animals in size order	If correct order, press 1; If incorrect order, press 0	If 1, goes to 2-list test items; If 0, goes to Q-D2
Q-D2	Food, then animals in size order	If correct order, press 1; If incorrect order, press 0	If 1, goes to 2-list test items; If 0, test discontinued

## 2-List Test Items

Read the screen: **Let's look at some more pictures. Remember, after you see the pictures, you will see a blank screen. Once you see this blank screen, tell me the foods first in size order from smallest to biggest, then the animals, in size order from smallest to biggest. Are you ready?**

Press the **spacebar** to continue and the presentation of the 2-List test items will begin.

As before, after the examiner chooses **1** or **0**, the question-- **Are you ready?** -- appears on the screen. Once confirming that the child is ready and attending, the examiner presses the **spacebar** to move on to the next item (list of objects).

 There is a code at the bottom right side of the iPad screen to indicate which item is being administered. The examiner should use this code to look up the correct response on the NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet, and then score the item using the keyboard (1 or 0).

### C.2.3.2 NIH Toolbox List Sorting Working Memory Test Instructions Age 7+

Before beginning the test, the wireless keyboard should be paired by Bluetooth with the iPad, if this has not already been done. While administering this measure, the examiner needs to be able to view the iPad and have the keyboard and the NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet easily accessible for scoring participant responses.

The task is introduced with the Title Screen: *NIH Toolbox LS 7+*. To check the Bluetooth connection, the examiner is asked at the bottom of the page to: **Press Spacebar to Continue**. Touching the **spacebar** begins the test. If the spacebar does not work, try repairing the keyboard or changing the batteries in the keyboard.

**REVIEW:** All the 1-List practice items have the same format. First, the examiner asks for the names of the pictures in size order from smallest to largest. If the participant answers incorrectly, there are two more opportunities to get a correct answer. The first comes after a verbal explanation and a repeat of the question; the second comes after replaying the item on the screen, followed by a verbal explanation and then repeating the question. If, after three opportunities, the participant continues to answer incorrectly, the test will be discontinued and no more items will be presented. Both practice items are detailed below.

#### 1-List Condition

Read the screen: **You are going to see some pictures one at a time on the screen. After each set of pictures, you will see a blank screen. When you see the blank screen, I want you to tell me the names of the pictures in size order from smallest to biggest. For example, if I show you a motorcycle, a bus, and a car, you would say: motorcycle, car, bus.**

**From now on, you will hear most of the instructions from the iPad. Do you have any questions?**

**Let's practice. Press Spacebar to continue.**

1-List Practice Item 1:

*Trial 1:* After the pictures are presented and the screen is blank, an audio recording says: **Now say the animals in size order.**

Correct Response: If participant says DOG, HORSE, press 1 and then press spacebar.

An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and 1-List Practice Item 2 will be presented.

Incorrect Response: If participant does not say DOG, HORSE, press 0 and then press spacebar. An audio recording says: **Let's try that again.**

*Trial 2 (if Trial 1 was incorrect):* An audio recording continues: **You saw a DOG and a HORSE; the DOG is smaller than the HORSE. Now say the animals in size order.**

Correct Response: If participant says DOG, HORSE, press 1 and then press spacebar.

An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and 1-List Practice Item 2 will be presented.

Incorrect Response: If participant does not say DOG, HORSE, press 0 and then press spacebar. An audio recording says: **Let's try that one more time.**

*Trial 3 (if Trial 2 was incorrect):* After the pictures are presented one more time and the screen is blank, an audio recording says: **You saw a DOG and a HORSE; the DOG is smaller than the HORSE. Now say the smaller animal and then the bigger animal.**

Correct Response: If participant says DOG, HORSE, press 1 and then press spacebar.

An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and 1-List Practice Item 2 will be presented.

If participant answers the question *incorrectly* after 3 trials, press 0 and then press spacebar. **Test will be discontinued.**

1-List Practice Item 2:

*Trial 1:* After the pictures are presented and the screen is blank, an audio recording says: **Now say the animals in size order, starting with the smallest animal.**

Correct Response: If participant says RABBIT, SHEEP, ELEPHANT, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and the 1-List introduction screen will be presented.

Incorrect Response: If participant does not say RABBIT, SHEEP, ELEPHANT, press 0 and then press **spacebar**. An audio recording says: **Let's try that again.**

*Trial 2 (if Trial 1 was incorrect):* An audio recording continues: **You saw a RABBIT, SHEEP and ELEPHANT; the RABBIT is smaller than the SHEEP and the SHEEP is smaller than the ELEPHANT. The RABBIT is the smallest animal, the SHEEP is the next biggest animal, and the ELEPHANT is the biggest animal. Now, say the animals in size order, starting with the smallest animal.**

Correct Response: If participant says RABBIT, SHEEP, ELEPHANT, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and the 1-List introduction screen will be presented.

Incorrect Response: If participant does not say RABBIT, SHEEP, ELEPHANT, press 0 and then press **spacebar**. An audio recording says: **Let's try that once more.**

*Trial 3 (if Trial 2 was incorrect):* After the pictures are presented again and the screen is blank, an audio recording says: **You saw a RABBIT, SHEEP and ELEPHANT; the RABBIT is smaller than the SHEEP and the SHEEP is smaller than the ELEPHANT. The RABBIT is the smallest animal, the SHEEP is the next biggest animal, and the ELEPHANT is the biggest animal. Now, say the animals in size order, starting with the smallest animal.**

Correct Response: If participant says RABBIT, SHEEP, ELEPHANT, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and presentation of the 1-List introduction screen will be presented.

If participant answers the question *incorrectly*, press 0 and then press spacebar. **Test will be discontinued.**

The 1-list practice items are summarized in the table below:

<b>P1 Presentation: Horse Dog (Flashing)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q1	Smaller first, then Bigger	If Dog Horse, press 1; If Horse Dog, press 0	If 1, goes to P2; If 0, goes to Q2
Q2	Smaller first, then Bigger	If Dog Horse, press 1; If Horse Dog, press 0	If 1, goes to P2; If 0, goes to Q3
Q3	Smaller first, then Bigger	If Dog Horse, press 1; If Horse Dog, press 0	If 1, goes to P2; If 0, test discontinued

<b>P2 Presentation: Elephant Rabbit Sheep (flashing)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q1	Animals in size order, starting with the smallest	If Rabbit, Sheep, Elephant, press 1; If any other order, press 0	If 1, goes to 1-list test items; If 0, goes to Q2
Q2	Animals in size order, starting with the smallest	If Rabbit, Sheep, Elephant, press 1; If any other order, press 0	If 1, goes to 1-list test items; If 0, goes to Q3
Q3	Animals in size order, starting with the smallest	If Rabbit, Sheep, Elephant, press 1; If any other order, press 0	If 1, goes to 1-list test items; If 0, test discontinued

#### 1-List Test Items:

Say: **Let's look at some more pictures. Remember, after you see the pictures you will see a blank screen. Once you see this blank screen, I want you to tell me what you just saw in size order from smallest to biggest. It is important to pay attention to the size of the object on the screen when putting things in size order from smallest to biggest. Are you ready?**

Press the **spacebar** to continue and the presentation of the 1-List test items will begin.

As noted earlier, after the examiner chooses **1** or **0**, the question: **Are you ready?** appears on the screen. Once confirming that the participant is ready and attending, the examiner presses the **spacebar** to move on to the next item (list of objects).

For the examiner, there is a code at the bottom right side of the iPad screen to indicate which item is being administered. The examiner should use this code to look up the correct response on the *NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet*, and then score the item using the keyboard (1 or 0).

## 2-List Condition

**REVIEW:** The 2-List practice items have the same format. First, the examiner asks for the food from smallest to largest and then for the animals from smallest to largest. If the answer is correct, the examiner moves on to the next question. If the participant answers incorrectly, there are two more opportunities to get a correct answer. The first opportunity comes after a verbal explanation and a repeat of the question; the second comes after replaying the item on the screen, followed by a verbal explanation and then a repeat of the question. If after a total of three opportunities, the participant continues to answer incorrectly, the test will be discontinued and no more items will be presented. The practice items are detailed below.

Say: **We're going to look at more pictures. This time, you will see both food and animals in a set of pictures. I'd like you to tell me the food first, and then the animals, in size order from smallest to biggest. It is important to pay attention to the size of the object on the screen when putting things in size order from smallest to biggest. Let's start by looking at some more pictures together. Press Spacebar to continue.**

After each answer, the examiner should indicate whether it was correct (1) or incorrect (0) on the keyboard. Then the question **Are you ready?** appears on the screen. *When the participant answers affirmatively, the examiner should press the spacebar to continue.*

### 2-List Practice Item 1:

*Trial 1:* After the pictures are presented and the screen is blank, an audio recording says: **Say the food, then the animal.**

Correct Response: If participant says BANANA, BEAR, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and 2-List Practice Item 2 will be presented.

Incorrect Response: If participant does not say BANANA, BEAR, press 0 and then press spacebar. An audio recording says: **Let's try that again.**

*Trial 2 (if Trial 1 was incorrect):* An audio recording continues: **The BEAR is an animal; the BANANA is a food. Now say the food first and then the animal.**

Correct Response: If participant says BANANA, BEAR, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and 2-List Practice Item 2 will be presented.

Incorrect Response: If participant does not say BANANA, BEAR, press 0 and then press spacebar. An audio recording says: **Let's try that once more.**

*Trial 3 (if Trial 2 was incorrect):* After the pictures are presented and the screen is blank, an audio recording says: **The BEAR is an animal; the BANANA is a food. Now say the food first and then the animal.**

Correct Response: If participant says BANANA, BEAR, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and 2-List Practice Item 2 will be presented.

Incorrect Response: If participant answers the question *incorrectly*, press 0 and then press spacebar. Test will be discontinued.

2-List Practice Item 2:

*Trial 1:* After the pictures are presented and the screen is blank, an audio recording says: **Say the food in size order from smallest to biggest and then say the animals in size order from smallest to biggest.**

Correct Response: If participant says PINEAPPLE, FROG, TIGER, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and the 2-list introduction screen will be presented.

Incorrect Response: If participant does not say PINEAPPLE, FROG, TIGER, press 0 and then press spacebar. An audio recording says: **Let's try that again.**

*Trial 2 (if Trial 1 was incorrect):* An audio recording continues: **You saw a frog, a pineapple, and a tiger. The pineapple is a food; the frog is the smallest animal, and the tiger is the biggest animal. Now, say the food in size order starting with the smallest food, and then the animals in size order, from smallest to biggest.**

Correct Response: If participant says PINEAPPLE, FROG, TIGER, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and the 2-list introduction screen will be presented.

Incorrect Response: If participant does not say PINEAPPLE, FROG, TIGER, press 0 and an audio recording says: **Let's try that one more time.**

*Trial 3 (if Trial 2 was incorrect):* After the pictures are presented and the screen is blank, an audio recording says: **You saw a frog, a pineapple, and a tiger. The pineapple is a food; the frog is the smallest animal, and the tiger is the biggest animal. Now, say the food in size order starting with the smallest food, and then the animals in size order, from smallest to biggest.**

Correct Response: If participant says PINEAPPLE, FROG, TIGER, press 1 and then press spacebar. An audio recording says: **That's right.** When it appears on the screen, ask: Are you ready? When the participant answers affirmatively, press the spacebar and presentation of the 2- list introduction screen will be presented.

Incorrect Response: If participant answers the question *incorrectly*, press 0 and then press spacebar. Test will be discontinued.

The 2-list practice items are summarized in the table below:

<b>P1 Presentation: Bear Banana (Flashing)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q1	Food first, then Animal	If Banana Bear, press 1; If Bear Banana, press 0	If 1, goes to P2; If 0, goes to Q2
Q2	Food first, then Animal	If Banana Bear, press 1; If Bear Banana, press 0	If 1, goes to P2; If 0, goes to Q3
Q3	Food first, then Animal	If Banana Bear, press 1; If Bear Banana, press 0	If 1, goes to P2; If 0, test discontinued
<b>P2 Presentation: Frog Pineapple Tiger (flashing)</b>			
	<b>Question</b>	<b>Response</b>	<b>Next step</b>
Q1	Food first, then Animals in size order, starting with the smallest	If Pineapple Frog Tiger, press 1; If any other order, press 0	If 1, goes to 2-list test items; If 0, goes to Q2
Q2	Food first, then Animals in size order, starting with the smallest	If Pineapple Frog Tiger, press 1; If any other order, press 0	If 1, goes to 2-list test items; If 0, goes to Q3
Q3	Food first, then Animals in size order, starting with the smallest	If Pineapple Frog Tiger, press 1; If any other order, press 0	If 1, goes to 2-list test items; If 0, test discontinued

### 2-List Test Items

**Read:** Let's look at some more pictures. Remember, after you see the pictures, you will see a blank screen. Once you see this blank screen, tell me the foods first in size order from smallest to biggest, then the animals, in size order from smallest to biggest. Are you ready? Press the spacebar to continue and the presentation of the 2-List test items will begin.

As before, after the examiner chooses **1** or **0**, the question: **Are you ready?** appears on the screen. Once confirming that the participant is ready and attending, the examiner presses the **spacebar** to move on to the next item (list of objects).

 **NOTE** There is a code at the bottom right side of the iPad screen to indicate which item is being administered. The examiner should use this code to look up the correct response on the NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet, and then score the item using the keyboard (1 or 0).

#### **C.2.4 NIH Toolbox Dimensional Change Card Sort Test (DCCS)**

The NIH Toolbox Dimensional Change Card Sort Test is a measure of cognitive flexibility and attention. Two target pictures are presented that vary along two dimensions (e.g., shape and color). Participants are asked to match a series of bivalent test pictures (e.g., yellow balls and blue trucks) to the target pictures, first according to one dimension (e.g., color) and then, after a number of trials, according to the other dimension (e.g., shape).

The relevant dimension for sorting is indicated by a cue word (e.g., “shape” or “color”) that appears on the screen for all participants and that, for young children ages 3-11, is also spoken by a prerecorded audio file.

##### **Equipment and materials needed:**

- iPad
- Home base

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

Practice items use white and brown colors and a Rabbit and Sailboat as shapes. Test items use blue and yellow colors and a Ball and Truck as shapes.

**All instructions are on the iPad screen:** The examiner reads them to and/or with the participant and points out the relevant aspects of the stimuli on the screen. The next screen appears when either the examiner or participant makes a choice.

There are two versions of this measure for ages 3-7. The first is the standard NIH Toolbox DCCS test for ages 3-7. The second is an experimental version (with “developmental extension,” or DEXT) that was designed to extend the range of assessment downward, for those participants who have difficulty understanding the standard task. Both versions yield a score for the standard measure, and the DEXT version provides simple raw scores and percentages for the experimental items.

##### **Standard administration:**

###### Practice items

Participants of all ages are given four practice trials with each dimension – color and shape. If the participant responds incorrectly, an audio recording prompts him/her to choose the correct image. Similarly, a separate audio file plays each time the participant gets a practice item correct.

###### Rules:

- Participants must get at least three out of four practice trials correct to advance to the practice trials for the next dimension and then to the test trials.
- If a participant of any age gets fewer than three out of four practice trials correct, he/she will complete up to two more sets of four practice trials, with the same cutoff to advance to the test trials.
- If a participant of any age does not meet the cutoff, the task will automatically discontinue.

If the participant does not respond after five seconds, the examiner should prompt him/her, saying: Choose one of the pictures.

### Test Trials

The examiner should not prompt the participant to respond during the test trials. If the participant does not respond after ten seconds, the program will automatically advance to the next test trial.

#### Ages 3-7

During the test trials, participants 3-7 years of age first complete a set of five trials to sort according to color. If these young participants succeed in four of the five test trials, the program advances to a set of five trials to sort according to shape.

If the young participants do not get four out of five test trials correct on either color or shape, the test ends.

If participants ages 3-7 meet the criterion on the second set of test trials (i.e., post-switch), they will complete the mixed block, consisting of 30 shape/color trials.

Because the mixed trials are scored for reaction time, these young participants need to be trained in the use of Home Base, where the participant places his/her index finger between trials. Training for Home Base precedes the introduction of the mixed trials for 3-7-year-olds.

#### Age 8+

Participants age 8+ receive training for Home Base before learning about the test. The test trials for participants 8+ years of age consist of a mixed block of 30 shape/color items.

#### **Developmental Extension (DEXT ages 3-7)**

In this version, participants are given five practice trials on each dimension – color and shape. If the participant responds incorrectly, an audio recording provides feedback and highlights the correct image. Similarly, a separate audio file plays each time the participant gets a practice item correct.

Participants must succeed in 4 out of 5 practice trials in this version to move on.

If they do succeed, the test administration continues in the same manner as the standard administration described above.

If they do not succeed on the practice trials of one dimension, they are directed to the developmental extension of this measure. In addition, participants will be directed to the developmental extension if they do not achieve 4 out of 5 correct on either the 5 color trials (“pre-switch”) or the 5 shape trials (“post-switch”). The logic underlying this developmental extension is detailed in the test instructions (DCCS 3-7 DEXT).

#### **Age-specific test instructions:**

[NIH Toolbox Dimensional Change Card Sort Test Ages 3-7](#)

[NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 with Developmental Extension \(DEXT\)](#)

[NIH Toolbox Dimensional Change Card Sort Test Ages 8-11](#)

[NIH Toolbox Dimensional Change Card Sort Test Ages 12+](#)

### C.2.4.1 NIH Toolbox Dimensional Change Card Sort Test Instructions Ages 3-7

This table outlines the item content read by as well as the actions for the examiner.

iPad screen written content		Examiner (E) Actions
<b>Title Screen</b>	NIH Toolbox DCCS 3-7	E touches and holds button to continue.
<b>Practice Intro</b>	We're going to play a matching game with colors and shapes.	E reads screen, then touches and holds button to continue.
<b>SHAPE Intro</b>	We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E points to BOAT, then demonstrates use of button.
	If it's a RABBIT, choose that picture.	E demonstrates use of button
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Shape Practice set 1</b>	4 items sorted by shape	
<b>More practice, if less than 3 out of 4 correct on set 1</b>	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E reads screen, then chooses BOAT.
	If it's a RABBIT, choose that picture.	E reads screen, then chooses RABBIT.
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Shape Practice set 2</b>	4 items sorted by shape	
<b>More practice, if less than 3 out of 4 correct on set 2</b>	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Shape Practice set 3</b>	4 items sorted by shape	
<b>Test ends, if less than 3 out of 4 correct on set 3</b>		
<b>COLOR intro</b>	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Color Practice set 1</b>	4 items sorted by color	
<b>More practice, if less than 3 out of 4 correct on set 1</b>	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.

iPad screen written content		Examiner (E) Actions
	If it's BROWN, choose that picture.	E chooses BROWN picture.
<b>Transition</b>	Now you try. Keep your eyes on the star in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Color Practice set 2</b>	4 items sorted by color	
<b>More practice, if less than 3 out of 4 correct on set 2</b>	Let's practice some more. In the COLOR game, choose the picture that is the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
<b>Transition</b>	Now you try. Keep your eyes on the star in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Color Practice set 3</b>	4 items sorted by color	
<b>Test ends, if less than 3 out of 4 correct on set 3</b>		
<b>COLOR and SHAPE intro</b>	Now, we're going to play with some different shapes and colors. This time we'll use BALLS and TRUCKS that are YELLOW and BLUE.	E reads screen, then touches and holds button to continue.
<b>Pre-switch intro</b>	Let's start with the COLOR game. Remember the COLOR game? In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's a BLUE one, choose this picture.	E chooses BLUE picture.
	And if it's a YELLOW one, choose that picture.	E chooses YELLOW picture.
<b>Transition</b>	Now you try. Keep your eyes on the star in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Color items</b>	5 items sorted by color (if child does not get 4 of 5 correct, test terminates)	
<b>Test ends, if less than 4 of 5 correct</b>		
<b>Post-switch intro</b>	Now we're going to play the SHAPE game. Remember the SHAPE game? In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a TRUCK, choose this picture.	E chooses TRUCK.
	And if it's a BALL, choose that picture.	E chooses BALL.
<b>Transition</b>	Now you try. Keep your eyes on the star in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Shape items</b>	5 items sorted by shape	
<b>Test ends, if less than 4 of 5 correct</b>		
<b>Home Base before Mixed Items</b>	We can also play both games together. But first we are going to learn about Home Base. This is your Home Base. Put your finger on the Home Base and wait for the next picture.	E reads screen and points to the home base; then touches and holds button to continue.

iPad screen written content		Examiner (E) Actions
	In this new game put your finger back on Home Base after each answer.	
<b>Transition to Mixed Trials</b>	Now we are ready to play both games together. Remember, when you hear the word SHAPE, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a TRUCK, choose this picture.	E chooses TRUCK.
	And if it's a BALL, choose that picture.	E chooses BALL.
	When you hear the word COLOR, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's a BLUE one, choose this picture.	E chooses BLUE picture.
	And if it's a YELLOW one, choose that picture.	E chooses YELLOW picture.
<b>Transition</b>	Now you try. Keep your eyes on the star in the middle of the screen. Remember: Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Test items</b>	30 mixed items	



### C.2.4.2 NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 with Developmental Extension (DEXT)

This table outlines the item content read by and the actions to be performed by the examiner and the child.

iPad screen written content		Examiner (E) & Child (C) Actions
<b>Title Screen</b>	NIH Toolbox DCCS 3-7 (DEXT)	E touches and holds button to continue.
<b>Practice Intro</b>	We're going to play a matching game with colors and shapes.	E reads screen, then touches and holds button to continue.
<b>SHAPE Intro</b>	We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E points to BOAT, then demonstrates use of button.
	If it's a RABBIT, choose that picture.	E demonstrates use of button.
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Shape Practice</b>	5 items sorted by shape	
<b>If less than 4 out of 5 correct</b>	Moves to developmental extension (DEXT Phase 1)	
<b>COLOR intro</b>	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Color Practice</b>	5 items sorted by color	
<b>If less than 4 out of 5 correct</b>	Moves to developmental extension (DEXT Phase 1)	
<b>COLOR and SHAPE intro</b>	Now, we're going to play with some different shapes and colors. This time we'll use BALLS and TRUCKS that are YELLOW and BLUE.	E reads screen, then touches and holds button to continue.
<b>Pre-switch intro</b>	Let's start with the COLOR game. Remember the COLOR game? In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's a BLUE one, choose this picture.	E chooses BLUE picture.
	And if it's a YELLOW one, choose that picture.	E chooses YELLOW picture.
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Color items</b>	5 items sorted by color	
<b>If less than 4 out of 5 correct</b>	Moves to developmental extension (DEXT Phase 2)	

iPad screen written content		Examiner (E) & Child (C) Actions
<b>Post-switch intro</b>	Now we're going to play the SHAPE game. Remember the SHAPE game? In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a TRUCK, choose this picture.	E chooses TRUCK.
	And if it's a BALL, choose that picture.	E chooses BALL.
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen.	E reads screen, then touches and holds button to continue.
<b>Shape items</b>	5 items sorted by shape	
<b>If less than 4 out of 5 correct</b>	Moves to developmental extension (DEXT Phase 3)	
<b>Home Base before Mixed Items</b>	We can also play both games together. But first we are going to learn about Home Base. This is your Home Base. Put your finger on Home Base and wait for the next picture. In this new game, put your finger back on Home Base after each answer.	E reads screen and points to the home base; then touches and holds button to continue.
<b>Transition to Mixed Trials</b>	Now we are ready to play both games together. Remember, when you hear the word SHAPE, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a TRUCK, choose this picture.	E chooses TRUCK.
	And if it's a BALL, choose that picture.	E chooses BALL.
	When you hear the word COLOR, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's a BLUE one, choose this picture.	E chooses BLUE picture.
	And if it's a YELLOW one, choose that picture.	E chooses YELLOW picture.
<b>Transition</b>	Now you try. Keep your eyes on the star ★ in the middle of the screen. Try to answer as fast as you can. Remember: Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Test items</b>	30 mixed items	

DCCS Developmental Extension (DEXT) Phase 1 (Elephant/Fish)		
	iPad screen written content	Examiner (E) & Child (C) Actions
<b>1A: Screen 1 – Instructions</b>	Now we are going to play a different game. Look what I have here! I have a fish! Look at these boxes down here. This box has an elephant in it, and this box has a fish in it. I'm going to put the fish in the fish box because that is where it belongs.	E reads screen and points out the relevant aspects. After 10 seconds, the Touch and Hold Here to Continue button appears. E then touches and holds the button to continue.
<b>1A: Screen 2 – Demonstration</b>	See, here is a fish. It goes in the fish box.	E reads screen and touches the fish box, which makes a clicking sound. The Touch and Hold Here to Continue button appears; then E touches and holds the button to continue.
<b>1A: Screen 3 – Fish Rule check</b>	Now, it's going to be your turn to play the fish game! Can you show me where the fish go in the fish game?	E reads screen. C touches a box.
<b>1: Screens 4a &amp; b – Feedback</b>	4a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
	4b (If incorrect) Uh oh. Remember, in this game, all fish go in the fish box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: <b>Can you show me where the fish go in the fish game?</b> E reads screen and C touches a box, triggering either 4a or 4b.  When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
<b>1A: Screen 5 – Transition</b>	OK, let's play!	E reads screen and then touches and holds button to advance to next screen.
<b>1A: Screen 6 – Rule reminder 1</b>	If it's a fish, then it goes in the fish box. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to advance to next screen.
<b>1A: Screen 7 – Live Trial 1</b>	Here is a fish. Where does it go?	E reads screen. C touches a box.
<b>1A: Screen 8 – Rule reminder 2</b>	Fish go here. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and Holds button to go to next screen.

DCCS Developmental Extension (DEXT) Phase 1 (Elephant/Fish)		
	iPad screen written content	Examiner (E) & Child (C) Actions
<b>1A: Screen 9 – Live Trial 2</b>	Here is a fish. Where does it go?	E reads screen. C touches a box.
<b>1A: Screen 10 – Rule reminder 3</b>	If it's a fish, then it goes in the fish box. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to advance to next screen.
<b>1A: Screen 11 – Live Trial 3</b>	Here is a fish. Where does it go?	E reads screen. C touches a box.
<b>1A: Screen 12 – Rule reminder 4</b>	Fish go here. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to advance to next screen.
<b>1A: Screen 13 – Live Trial 4</b>	Here is a fish. Where does it go?	E reads screen. C touches a box.
<b>1A: Screen 14 – Rule reminder 5</b>	If it's a fish, then it goes in the fish box. (Appears above the fish box.)	E reads screen and points to fish box; then E touches and holds button to advance to next screen.
<b>1A: Screen 15 – Live Trial 5</b>	Here is a fish. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, the test is discontinued. If 4 or more correct, the test continues to Phase 1B.		
<b>1B: Screen 1 – Instructions</b>	Now we're going to play a different game. Look what I have here! I have an elephant! I'm going to put the elephant in the elephant box because that's where it belongs.	E reads screen and points out the relevant aspects. After 8 seconds, the Touch and Hold Here to Continue button appears. Then E touches and holds the button to continue.
<b>1B: Screen 2 – Instructions</b>	Now, it's going to be your turn to put the elephant in the elephant box.	E reads screen; after 2 seconds, Touch and Hold Here to continue button appears. Then E touches and holds the button to continue
	OK, let's play.	E reads screen and then touches and holds button to advance to next screen.
<b>1B: Screen 3 – Rule reminder 1</b>	If it's an elephant, then it goes in the elephant box. (Appears above the elephant box.)	E reads screen and points to elephant box; then E touches and holds button to advance to next screen.
<b>1B: Screen 4 – Live trial 1</b>	Here is an elephant. Where does it go?	E reads screen. C touches a box.
<b>1B: Screen 5 – Rule reminder 2</b>	Elephants go here. (Appears above the elephant box.)	E reads screen, points to elephant box and then E touches and holds button to continue.
<b>1B: Screen 6 – Live trial 2</b>	Here is an elephant. Where does it go?	E reads screen. C touches a box.

DCCS Developmental Extension (DEXT) Phase 1 (Elephant/Fish)		
	iPad screen written content	Examiner (E) & Child (C) Actions
<b>1B: Screen 7 – Rule reminder 3</b>	If it's an elephant, then it goes in the elephant box. (Appears above the elephant box.)	E reads screen and points to elephant box; then E touches and holds button to advance to next screen.
<b>1B: Screen 8 – Live trial 3</b>	Here is an elephant. Where does it go?	E reads screen. C touches a box.
<b>1B: Screen 9 – Rule reminder 4</b>	Elephants go here. (Appears above the elephant box.)	E reads screen and points to elephant box; then E touches and holds button to advance to next screen.
<b>1B: Screen 10 – Live Trial 4</b>	Here is an elephant. Where does it go?	E reads screen. C touches a box.
<b>1B: Screen 11 – Rule reminder 5</b>	If it's an elephant, then it goes in the elephant box. (Appears above the elephant box.)	E reads screen and points to elephant box; then E touches and holds button to advance to next screen.
<b>1B: Screen 12 – Live Trial 5</b>	Here is an elephant. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, the test is discontinued. If 4 or more correct, the test continues to DEXT Phase 2.		

DCCS Developmental Extension (DEXT) Phase 2 (Big Kitty/Little Kitty)		
	iPad screen written content	Examiner (E) & Child (C) Actions
<b>2A: Screen 1 – Instruction</b>	Now, we're going to play a different game. Here I have a little kitty and a big kitty. Look at these boxes down here. This one has a little kitty in it, and this one has a big kitty in it. I'm going to put the little kitties in the little kitty box. And I'm going to put the big kitties in the big kitty box.	E reads screen and points out the relevant aspects. After 10 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to continue.
<b>2A: Screen 2 – Demonstration</b>	Here is a big kitty. It goes in the big kitty box.	E reads screen and touches the big kitty box, which makes a clicking sound. Touch and Hold Here to Continue button appears; then E touches and holds button to continue.
<b>2A: Screen 3 – Demonstration</b>	Here is a little kitty. It goes in the little kitty box.	E reads screen and touches the little kitty box, which makes a clicking sound. Touch and Hold Here to Continue button appears; then E touches and holds button to continue.
<b>2A: Screen 4 – Instruction</b>	Now, it's going to be your turn. Put the little kitties in the little kitty box and the big kitties in the big kitty box.	E reads screen, then touches and holds the button to continue.
<b>2A: Screen 5 – Rule check</b>	Can you show me where the little kitties go?	E reads screen. C touches a box.
<b>2A: Screens 6a &amp; 6b – Feedback</b>	6a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. Then E touches and holds button to continue.
	6b (If incorrect) Uh oh. Remember, in this game, the big kitties go in the big kitty box, and the little kitties go in the little kitty box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: <b>Can you show me where the little kitties go?</b> E reads screen and C touches a box, triggering either 6a or 6b. Touch and Hold Here to Continue button appears again, E touches and holds button to continue.
<b>2A: Screen 7 – Rule check</b>	Can you show me where the big kitties go?	E reads screen. C touches a box.

DCCS Developmental Extension (DEXT) Phase 2 (Big Kitty/Little Kitty)		
	iPad screen written content	Examiner (E) & Child (C) Actions
<b>2A: Screens 8a &amp; 8b – Feedback</b>	8a (If correct) Very good, that's right.  8b (If incorrect) Uh oh. Remember, in this game, the big kitties go in the big kitty box, and the little kitties go in the little kitty box.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to continue to next screen.  Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: <b>Can you show me where the big kitties go?</b> E reads screen and C touches a box, triggering either 8a or 8b.  When Touch and Hold Here to Continue button appears again, E touches and holds button to continue.
<b>2A: Screen 9 – Transition</b>	OK, let's put all the kitties in their boxes.	E reads screen. Touch and Hold Here to Continue button appears, then E touches and holds button to continue.
<b>2A: Screen 10 – Rule reminder 1</b>	If it's a little kitty, then it goes in the little kitty box. If it's a big kitty, then it goes in the big kitty box. (Text appears above relevant boxes.)	E reads screen. After 5, seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to move to next screen.
<b>2A: Screen 11 – Live Trial 1</b>	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
<b>2A: Screen 12 – Rule reminder 2</b>	Little kitties go here. Big kitties go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
<b>2A: Screen 13 – Live Trial 2</b>	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
<b>2A: Screen 14 – Rule reminder 3</b>	If it's a little kitty, then it goes in the little kitty box. If it's a big kitty, then it goes in the big kitty box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to continue.
<b>2A: Screen 15 – Live Trial 3</b>	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
<b>2A: Screen 16 – Rule reminder 4</b>	Little kitties go here. Big kitties go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button

DCCS Developmental Extension (DEXT) Phase 2 (Big Kitty/Little Kitty)		
	iPad screen written content	Examiner (E) & Child (C) Actions
		appears. E touches and holds button to continue.
<b>2A: Screen 17 – Live trial 4</b>	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
<b>2A: Screen 18 – Rule reminder 5</b>	If it's a little kitty, then it goes in the little kitty box. If it's a big kitty, then it goes in the big kitty box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>2A: Screen 19 – Live Trial 5</b>	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, DEXT Phase 2 is discontinued (If DEXT started at Phase 2, Phase 1A items are presented; depending on performance on Phase 1A items, Phase 1B items may be presented as well. Then the test is discontinued). If 4 or more correct, test continues to Phase 2B.		
<b>2B: Screen 1 – Instructions</b>	OK, now let's play a silly game. Let's put all the big kitties in the little kitty box and put all the little kitties in the big kitty box. This is a silly game.	E reads screen. After 7 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>2B: Screen 2 – Instructions</b>	Let's try this silly game!	E reads screen. After 1 second, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
<b>2B: Screen 3 – Rule reminder 1</b>	If it's a little kitty, then it goes in the big kitty box. If it's a big kitty, then it goes in the little kitty box (Text appears above reversed boxes.)	E read screens. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>2B: Screen 4 – Live trial 1</b>	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
<b>2B: Screen 5 – Rule reminder 2</b>	Little kitties go here. Big kitties go here. (Text appears above reversed boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>2B: Screen 6 – Live trial 2</b>	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
<b>2B: Screen 7 – Rule reminder 3</b>	If it's a little kitty, then it goes in the big kitty box. If it's a big kitty, then it goes in the little kitty box (Text appears above reversed boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
<b>2B: Screen 8 – Live trial 3</b>	Here is a little kitty. Where does it go?	E reads screen. C touches a box.

DCCS Developmental Extension (DEXT) Phase 2 (Big Kitty/Little Kitty)		
	iPad screen written content	Examiner (E) & Child (C) Actions
<b>2B: Screen 9 – Rule reminder 4</b>	Little kitties go here. Big kitties go here. (Text appears above reversed boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
<b>2B: Screen 10 – Live Trial 4</b>	Here is a little kitty. Where does it go?	E reads screen. C touches a box.
<b>2B: Screen 11 – Rule reminder 5</b>	If it's a little kitty, then it goes in the big kitty box. If it's a big kitty, then it goes in the little kitty box (Text appears above reversed boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
<b>2B: Screen 12 – Live Trial 5</b>	Here is a big kitty. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, DEXT Phase 2 is discontinued (If DEXT started at Phase 2, Phase 1A items are presented; depending on performance on Phase 1A items, Phase 1B items may be presented as well. Then the test is discontinued). No Phase is administered more than once. If 4 or more correct, the test continues to DEXT Phase 3.		

DCCS Developmental Extension (DEXT) Phase 3 (Separated shape and color)		
	iPad screen written content	Examiner (E) & Child (C) Actions
<b>3A: Screen 1 – Instructions</b>	Now we're going to play another game. Here is a flower and here is a heart. This is the shape game. In the shape game, all the flowers go in the flower box, And all the hearts go in the heart box.	E reads screen and points out the relevant aspects. After 10 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3A: Screen 2 – Instruction</b>	See, here is a heart. It goes in the heart box.	E reads screen and touches the heart box, which makes a clicking sound. Touch and Hold Here to Continue button appears; E touches and holds the button to continue.
<b>3A: Screen 3 – Instruction</b>	And here is a flower. It goes in the flower box.	E reads screen and touches the flower box, which makes a clicking sound. Touch and Hold Here to Continue button appears; E touches and holds the button to continue
<b>3A: Screen 4 – Rule check</b>	Can you show me where the hearts go in the shape game?	E reads screen. C touches a box.
<b>3A: Screens 5a &amp; b – Feedback</b>	5a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
	5b (If incorrect) Uh oh. Remember, in the shape game, hearts go in the heart box and flowers go in the flower box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: <b>Can you show me where the hearts go?</b> E reads screen and C touches a box, triggering either 5a or b.
<b>3A: Screen 6 – Rule check</b>	Can you show me where the flowers go in the shape game?	When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
	5a (If correct) Very good, that's right.	E reads screen. C touches a box.
<b>3A: Screens 7a &amp; b – Feedback</b>	5a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
	5b (If incorrect) Uh oh. Remember, in the shape game, hearts go in the heart box and flowers go in the flower box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: <b>Can you show me where the flowers go?</b> E reads screen

DCCS Developmental Extension (DEXT) Phase 3 (Separated shape and color)		
	iPad screen written content	Examiner (E) & Child (C) Actions
		and C touches a box, triggering either 5a or b. When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
<b>3A: Screens 8 – Transition</b>	Now let's do more like that!	E reads screen. When Touch and Hold Here to Continue button appears, E touches and holds button to continue.
<b>3A: Screen 9 – Rule reminder 1</b>	If it's a flower, then it goes in the flower box. If it's a heart, then it goes in the heart box. (Text appears above relevant boxes.)	E reads screen. After 5, seconds, Touch and Hold Here to Continue button appears. Then E touches and holds button to advance to next screen.
<b>3A: Screen 10 – Live Trial 1</b>	Here is a flower. Where does it go?	E reads screen. C touches a box.
<b>3A: Screen 11 – Rule reminder 2</b>	Flowers go here. Hearts go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3A: Screen 12 – Live Trial 2</b>	Here is a heart. Where does it go?	E reads screen. C touches a box.
<b>3A: Screen 13 – Rule reminder 3</b>	If it's a flower, then it goes in the flower box. If it's a heart, then it goes in the heart box. (Text appears above relevant boxes.)	E reads screen. After 5, seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3A: Screen 14 – Live Trial 3</b>	Here is a flower. Where does it go?	E reads screen. C touches a box.
<b>3A: Screen 15 – Rule reminder 4</b>	Flowers go here. Hearts go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3A: Screen 16 – Live trial 4</b>	Here is a flower. Where does it go?	E reads screen. C touches a box.
<b>3A: Screen 17 – Rule reminder 5</b>	If it's a flower, then it goes in the flower box. If it's a heart, then it goes in the heart box. (Text appears above relevant boxes.)	E reads screen. After 5, seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3A: Screen 18 – Live Trial 5</b>	Here is a heart. Where does it go?	E reads screen. C touches a box.
If less than 4 of 5 correct, DEXT Phase 3 is discontinued (If DEXT started at Phase 3, DEXT Phase 2A items are presented and depending on performance on Phase 2A items, DEXT 2B OR DEXT 1A is presented. When either or both (depending on performance) Phase 2A and 2B are administered, the		

### DCCS Developmental Extension (DEXT) Phase 3 (Separated shape and color)

	iPad screen written content	Examiner (E) & Child (C) Actions
	<p>test ends. When either or both (depending one performance) Phase 1A and 1B items are administered, the test ends).</p> <p>No Phase is administered more than once. If 4 or more correct on DEXT Phase 3A, the test continues to Phase 3B.</p>	
<b>3B: Screen 1 – Instructions</b>	Now we're going to play a new game. We're not going to play the shape game anymore. We're going to play the color game. In the color game, all the pink ones go in the pink box. All the yellow ones go in the yellow box.	E reads screen. After 10 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
<b>3B: Screen 2 – Instructions</b>	Let's try this game!	E reads screen. After 1 second, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3B: Screen 3 – Rule reminder 1</b>	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3B: Screen 4 – Live trial 1</b>	Here's a yellow one. Where does it go?	E reads screen. C touches a box.
<b>3B: Screen 5 – Rule reminder 2</b>	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3B: Screen 6 – Live trial 2</b>	Here's a pink one. Where does it go?	E reads screen. C touches a box.
<b>3B: Screen 7 – Rule reminder 3</b>	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3B: Screen 8 – Live trial 3</b>	Here's a pink one. Where does it go?	E reads screen. C touches a box.
<b>3B: Screen 9 – Rule reminder 4</b>	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3B: Screen 10 – Live Trial 4</b>	Here's a yellow one. Where does it go?	E reads screen. C touches a box.
<b>3B: Screen 11 – Rule reminder 5</b>	If it's a pink one, then it goes in the pink box. If it's a yellow one, then it goes in the yellow box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>3B: Screen 12 – Live Trial 5</b>	Here's a yellow one. Where does it go?	E reads screen. C touches a box.

<b>DCCS Developmental Extension (DEXT) Phase 3 (Separated shape and color)</b>		
	<b>iPad screen written content</b>	<b>Examiner (E) &amp; Child (C) Actions</b>
<p>If less than 4 of 5 correct, DEXT Phase 3 is discontinued (If DEXT started at Phase 3, DEXT Phase 2A items are presented; depending on performance on Phase 2A items, Phase 2B or Phase 1A is presented. When either or both (depending on performance) Phase 2A and 2B are administered, the test ends; or, when either or both (depending on performance) Phase 1A and 1B items are administered, the test ends).</p> <p>No Phase is administered more than once. If 4 or more correct, test continues to DEXT Phase 4.</p>		

Developmental Extension (DEXT) Phase 4 (Integrated color and shape) DCCS		
	iPad screen written content	Examiner (E) & Child (C) Actions
<b>4A: Screen 1 – Instructions</b>	Now we're going to play the color game with different pictures. In this color game, all the red ones go in the red box. And all the blue ones go in the blue box.	E reads screen and points out the relevant aspects. After 8 seconds, Touch and Hold Here to Continue button appears. E touches and holds the button to continue.
<b>4A: Screen 2 – Demonstration</b>	Here is a red one. It goes in the red box.	E reads screen and touches the red box, which makes a clicking sound. Touch and Hold Here to Continue button appears; E touches and holds the button to continue.
<b>4A: Screen 3 – Demonstration</b>	Here is a blue one. It goes in the blue box.	E reads screen and touches the blue box, which makes a clicking sound. Touch and Hold Here to Continue button appears; E touches and holds the button to continue
<b>4A: Screen 4 – Rule check</b>	Can you show me where the blue ones go in the color game?	E reads screen. C touches a box.
<b>4A: Screens 5a &amp; b – Feedback</b>	5a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
	5b (If incorrect) Uh oh. Remember, in the color game, if it's a blue one, then put it in the blue box, but if it's a red one, put it in the red box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: <b>Can you show me where the blue ones go?</b> E reads screen and C touches a box, triggering either 5a or b. When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
<b>4A: Screen 6 – Rule check</b>	Can you show me where the blue ones go in the color game?	E reads screen. C touches a box.
<b>4A: Screens 7a &amp; b – Feedback</b>	5a (If correct) Very good, that's right.	E reads screen. Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
	5b (If incorrect) Uh oh. Remember, in the color game, if it's a blue one, then put it in the blue box, but if it's a red one, put it in the red box.	Touch and Hold Here to Continue button appears; after E touches and holds button, screen says: <b>Can you show me where the red ones go?</b> E reads screen and C touches a box, triggering either 5a or b. When Touch and Hold Here to Continue button appears again, E touches and holds button to advance to next screen.
<b>4A: Screens 8 – Transition</b>	Now let's do some more like that!	E reads screen. When Touch and Hold Here to Continue button appears, E touches and holds button to continue.
<b>4A: Screen 9 – Rule reminder 1</b>	If it's a red one, then it goes in the red box. If it's a blue one, then it goes in	E reads screen. After 5, seconds, Touch and Hold Here to Continue

	the blue box. (Text appears above relevant boxes.)	button appears. E touches and holds button to continue.
<b>4A: Screen 10 – Live Trial 1</b>	Here is a red one. Where does it go?	E reads screen. C touches a box.
<b>4A: Screen 11 – Rule reminder 2</b>	Red ones go here. Blue ones go here. (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4A: Screen 12 – Live Trial 2</b>	Here is a blue one. Where does it go?	E reads screen. C touches a box.
<b>4A: Screen 13 – Rule reminder 3</b>	If it's a red one, then it goes in the red box. If it's a blue one, then it goes in the blue box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4A: Screen 14 – Live Trial 3</b>	Here is a blue one. Where does it go?	E reads screen. C touches a box.
<b>4A: Screen 15 – Rule reminder 4</b>	Red ones go here. Blue ones go here. (text above relevant boxes)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4A: Screen 16 – Live trial 4</b>	Here is a red one. Where does it go?	E reads screen. C touches a box.
<b>4A: Screen 17 – Rule reminder 5</b>	If it's a red one, then it goes in the red box. If it's a blue one, then it goes in the blue box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4A: Screen 18 – Live Trial 5</b>	Here is a red one. Where does it go?	E reads screen. C touches a box.

If less than 4 of 5 correct, the test is discontinued. If 4 or more correct, the test continues to Phase 4B.

<b>4B: Screen 1 – Instructions</b>	Now we're going to play a different game. We're not going to play the color game anymore. We're going to play the shape game. In the shape game, all the stars go in the star box. All the airplanes go in the airplane box.	E reads screen. After 10 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to advance to next screen.
<b>4B: Screen 2 – Transition</b>	Let's try this game!	E reads screen. After 1 second, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4B: Screen 3 – Rule reminder 1</b>	If it's an airplane, then it goes in the airplane box. If it's a star, then it goes in the star box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4B: Screen 4 – Live trial 1</b>	Here is an airplane. Where does it go?	E reads screen. C touches a box.
<b>4B: Screen 5 – Rule reminder 2</b>	Airplanes go here. Stars go here (Text appears above relevant boxes.)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4B: Screen 6 – Live trial 2</b>	Here is a star. Where does it go?	E reads screen. C touches a box.
<b>4B: Screen 7 – Rule reminder 3</b>	If it's an airplane, then it goes in the airplane box. If it's a star, then it goes	E reads screen. After 5 seconds, Touch and Hold Here to Continue button

	in the star box. (Text appears above relevant boxes.)	appears. E touches and holds button to continue.
<b>4B: Screen 8 – Live trial 3</b>	Here is an airplane. Where does it go?	E reads screen. C touches a box.
<b>4B: Screen 9 – Rule reminder 4</b>	Airplanes go here. Stars go here (text above boxes)	E reads screen. After 3 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4B: Screen 10 – Live Trial 4</b>	Here is an airplane. Where does it go?	E reads screen. C touches a box.
<b>4B: Screen 11 – Rule reminder 5</b>	If it's an airplane, then it goes in the airplane box. If it's a star, then it goes in the star box. (Text appears above relevant boxes.)	E reads screen. After 5 seconds, Touch and Hold Here to Continue button appears. E touches and holds button to continue.
<b>4B: Screen 12 – Live Trial 5</b>	Here is a star. Where does it go?	E reads screen. C touches a box.
DEXT Phase 4 is complete. End of DCCS.		

### C.2.4.3 Dimensional Change Card Sort Test Instructions Ages 8-11

This table outlines the item content read by as well as the actions for the examiner.

iPad screen written content		Examiner (E) Actions
<b>Title Screen</b>	NIH Toolbox DCCS 8-11	E touches and holds button to continue
<b>Home Base Intro</b>	We're going to play a matching game with colors and shapes. But first we are going to learn about Home Base. This is your Home Base. Put your finger on the Home Base and wait for the next picture.	Reads screen and points to Home Base; then touches and holds button to continue.
<b>SHAPE intro</b>	We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E points to BOAT, then demonstrates use of button.
	If it's a RABBIT, choose that picture.	E points to RABBIT, then touches and holds button to continue.
<b>Transition</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Shape Practice Set 1</b>	4 items sorted by shape	
<b>More practice, if less than 3 out of 4 correct on Set 1</b>	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
<b>Transition</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Shape Practice Set 2</b>	4 items sorted by shape	
<b>More practice, if less than 3 out of 4 correct on Set 2</b>	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
<b>Transition</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Shape Practice Set 3</b>	4 items sorted by shape	
<b>Test ends, if less than 3 out of 4 correct on Set 3</b>		

iPad screen written content		Examiner (E) Actions
<b>COLOR intro</b>	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
<b>Transition</b>	Now you try. Keep your eyes on the star. Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Color Practice Set 1</b>	4 items sorted by color	
<b>More practice, if less than 3 out of 4 correct on Set 1</b>	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
<b>Transition</b>	Now you try. Keep your eyes on the star. Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Color Practice Set 2</b>	4 items sorted by color	
<b>More practice, if less than 3 out of 4 correct on Set 2</b>	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
<b>Transition</b>	Now you try. Keep your eyes on the star. Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Color Practice Set 3</b>	4 items sorted by color	
<b>Test ends, if less than 3 out of 4 correct on Set 3</b>		
<b>Test item intro</b>	Now we're going to play both games together. Remember, if you see and hear the word SHAPE, you choose the picture that's the same SHAPE as the picture in the middle of the screen. If you see and hear the word COLOR, you choose the picture that's the same COLOR as the picture in the middle of the screen. Remember, put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.

iPad screen written content		Examiner (E) Actions
<b>Transition</b>	<p>Now you try. </p> <p>Keep your eyes on the star. Answer as fast as you can without making mistakes.</p> <p>If you make a mistake, just keep going!</p> <p>Put your finger back on Home Base after you answer.</p>	E reads screen, then touches and holds button to continue.
<b>Test items</b>	30 mixed items	



#### C.2.4.4 Dimensional Change Card Sort Test Instructions Ages 12+

This table outlines the item content read by as well as the actions for the examiner.

iPad screen written content		Examiner (E) Actions
<b>Title Screen</b>	NIH Toolbox DCCS 12+	E touches and holds button to continue
<b>Home Base Intro</b>	We're going to play a matching game with colors and shapes. But first we are going to learn about Home Base. This is your Home Base. Put your finger on the Home Base and wait for the next picture.	E reads screen and points to Home Base; then touches and holds button to continue.
<b>SHAPE intro</b>	We'll play the SHAPE game first. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E points to BOAT, then demonstrates use of button.
	If it's a RABBIT, choose that picture.	E points to RABBIT, then touches and holds button to continue.
<b>Transition</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Shape Practice set 1</b>	4 items sorted by shape	
<b>More practice, if less than 3 out of 4 correct on set 1</b>	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
<b>Shape Practice set 2</b>	4 items sorted by shape	
<b>More practice, if less than 3 out of 4 correct on set 2</b>	Let's practice that some more. In the SHAPE game, choose the picture that's the same SHAPE as the picture in the middle of the screen. If it's a BOAT, choose this picture.	E chooses BOAT.
	If it's a RABBIT, choose that picture.	E chooses RABBIT.
<b>Shape Practice set 3</b>	4 items sorted by shape	
<b>Test ends, if less than 3 out of 4 correct on set 3</b>		
<b>COLOR intro</b>	We can also match by COLOR. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's BROWN, choose this picture.	E points to, then chooses, BROWN picture.
	If it's WHITE, choose that picture.	E points to, then chooses, WHITE picture.
<b>Transition</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.

iPad screen written content		Examiner (E) Actions
<b>Color Practice set 1</b>	4 items sorted by color	
<b>More practice, if less than 3 out of 4 correct on set 1</b>	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
<b>Transition</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Color Practice set 2</b>	4 items sorted by color	
<b>More practice, if less than 3 out of 4 correct on set 2</b>	Let's practice some more. In the COLOR game, choose the picture that's the same COLOR as the picture in the middle of the screen. If it's WHITE, choose this picture.	E chooses WHITE picture.
	If it's BROWN, choose that picture.	E chooses BROWN picture.
<b>Transition</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going! Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Color Practice set 3</b>	4 items sorted by color	
<b>Test ends, if less than 3 out of 4 correct on set 3</b>		
<b>Test item intro</b>	Now we're going to play both games together. Remember, if you see the word SHAPE, you choose the picture that is the same SHAPE as the picture in the middle of the screen. If you see the word COLOR, you choose the picture that is the same COLOR as the picture in the middle of the screen. Remember, put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Transition</b>	Now you try. Keep your eyes on the star. ★ Answer as fast as you can without making mistakes. If you make a mistake, just keep going. Put your finger back on Home Base after you answer.	E reads screen, then touches and holds button to continue.
<b>Test items</b>	30 mixed items	

### **C.2.5 NIH Toolbox Pattern Comparison Processing Speed Test**

The NIH Toolbox Pattern Comparison Processing Speed Test is designed to measure processing speed. The test itself takes less than 90 seconds and requires participants to discern whether two side-by-side pictures are the same or not.

Younger children make this decision by choosing either a “smiley face” (corresponding to a “yes” response) or a “frowny face” (corresponding to a “no” response). Older children and adults (Ages 7+) make this decision with “yes” or “no” buttons on the screen

#### **Equipment needed:**

- iPad
- Small ball (optional)

#### **Practice Items:**

Young children are administered two demonstration items and five practice items; older children and adults are administered six practice items.

All participants touch the buttons that matches their choice: “smiley face” or “yes” for same or look alike or “frowny face” or “no” for not the same or do not look alike. The practice items are not timed. If a participant (child or adult) continues to make an error after being corrected on two practice items, the test will discontinue.

For both test and practice items, if there is no response in 10 seconds, the pre-recorded audio asks: **Are these the same?**

During practice items only, an audio recording will follow each item presentation:

If the item is correct, an audio recording will say: **That's right.**

If the item is incorrect, an audio recording will say why the item is incorrect. The item will appear a second time and the participant will be asked to respond again.

If a participant (child or adult) continues to make an error after being corrected two times on two different practice items, the test will discontinue.

#### Test items:

There are a maximum of 130 items or a maximum response time of 85 seconds.

#### Prompts:

Some participants need reminders to stay on task. The examiner may give prompts, although fewer are better as this is a timed task. Each prompt should be succinct.

Examples are: look at the screen; are these the same, yes or no; remember to choose a button; remember to choose as quickly as you can.

Handedness: If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to [Appendix 3](#) for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that “RIGHT” or “LEFT” is displayed where appropriate

**IMPORTANT REMINDER:** Unlike some of the other tasks, if participants have difficulty touching the screen, the examiner **cannot** answer for them, as this task measures processing speed and having the examiner answer would compromise the accuracy of this measurement.

Participants may be given a small stress ball to keep in their non-dominant hand.

**Age-specific test instructions:**

[NIH Toolbox Pattern Comparison Processing Speed Test Instructions Ages 3-6](#)

[NIH Toolbox Pattern Comparison Processing Speed Test Instructions Ages 7+](#)

### **C.2.5.1 Pattern Comparison Processing Speed Test Instructions Ages 3-6**

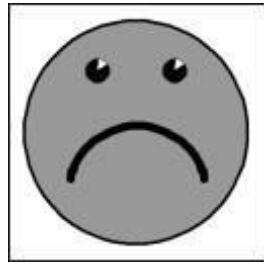
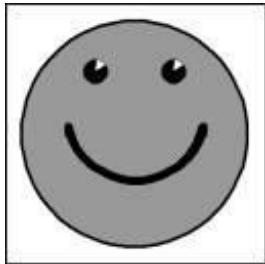
The task is introduced with the Title Screen: NIH Toolbox PC 3-6. At the bottom of the screen is a button **Touch and Hold Here to Continue**. **Touch and hold that button to begin the test.**

**Handedness:** If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to [Appendix 3](#) for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that “RIGHT” or “LEFT” is displayed where appropriate

Read the screen: **I would like you to use the pointer (index) finger of this (point to dominant right or left as appropriate) hand to answer.**

**Let's look at these two faces. One of them is a SMILEY face and the other is a FROWN face (point to each).**



**Touch and hold button that says: Touch and hold here to continue.**

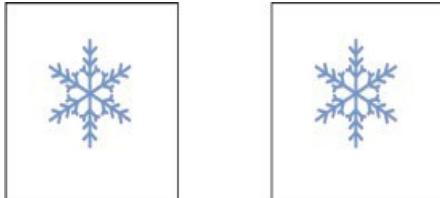
Read the screen: **Now I am going to show you some pictures. On each screen, there will be two pictures. Sometimes the pictures look alike or the same, and sometimes the pictures do not look alike and are NOT the same.**

**When the pictures look alike or the same, you should choose the SMILEY face. When they do NOT look alike or the same, you should choose the FROWN face.**

**Touch and hold button that says: Touch and hold here to continue.**

Ages 3-6 Practice Item 1:

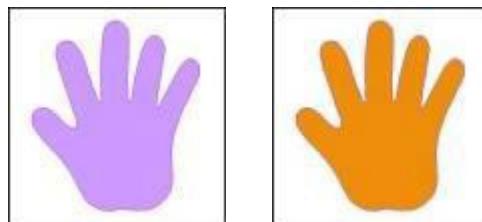
Read the screen: **Look at the boxes on the screen; in them are two pictures: this picture (point to left box) and this picture (point to right box). These two pictures look alike or the same, so we'll choose the SMILEY face. Let's choose the SMILEY face together.**



Audio recording says: **Great job!** when the SMILEY face is touched. Next item will appear.

Ages 3-6 Practice Item 2:

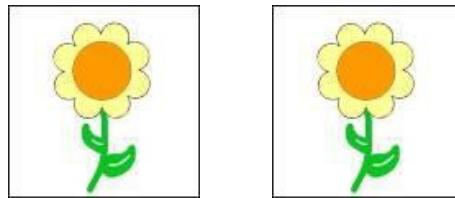
Read the screen: **Look at these pictures here. This picture (point) and this picture (point) do NOT look alike or the same. This picture (point) is purple but this picture (point) is orange. This means the pictures are NOT alike, so we'll choose the FROWN face. Let's choose the FROWN face together and then you will do some practice.**



Audio recording says: **Great job!** when FROWN face is touched. Next item will appear.

Ages 3-6 Practice Item 3:

Audio recording says: **Are these the same? Remember, touch the SMILEY face if they look alike or are the same and touch the FROWN face if they do not look alike and are NOT the same. Pictures will stay on screen, until there is a response and audio recording will repeat: Are these the same?**



If correct (**SMILEY face**), the audio recording says: **Great job!** Next item will appear.

If incorrect (**FROWN face**), the audio recording says: **The pictures look alike, the same. Both pictures are flowers that are the same size and color, so choose the SMILEY face.** SMILEY face will flash; item will stay on screen.

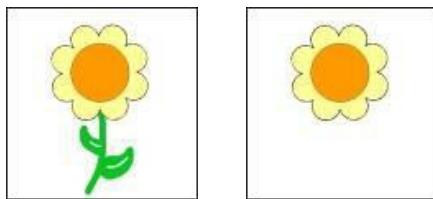
If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

Ages 3-6 Practice Item 4:

Audio recording says: **Are these the same?** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**FROWN face**), the audio recording says: **Great job!** Next item will appear.

If incorrect (**SMILEY face**), the audio recording says: **These pictures do not look alike and are NOT the same. One picture is a flower with a stem and one picture is only the top of a flower, with no stem. Choose the FROWN face. FROWN face will flash; item will stay on screen.**

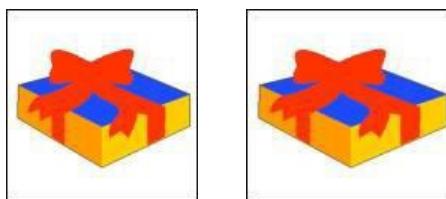
If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

Ages 3-6 Practice Item 5:

Audio recording says: **Are these the same?** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**SMILEY face**), the audio recording says: **Great job!** Next item will appear.

If incorrect (**FROWN face**), the audio recording says: **These pictures look alike, the same. Both are pictures of a present or gift box, so choose the SMILEY face. SMILEY face will flash; item will stay on screen.**

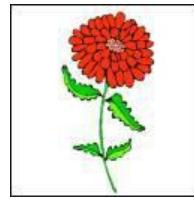
If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

Ages 3-6 Practice Item 6:

Audio recording says: **Are these the same?** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**FROWN face**), the audio recording says: **Great job!** Next item will appear.

If incorrect (**SMILEY face**), the audio recording says: **These pictures do not look alike and are NOT the same. One flower is purple and the other flower is red; so choose the FROWN face. FROWN face** will flash; item will stay on screen.

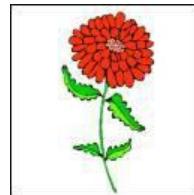
If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

#### Ages 3-6 Practice Item 7:

Audio recording says: **Are these the same?** Pictures will stay on screen, until there is a response and audio recording will repeat: **Are these the same?**



If correct (**SMILEY face**), the audio recording says: **Great job!** Practice items are complete.

If incorrect (**FROWN face**), the audio recording says: **These pictures look alike. Both are pictures of red flowers, so choose the SMILEY face. SMILEY face** will flash; item will stay on screen.

If no response, the audio recording repeats: **Are these the same?**

If child chooses correctly, the audio recording will say: **Great job!** Next item will appear.

If child chooses incorrectly another time, iPad program moves to next practice item after repeating explanation above.

#### Test Items:

**NOTE:** If the child has not correctly chosen the SMILEY or FROWN face after two trials on two practice items 3-7, testing will automatically be discontinued and iPad will move on to the next test.

Test Items:

Read the screen: **Now you'll do some more. Remember, touch the SMILEY face if the pictures look alike or are the same and touch the FROWN face if they do not look alike and are NOT the same. Make a choice as quickly as you can. Are you ready?**

When ready, touch and hold button that says: Touch and hold here to continue.

For both test and practice items, if participant does not respond within 10 seconds, audio recording asks: **Are these the same?**

When either 130 items appear or 85 seconds of testing time has occurred, the test will end (if a participant is working on an item when time is up, he/she will be permitted to complete it).

### C.2.5.2 Pattern Comparison Processing Speed Test Instructions Ages 7+

The task is introduced with the Title Screen: NIH Toolbox PC 7+. At the bottom of the screen is a button **Touch and Hold Here to Continue**. Touch and hold that button to begin the test.

**Handedness:** If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to [Appendix 3](#) for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that “RIGHT” or “LEFT” is displayed where appropriate

An audio recording says:

**On each screen, you are going to see two pictures. Sometimes the two pictures are the same and sometimes the two pictures are NOT the same. If the pictures look the same, touch the ‘Yes’ button. If they do NOT look the same, touch the NO button. If you make a mistake during the practice, you will hear a message to try again. Use your \_\_\_\_\_ (dominant hand from handedness, audio will say “right” or “left”) index finger to respond. Let's try some for practice.**

When the audio recording is complete, **Touch and hold here to continue** appears on the screen. Touch and hold that button to begin the administration.

Practice Items:

There are 6 practice items. The first practice item is introduced with an audio recording asking: **Are these the same? Remember, touch YES if they look alike or are the same and touch NO if they do not look alike and are NOT the same.**

For the other five practice items, an audio recording asks: **Are these the same?**

If the participant answers correctly, an audio recording says: **That's right!** The next item will appear.

If the participant answers incorrectly, an audio recording explains why the answer is wrong. The correct answer will flash; item will stay on screen. If participant chooses correctly, an audio recording will say: **That's right!** and the next item will appear.

If the participant chooses incorrectly another time, the program automatically moves to the next practice item after repeating the explanation above.

Practice item	Correct response	Incorrect response
1	Yes: both yellow flowers	No
2	No: a flower with stem & top of a flower	Yes
3	No: one present & many presents	Yes
4	Yes: both single presents	No
5	No: purple flower & red flower	Yes
6	Yes: both red flowers	No

**NOTE:** If a participant makes an error a second time after being corrected on two different practice items, the test will discontinue.

Test Items:

An audio recording introduces the test items: **Now we'll do some more. Remember, use your \_\_\_\_\_ (right/left; audio will say the dominant one) index finger to respond. Touch YES if the pictures look the same and touch NO if they do NOT look the same. It is important that you choose as quickly as you can.**

When the audio file is complete, **Touch and hold here to continue** appears on the screen. Touch and hold that button to continue with the test items.

For both test and practice items, if the participant does not respond within 10 seconds, the audio asks: **Are these the same?**

When either 130 items appear or 85 seconds of testing time has occurred, the test will end (if a participant is working on an item when time is up, he/she will be permitted to complete it).

### **C.2.6 NIH Toolbox Picture Sequence Memory Test**

In this measure of episodic memory, sequences of pictured objects and activities are presented in a particular order. The participants are asked to reproduce the sequence of pictures that is shown on the screen.

#### **Equipment and materials needed:**

- iPad

There are three different sets (forms) of test items for this measure: forms A, B, and C. Each form has different test items that yield equivalent scores and can be used in a repeated measures research design to minimize practice effects. The forms are typically given in alphabetical order but may be given in any order as indicated by the user.

There are also different practice sequences and test items for participants of different ages: 3-4, 5-6, 7 and 8+. For each age group, there is the option to use one of the three forms: A, B, or C.

#### **Special Instructions:**

For all participants, a demonstration sequence shows participants how to move the pictures on the screen. After this, there are practice sequences that differ for participants of differing ages: 3-4, 5-6, 7 and 8+ years. In addition, the test sequences differ in length for participants of differing ages.

Participants respond by dragging pictures from the yellow box on the screen into the gray boxes on the screen. They may verbalize the picture labels as they move the pictures. If, however, verbalizing the picture labels seems to interfere with the participant's performance, the examiner should say: **"You don't need to say the words/labels."** If participants indicate that saying the labels helps them, the examiner may reassure them that they may say the labels if they wish.

If participants look away from the screen while the pictures are being presented, the examiner should remind them to: **"Watch the screen."** Additionally, examiners should not allow participants to touch the screen while the pictures are being presented. If participants try to touch the screen while pictures are being presented or while the examiner is giving instructions, say: **"Do not touch the screen until I tell you that it is your turn."**

If necessary, remind participants to: **"Wait until I tell you it is your turn (to touch the screen)."**

If the participant has difficulty dragging the pictures across the screen during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner should move the pictures in the way the participant indicates. The examiner should ensure the participant completely understands how the process will work and should say something like the following to the participant: You point to the picture you want to move, then point to the grey box where you want to move it. I'll move it there for you.

#### **Age-specific test instructions:**

[NIH Toolbox Picture Sequence Memory Test Ages 3-4](#)

[NIH Toolbox Picture Sequence Memory Test Ages 5-6](#)

[NIH Toolbox Picture Sequence Memory Test Age 7](#)

[NIH Toolbox Picture Sequence Memory Test Ages 8+](#)

### **C.2.6.1 Picture Sequence Memory Test Instructions Ages 3-4**

If the child has difficulty dragging the pictures across the screen, during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner will move the pictures in the way the child indicates. The examiner should ensure the child completely understands how the process will work and can **say something like the following: You point to the picture you want to move, then point to the gray box where you want to move it. I'll move it there for you.**

The test begins with a Title Screen: **NIH Toolbox PSM 3-4 Form (A, B, or C)**. At the bottom of the screen is a button **Touch and Hold Here to Continue**. Touch and hold that button to begin the test.

On the next screen, read the text: **Now we are going to play a memory game, but first I am going to teach you how to move the pictures on this screen.** When finished reading, touch the button at the bottom of the screen that says **Touch and Hold Here to Continue**.

The next screen begins the three-step demonstration sequence. If the steps are not followed, the **Touch and Hold Here to Continue** button will not be active.

#### **Step 1: Moving Pictures from the Yellow Box to the Gray Boxes**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: Here you see some pictures in a yellow box. I want to show you how to move the pictures to the gray boxes. You can move pictures from this yellow box to the gray boxes, like this. Touch on the picture in the yellow box; then drag the picture you touched to the gray box where you want to move it. Now you try with this picture.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says **Touch and Hold Here to Continue**.

#### **Step 2: Moving Pictures from the Gray Boxes to the Yellow Box**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: You can also move pictures from the gray boxes back to the yellow box, like this. Touch the picture you want to move. Then drag that picture to the yellow box. Now you move the other picture back to the yellow box.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says **Touch and Hold Here to Continue**.

#### **Step 3: Moving Pictures between the Gray Boxes**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: You can also move the pictures from one gray box to another, like this. First, you touch the picture in one gray box. Then, drag that picture to the gray box where you want the picture to go. Now you try it; move the picture from here to here.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

Introduction to the Practice Items:

Read the screen: **Now, we're going to play the game. You will see some pictures on the screen. You should remember them and show them back to me in the same way you saw them on the screen.**

When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

The next screen begins the practice sequences. There are two practice sequences. If the child does not succeed after two trials on first practice sequence of two pictures, the test is discontinued. The second practice sequence has three pictures; if the child succeeds in four or fewer trials, the test sequence is started. If the child does not succeed on the second practice sequence after four trials, the test is discontinued.

Practice Sequence 1:

Say: **Now, you will see how to Eat Ice Cream.** When finished reading, touch and hold the button at the bottom of the screen that says *Touch and Hold here to Continue*.

As the pictures are presented, an audio recording will say appropriate labels:

First, put a scoop on the cone.  
Then, eat the ice cream.

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Eat Ice Cream. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the child.

If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

#### **Logic:**

- If child gives correct response: Practice sequence 2, Have a Birthday Party, will be presented.
- If child gives incorrect response: Eat Ice Cream will be presented again with an audio recording that says: Let's try that again

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Eat Ice Cream. Now, you move the pictures in the same way you saw them on the screen.** The examiner may have to explain that the child made a mistake on the first trial.

If child fails both trials of Practice Sequence 1, test will discontinue.

#### Practice Sequence 2:

Say: **That's right. Now, you will see how to have a Birthday Party.** When finished reading, touch and hold the button at the bottom of the screen that says Touch and Hold Here to Continue.

As the pictures are presented, an audio recording will say appropriate labels:

First, bake the cake. Next,  
frost it.  
And last, put on the candles.

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, "**Are you finished?**" Ask this of the child.

If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

#### Logic:

1. If child gives correct response, Test Item will be presented.
2. If child gives incorrect response, Have a Birthday Party will be presented again with an audio recording saying, "Let's try that again." After the pictures are presented and as the pictures are scrambled, an audio recording will say: That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.
3. If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
4. If child fails all 4 trials, test will discontinue.

#### Test Sequences:

Children ages 3-4 are presented with two trials of a 6-step sequence.

Read the screen: **Now we are going to play the game with more pictures. This time you will see how to Play in the Park (Form A); Go to the Fair (Form B); Work on the Farm (Form C).**

When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

Test Item (Trial 1):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the Park	Form B: Go to the Fair	Form C: Work on the Farm
<ul style="list-style-type: none"><li>• Open a picnic basket</li><li>• Lay out the blanket</li><li>• Sit on the blanket</li><li>• Put a coin in the duck food machine</li><li>• Get the duck food</li><li>• Feed the ducks</li></ul>	<ul style="list-style-type: none"><li>• Take the pony out of the barn</li><li>• Put the saddle on the pony</li><li>• Go for a pony ride</li><li>• Put the hot dog in a bun</li><li>• Spread mustard on the hot dog</li><li>• Eat the hot dog</li></ul>	<ul style="list-style-type: none"><li>• Dig a hole</li><li>• Plant the tomatoes</li><li>• Water the tomatoes</li><li>• Put up a fence</li><li>• Get some paint</li><li>• Paint the fence</li></ul>

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park (Form A); Go to the Fair (Form B); Work on the Farm (Form C). Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Read the screen: **Now you will see again how to Play in the Park (or Go to the Fair or Work on the Farm). Everyone has to do this more than once.**

When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

Test Item (Trial 2):

As the pictures are presented, an audio recording will say appropriate labels (same as Trial 1; see above).

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park (or Go to the Fair or Work on the Farm). Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

**Logic:**

Test will terminate after the two test sequences have been presented.

### **C.2.6.2 Picture Sequence Memory Test Instructions Ages 5-6**

If the child has difficulty dragging the pictures across the screen, during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner will move the pictures in the way the child indicates. The examiner should ensure the child completely understands how the process will work and can **say something like the following: You point to the picture you want to move, then point to the gray box where you want to move it. I'll move it there for you.**

The test begins with a Title Screen: NIH Toolbox PSM 5-6 Form A, B or C. At the bottom of the screen is a button **Touch and Hold Here to Continue**. Touch and hold that button to begin the test.

On the next screen, read the text: **Now we are going to play a memory game, but first I am going to teach you how to move the pictures on this screen.** When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

The next screen begins the three-step demonstration sequence. If the steps are not followed, the *Touch and Hold Here to Continue* button will not be active.

#### **Step 1: Moving Pictures from the Yellow Box to the Gray Boxes**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: Here you see some pictures in a yellow box. I want to show you how to move the pictures to the gray boxes. You can move pictures from this yellow box to the gray boxes, like this. Touch on the picture in the yellow box; then drag the picture you touched to the gray box where you want to move it. Now you try with this picture.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

#### **Step 2: Moving Pictures from the Gray Boxes to the Yellow Box**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: You can also move pictures from the gray boxes back to the yellow box, like this. Touch the picture you want to move. Then drag that picture to the yellow box. Now you move the other picture back to the yellow box.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

#### **Step 3: Moving Pictures between the Gray Boxes**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: You can also move the pictures from one gray box to another, like this. First, you touch the picture in one gray box. Then, drag that picture to the gray box where you want the picture to go. Now you try it; move the picture from here to here.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

Introduction to the Practice Items:

Read the screen: **Now, we're going to play the game. You will see some pictures on the screen. You should remember them and show them back to me in the same way you saw them on the screen.**

When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue.*

The next screen begins the practice sequences. There are two practice sequences. The child has four trials to complete each sequence. If the child succeeds in four trials or less, the next practice sequence or test sequence is presented. If the child fails all four trials of either practice sequence, the test is discontinued.

Practice Sequence 1:

Say: **Now, you will see how to Have a Birthday Party.** When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue.*

As pictures are presented, an audio recording will say the appropriate labels:

**First, bake the cake.**

**Next, frost it.**

**And last, put on the candles.**

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, "**Are you finished?**" Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

#### **Logic:**

- If child gives correct response, Practice sequence 2, Go Camping, will be presented.
- If child gives incorrect response, Have a Birthday Party will be presented again with an audio recording saying **Let's try that again.** After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.**
- If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
- If child fails all 4 trials, test will discontinue.

Practice Sequence 2:

Say: **That's right. Now, you will see how to Go Camping.** When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

As pictures are presented, an audio recording will say the appropriate labels:

First, put up the tent. Then,  
go for a hike. Then, catch a  
fish.  
And last, roast a marshmallow.

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

**Logic:**

- If child gives correct response, Test Item will be presented.
- If child gives incorrect response, Go Camping will be repeated with an audio recording saying, **Let's try that again.** After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**
- If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
- If child fails all 4 trials, test will discontinue.

Test Sequences:

Children ages 5-6 will be presented with two trials of a 9-step sequence.

Read the screen: **Now we are going to play the game with more pictures. This time you will see how to Play in the Park (Form A); Go to the Fair (Form B); Work on the Farm (Form C).** When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

Test Item (Trial1):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the Park	Form B: Go to the Fair	Form C: Work on the Farm
<ul style="list-style-type: none"><li>• Fly a kite</li><li>• Play in the sand</li><li>• Go down the slide</li><li>• Pull the wagon</li><li>• Draw on the side walk</li><li>• Pet the dog</li><li>• Feed the ducks</li><li>• Push the swing</li><li>• Smell a flower</li></ul>	<ul style="list-style-type: none"><li>• Get a hot dog</li><li>• Go for a pony ride</li><li>• Pet the sheep</li><li>• Win a dog show</li><li>• Go on a ride</li><li>• Get some tickets</li><li>• Get some ice cream</li><li>• Play a game</li><li>• Milk a cow</li></ul>	<ul style="list-style-type: none"><li>• Put the cow in the barn</li><li>• Drive the tractor</li><li>• Feed the pig</li><li>• Load the cart</li><li>• Peel the corn</li><li>• Chop some wood</li><li>• Collect the eggs</li><li>• Put the blanket on the horse</li><li>• Plant the tomatoes</li></ul>

After the pictures are presented and as the pictures are scrambled, an audio recording will say:-**That's how to Play in the Park** (Form A); **Go to the Fair** (Form B); **Work on the Farm** (Form C). **Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Read the screen: **Now you will see again how to Play in the Park** (Form A); **Go to the Fair** (Form B); **Work on the Farm** (Form C). **Everyone has to do this more than once.** When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

Test Item (Trial 2):

As the pictures are presented, an audio recording will say appropriate labels (same as Trial 1; see above).

After the pictures are presented and as the pictures are scrambled, an audio recording will say:-**That's how to Play in the Park** (Form A); **Go to the Fair** (Form B); **Work on the Farm** (Form C). **Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

**Logic:**

Test will terminate after the two test sequences have been presented.

### C.2.6.3 Picture Sequence Memory Test Instructions Age 7

If the child has difficulty dragging the pictures across the screen, during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner will move the pictures in the way the child indicates. The examiner should ensure the child completely understands how the process will work and can **say something like the following:** You point to the picture you want to move, then point to the gray box where you want to move it. I'll move it there for you.

The test begins with a Title Screen: NIH Toolbox PSM 7 Form A, B or C. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

On the next screen, read the text: **Now we are going to play a memory game, but first I am going to teach you how to move the pictures on this screen.**

When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

The next screen begins the three-step demonstration sequence. If the steps are not followed, the *Touch and Hold Here to Continue* button will not be active.

#### Step 1: Moving Pictures from the Yellow Box to the Gray Boxes

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: Here you see some pictures in a yellow box. I want to show you how to move the pictures to the gray boxes. You can move pictures from this yellow box to the gray boxes, like this. Touch on the picture in the yellow box; then drag the picture you touched to the gray box where you want to move it. Now you try with this picture.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

#### Step 2: Moving Pictures from the Gray Boxes to the Yellow Box

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: You can also move pictures from the gray boxes back to the yellow box, like this. Touch the picture you want to move. Then drag that picture to the yellow box. Now you move the other picture back to the yellow box.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

#### Step 3: Moving Pictures between the Gray Boxes

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: You can also move the pictures from one gray box to another, like this. First, you touch the picture in one gray box. Then, drag that picture to the gray box where you want the picture to go. Now you try it; move the picture from here to here.**

After the child demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

### Introduction to the Practice Items

Read the screen: **Now, we're going to play the game. You will see some pictures on the screen. You should remember them and show them back to me in the same way you saw them on the screen.**

When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

The next screen begins the two practice sequences. The child has four trials to complete each sequence. If the child succeeds in four trials or less, the next practice sequence or test sequence is presented. If the child fails all four trials of either practice sequence, the test is discontinued.

#### Practice Sequence 1:

Say: **Now, you will see how to Have a Birthday Party.** When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

As pictures are presented, an audio recording will say the appropriate labels:

First, bake the cake. Next,  
frost it.  
And last, put on the candles.

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, "**Are you finished?**" Ask this of the child.

If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

#### Logic:

- If child gives correct response, Practice sequence 2, Go Camping, will be presented.
- If child gives incorrect response, Have a Birthday Party will be presented again with an audio recording saying **Let's try that again.** After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Have a Birthday Party. Now, you move the pictures in the same way you saw them on the screen.**
- If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
- If child fails all 4 trials, test will discontinue.

Practice Sequence 2:

Say: **That's right. Now, you will see how to Go Camping.** When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

As pictures are presented, an audio recording will say the appropriate labels:

First, put up the tent. Then,  
go for a hike. Then, catch a  
fish.  
And last, roast a marshmallow.

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the child.

If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

If child gives correct response, Test Items will be presented.

If child gives incorrect response, Go Camping will be repeated with an audio recording saying **Let's try that again.** After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**

**Logic:**

- If child gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
- If child fails all 4 trials, test will discontinue.

Test Sequences:

Children age 7 will be presented with two test trials: one with a 15-step sequence and the other with an 18-step sequence.

Read the screen: **Now we are going to play the game with more pictures. This time you will see how to Play in the Park (Form A); Go to the Fair (Form B); Work on the Farm (Form C).**

When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

Test Item (Trial1):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the Park	Form B: Go to the Fair	Form C: Work on the Farm
<ul style="list-style-type: none"><li>• Fly a kite</li><li>• Play in the sand</li><li>• Go down the slide</li><li>• Pull the wagon</li><li>• Swing on the monkey bars</li><li>• Lay out the blanket</li><li>• Play catch</li><li>• Catch a butterfly</li><li>• Kick the ball</li><li>• Take the baby for a walk</li><li>• Draw on the sidewalk</li><li>• Pet the dog</li><li>• Feed the ducks</li><li>• Push the swing</li><li>• Smell a flower</li></ul>	<ul style="list-style-type: none"><li>• Get a hot dog</li><li>• Go for a pony ride</li><li>• Pet the sheep</li><li>• Win a dog show</li><li>• Watch the rodeo</li><li>• Catch a pig</li><li>• Judge the cake</li><li>• See a puppet theater</li><li>• Take a picture of a clown</li><li>• Look at the babies</li><li>• Go on a ride</li><li>• Get some tickets</li><li>• Get some ice cream</li><li>• Play a game</li><li>• Milk a cow</li></ul>	<ul style="list-style-type: none"><li>• Put the cow in the barn</li><li>• Drive the tractor</li><li>• Feed the pig</li><li>• Load the cart</li><li>• Put the carrots in the basket</li><li>• Pick the fruit</li><li>• Fix the fence</li><li>• Cut the sheep's wool</li><li>• Collect the honey</li><li>• Shovel out the barn</li><li>• Peel the corn</li><li>• Chop some wood</li><li>• Collect the eggs</li><li>• Put the blanket on the horse</li><li>• Plant the tomatoes</li></ul>

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park (Form A); Go to the Fair (Form B); Work on the Farm (Form C). Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **“Are you finished?”** Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Read the screen: **Now we’re going to do the same pictures with some more pictures added. Everyone is asked to do this more than once.** When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

Test Item (Trial 2):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the Park	Form B: Go to the Fair	Form C: Work on the Farm
<ul style="list-style-type: none"><li>• Fly a kite</li><li>• Play in the sand</li><li>• Go down the slide</li><li>• Pull the wagon</li><li>• Swing on the monkey bars</li><li>• Lay out the blanket</li><li>• Play catch</li><li>• Catch a butterfly</li><li>• Ride a bike</li><li>• Row the boat</li><li>• Read a book</li><li>• Kick the ball</li><li>• Take the baby for a walk</li><li>• Draw on the sidewalk</li><li>• Pet the dog</li><li>• Feed the ducks</li><li>• Push the swing</li><li>• Smell a flower</li></ul>	<ul style="list-style-type: none"><li>• Get a hot dog</li><li>• Go for a pony ride</li><li>• Pet the sheep</li><li>• Win a dog show</li><li>• Watch the rodeo</li><li>• Catch a pig</li><li>• Judge the cake</li><li>• See a puppet theater</li><li>• Watch a tractor pull</li><li>• Play in the band</li><li>• Go on a hay ride</li><li>• Take a picture of a clown</li><li>• Look at the babies</li><li>• Go on a ride</li><li>• Get some tickets</li><li>• Get some ice cream</li><li>• Play a game</li><li>• Milk a cow</li></ul>	<ul style="list-style-type: none"><li>• Put the cow in the barn</li><li>• Drive the tractor</li><li>• Feed the pig</li><li>• Load the cart</li><li>• Put the carrots in the basket</li><li>• Pick the fruit</li><li>• Fix the fence</li><li>• Cut the sheep's wool</li><li>• Cut the wheat</li><li>• Herd the goats</li><li>• Put up the scarecrow</li><li>• Collect the honey</li><li>• Shovel out the barn</li><li>• Peel the corn</li><li>• Chop some wood</li><li>• Collect the eggs</li><li>• Put the blanket on the horse</li><li>• Plant the tomatoes</li></ul>

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to how to Play in the Park (Form A); Go to the Fair (Form B); Work on the Farm (Form C). Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the child. If child says YES, touch and hold the YES button. If the child says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

**Logic:**

Test will terminate after the two test sequences have been presented.

#### **C.2.6.4 Picture Sequence Memory Test Instructions Age 8+**

If the participant has difficulty dragging the pictures across the screen, during the demonstration sequence, practice sequences, or the actual test sequences, he/she may point and the examiner will move the pictures in the way the participant indicates. The examiner should ensure the participant completely understands how the process will work and can **say something like the following:** You point to the picture you want to move, then point to the gray box where you want to move it. I'll move it there for you.

The test begins with a Title Screen: NIH Toolbox PSM 8+ Form A, B or C. At the bottom of the screen is a button **Touch and Hold Here to Continue**. Touch and hold that button to begin the test.

On the next screen, read the text: **Now we are going to play a memory game, but first I am going to teach you how to move the pictures on this screen.**

When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

The next screen begins the three-step demonstration sequence. If the steps are not followed, the *Touch and Hold Here to Continue* button will not be active.

##### **Step 1: Moving Pictures from the Yellow Box to the Gray Boxes**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: Here you see some pictures in a yellow box. I want to show you how to move the pictures to the gray boxes. You can move pictures from this yellow box to the gray boxes, like this. Touch on the picture in the yellow box; then drag the picture you touched to the gray box where you want to move it. Now you try with this picture.**

After the participant demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

##### **Step 2: Moving Pictures from the Gray Boxes to the Yellow Box**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: You can also move pictures from the gray boxes back to the yellow box, like this. Touch the picture you want to move. Then drag that picture to the yellow box. Now you move the other picture back to the yellow box.**

After the participant demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

##### **Step 3: Moving Pictures between the Gray Boxes**

Read the text above the yellow box on the screen and demonstrate the actions described.

**Say: You can also move the pictures from one gray box to another, like this. First, you touch the picture in one gray box. Then, drag that picture to the gray box where you want the picture to go. Now you try it; move the picture from here to here.**

After the participant demonstrates understanding of this step, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

#### Introduction to the Practice Items

Read the screen: **Now, we're going to play the game. You will see some pictures on the screen. You should remember them and show them back to me in the same way you saw them on the screen.**

When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

The next screen begins the one practice sequence for these ages. The participant has four trials to complete the sequence. If the participant succeeds in four trials or less, the test sequences are presented.

If the participant fails all four trials of the practice sequence, the test is discontinued.

#### Practice Sequence:

Say: **Now, you will see how to Go Camping.** When finished reading, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

As pictures are presented, an audio recording will say the appropriate labels:

First, put up the tent. Then,  
go for a hike. Then, catch a  
fish.  
And last, roast a marshmallow.

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, “**Are you finished?**” Ask this of the participant.

If participant says YES, touch and hold the YES button. If the participant says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

#### Logic:

- If participant gives correct response, Test Item will be presented.
- If participant gives incorrect response, Go Camping will be repeated with an audio recording saying **Let's try that again**. After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Go Camping. Now, you move the pictures in the same way you saw them on the screen.**
- If participant gives incorrect response again, #2 above is repeated up to two additional times (or a total of 4 trials).
- If participant fails all 4 trials, test will discontinue.

Test Sequences:

Participants ages 8+ will be presented with two trials: one with a 15-step sequence and the other with an 18-step sequence.

Read the screen: **Now we are going to play the game with more pictures. This time you will see how to Play in the Park (Form A); Go to the Fair (Form B); Work on the Farm (Form C).**

When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

Test Item (Trial1):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the Park	Form B: Go to the Fair	Form C: Work on the Farm
<ul style="list-style-type: none"><li>• Fly a kite</li><li>• Play in the sand</li><li>• Go down the slide</li><li>• Pull the wagon</li><li>• Swing on the monkey bars</li><li>• Lay out the blanket</li><li>• Play catch</li><li>• Catch a butterfly</li><li>• Kick the ball</li><li>• Take the baby for a walk</li><li>• Draw on the sidewalk</li><li>• Pet the dog</li><li>• Feed the ducks</li><li>• Push the swing</li><li>• Smell a flower</li></ul>	<ul style="list-style-type: none"><li>• Get a hot dog</li><li>• Go for a pony ride</li><li>• Pet the sheep</li><li>• Win a dog show</li><li>• Watch the rodeo</li><li>• Catch a pig</li><li>• Judge the cake</li><li>• See a puppet theater</li><li>• Take a picture of a clown</li><li>• Look at the babies</li><li>• Go on a ride</li><li>• Get some tickets</li><li>• Get some ice cream</li><li>• Play a game</li><li>• Milk a cow</li></ul>	<ul style="list-style-type: none"><li>• Put the cow in the barn</li><li>• Drive the tractor</li><li>• Feed the pig</li><li>• Load the cart</li><li>• Put the carrots in the basket</li><li>• Pick the fruit</li><li>• Fix the fence</li><li>• Cut the sheep's wool</li><li>• Collect the honey</li><li>• Shovel out the barn</li><li>• Peel the corn</li><li>• Chop some wood</li><li>• Collect the eggs</li><li>• Put the blanket on the horse</li><li>• Plant the tomatoes</li></ul>

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the Park (Form A); Go to the Fair (Form B); Work on the Farm (Form C). Now, you move the pictures in the same way you saw them on the screen.**

When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **“Are you finished?”** Ask this of the participant. If participant says YES, touch and hold the YES button. If the participant says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

Read the screen: **Now we're going to do the same pictures with some more pictures added. Everyone is asked to do this more than once.** When finished reading, touch the button at the bottom of the screen that says Touch and Hold Here to Continue.

Test Item (Trial 2):

As the pictures are presented, an audio recording will say appropriate labels:

Form A: Play in the Park	Form B: Go to the Fair	Form C: Work on the Farm
<ul style="list-style-type: none"> <li>• Fly a kite</li> <li>• Play in the sand</li> <li>• Go down the slide</li> <li>• Pull the wagon</li> <li>• Swing on the monkey bars</li> <li>• Lay out the blanket</li> <li>• Play catch</li> <li>• Catch a butterfly</li> <li>• Ride a bike</li> <li>• Row the boat</li> <li>• Read a book</li> <li>• Kick the ball</li> <li>• Take the baby for a walk</li> <li>• Draw on the sidewalk</li> <li>• Pet the dog</li> <li>• Feed the ducks</li> <li>• Push the swing</li> <li>• Smell a flower</li> </ul>	<ul style="list-style-type: none"> <li>• Get a hot dog</li> <li>• Go for a pony ride</li> <li>• Pet the sheep</li> <li>• Win a dog show</li> <li>• Watch the rodeo</li> <li>• Catch a pig</li> <li>• Judge the cake</li> <li>• See a puppet theater</li> <li>• Watch a tractor pull</li> <li>• Play in the band</li> <li>• Go on a hay ride</li> <li>• Take a picture of a clown</li> <li>• Look at the babies</li> <li>• Go on a ride</li> <li>• Get some tickets</li> <li>• Get some ice cream</li> <li>• Play a game</li> <li>• Milk a cow</li> </ul>	<ul style="list-style-type: none"> <li>• Put the cow in the barn</li> <li>• Drive the tractor</li> <li>• Feed the pig</li> <li>• Load the cart</li> <li>• Put the carrots in the basket</li> <li>• Pick the fruit</li> <li>• Fix the fence</li> <li>• Cut the sheep's wool</li> <li>• Cut the wheat</li> <li>• Herd the goats</li> <li>• Put up the scarecrow</li> <li>• Collect the honey</li> <li>• Shovel out the barn</li> <li>• Peel the corn</li> <li>• Chop some wood</li> <li>• Collect the eggs</li> <li>• Put the blanket on the horse</li> <li>• Plant the tomatoes</li> </ul>

After the pictures are presented and as the pictures are scrambled, an audio recording will say: **That's how to Play in the park (Form A); Go to the fair (Form B); Work on the farm (Form C).**

**Now, you move the pictures in the same way you saw them on the screen.** When all pictures have been placed in gray boxes, a pop-up will appear on the screen, **“Are you finished?”** Ask this of the participant. If participant says YES, touch and hold the YES button. If the participant says NO, touch any of the pictures and the pop-up will disappear. If no picture is moved out of a gray box, the pop-up will continue to be on the screen. The pop-up will close if a picture is moved back to the yellow box and will reappear each time all pictures have been placed in gray boxes.

**Logic:**

- Test will terminate after the two test sequences have been presented.

### **C.2.7 NIH Toolbox Oral Reading Recognition Test**

The NIH Toolbox Oral Reading Recognition Test is a measure of reading decoding skills. These skills are part of what are considered crystallized abilities, abilities that are dependent on past learning and exposure to other cultural experiences. To accomplish this, the iPad is paired with a wireless keyboard on which the examiner indicates whether the participant's response is correct or not.

#### **Equipment and materials needed:**

- iPad
- Bluetooth wireless keyboard
- Pronunciation guide

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

#### **Setting up Bluetooth Wireless Keyboard:**

1. Go to the **Settings** app of the iPad and make sure Bluetooth is turned on.
2. Make sure the keyboard is in discovery mode by pressing the round button at the top right end of the keyboard and the small green light to the left of the button begins flashing.
3. Select the keyboard when it appears on the My Devices list on the iPad.
4. When a pop up window appears on the iPad screen, follow the instructions and enter the required code on the keyboard.

The usual keyboard on the iPad will not work when the external keyboard is working. To turn off the external keyboard, press the round button at the top right end of the keyboard, move at least 15 meters from the iPad with the keyboard, or touch the "information" button  on the iPad and touch "forget this device."

#### **Using the Keyboard**

Once the participant pronounces a letter or word, the examiner checks a pronunciation key and types **1** if the pronunciation is correct or **0** if the response is incorrect. After choosing **1** or **0**, the examiner presses the spacebar to move on to the next word or letter.

Ctrl + Shift on the Keyboard is equivalent to the gesture used to STOP an administration on the iPad. Like the iPad, when Ctrl + Shift is entered on the keyboard, a login screen will pop up and ask for the password of the user who started the assessment. As described earlier, three options will appear: resume, skip, and stop.

In this task, the participant is asked to read and pronounce letters and words as accurately as possible. For the youngest children, the initial items may require them to identify the letters in an array with three symbols or to identify a specific letter in an array of four letters. In such cases, an audio file will play, instructing the participant to point out the answer on the iPad screen; the examiner will score the item accordingly using the keyboard, as with all other items. The administration is individualized using a computerized adaptive (CAT) format. This task is

intended for participants 7 years and older, although it can be administered to children as young as age 3, as appropriate.

The test uses age (for participants younger than 18) and education (for participants age 18 and older) to determine which items it initially presents. There is an override in the participant information screen. If an examiner feels that a participant should begin the test at a level higher or lower than that determined by his/her education and age, the examiner should use this feature. One set of instructions is used for all participants.

Each participant will see a series of letters and words presented one at a time on the computer screen. Items are presented in order of difficulty—the computer adjusts the difficulty level of items depending on the participant's performance. The number of items presented will depend on age and performance; for most participants, the measure will last approximately 3 minutes and will contain about 25 items. The computer will administer each item one by one, in an untimed fashion, until the test is completed.

The measure cannot be self-administered; an examiner must record whether each response is correct.

After the participant pronounces a letter or word, the examiner checks a pronunciation key as needed and types 1 if the pronunciation is correct or 0 if the response is incorrect. After choosing 1 or 0, the examiner presses the spacebar to move on to the next word or letter. The examiner can go back and change one prior answer by touching the left arrow on the keyboard and choosing a new answer and then touching the spacebar to activate the next item.

Testing is automatically discontinued if a participant makes seven consecutive errors.

**Note:** It is essential that the examiner thoroughly review and master the pronunciation guide before administering this test. The examiner should not rely on his/her understanding of word pronunciations based on previous experience. Instead, the examiner must adhere to this guide for all item scoring. At the same time, while scoring is strict, it should take into consideration difficulties in pronunciation that can be attributed to dialect or articulation; to the extent that these difficulties are consistent throughout the testing, they should be accepted as correct pronunciations by the examiner.

### C.2.7.1 Oral Reading Recognition Test Instructions Age 3+

Before beginning the test, the wireless keyboard should be paired by Bluetooth with the iPad, if this has not already been done. While administering this measure, the examiner needs to be able to view the iPad and have the keyboard and word list and pronunciation guide easily accessible for scoring participant responses.

The task is introduced with the Title Screen: NIH Toolbox OR 3+.

To check the Bluetooth connection, the examiner is asked at the bottom of the page to: *Press Spacebar to Continue*. Touching the **spacebar** begins the test. If the spacebar does not work, try re-pairing the keyboard or changing the batteries in the keyboard.

Say: **Now I'm going to show you some letters and some words. I want you to read each letter or word out loud. Read each one loud enough so that I can hear you. Some will be easy and some will be hard. Don't worry if you don't know the word or its meaning—just read it out loud the best you can. Let's begin.**

Press spacebar to continue.

When the first item appears, say: **Tell me, what is this letter/word?** (Say whichever is appropriate. This prompt can be repeated as many times as needed.)

After participant answers, the examiner checks a pronunciation guide as needed and types 1 if the participant's pronunciation is correct or 0 if the response is incorrect.

After choosing **1** or **0**, the examiner **presses the spacebar** to move on to the next word or letter. Pressing the spacebar registers the choice in the scoring program; until the spacebar is pressed, the examiner may change his/her choice without having to go back.

If the participant says: *"I don't know this one"* or *"I can't read it"*, say: **It is OK if you don't know the word or what it means—just try to read it as best you can.** This prompt can be used to reassure participants if they refuse to read the letters/words. If, after prompting, a participant refuses to offer a response, mark the item incorrect (**0**) and press the spacebar to move on to the next item.

 The examiner can go back one previous item to change an answer if the participant self-corrects or the examiner realizes a scoring error was made. To do this, press the left arrow on the keyboard, then press 1 or 0 to indicate the score for the item to be corrected item. Then, press the spacebar and the next item will be presented (this may or may not be the same word/letter seen before the left arrow was pressed).

 For the youngest children, the initial items may require them to identify the letters in an array with three symbols or to identify a specific letter in an array of four letters. In such cases, an audio file will play, instructing the participant to point out the answer on the iPad screen; the examiner will score the item accordingly using the keyboard, as with all other items.

### **C.2.8 Oral Symbol Digit Test**

The NIH Toolbox Oral Symbol Digit Test is a brief and easily administered measure of processing speed designed for ages 8 and above. It consists of a “key” of 9 unique symbols, each paired with a number from 1-9, and requires the participant to look at a long series of symbols without numbers and call out orally which number belongs with each symbol. The participant must call out the numbers sequentially and as quickly as possible, looking at a (preferably) laminated sheet, while the examiner records the participant’s response as correct/incorrect directly on the iPad using the touch screen. The test results are automatically scored. The participant has 120 seconds to call out as many correct numbers as he/she can, in order, without skipping any. The test is designed for ages 8 and above, but at the researcher’s/examiner’s discretion, it may be administered to children younger than 8.

#### **Equipment and materials needed:**

- iPad
- Laminated sheet containing key and nine practice items on one side and the key and test items on the other side

#### **General Instructions:**

1. The introductory instructions, practice instructions, and the instructions for completing the test items will be printed on the iPad screen and are to be read by the examiner. The test items themselves are on the laminated sheet that is provided by the examiner to the participant, while the examiner marks each item called out correctly on the iPad screen. The examiner initiates the test and the iPad timer by touching the *START TEST* button.
2. The iPad should face toward the examiner. The participant does not interact with the iPad during this test.
3. All items with the correct answers (144 in total) will appear in “scoring boxes” on the iPad screen. As the participant calls out answers to each item (in order), the examiner touches each the item to mark it as correct, or leaves it unmarked if it is incorrect. Touching the item on the iPad screen adds a check mark by the number. If the examiner makes an error, he/she should simply touch the item again to deselect it.
4. As needed, the examiner should slide his/her finger on the screen to scroll to more items and to score each of them (for legibility, not all 144 items appear on the iPad screen at once, but all are accessible via scrolling; this is manageable because the participant must answer items in the order presented, without skipping any).
5. The participant has 120 seconds to answer as many items as he/she can, in order, without skipping any. At the end of 120 seconds, a tone will sound to alert the examiner and participant that time is up. The examiner should instruct the participant to stop. The examiner may continue recording any items that need to be scored before touching *NEXT* to end the test.

#### **C.2.8.1 NIH Toolbox Oral Symbol Digit Test Instructions Age 8+**

The task is introduced with the Title Screen: NIH Toolbox OSD 8+. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

The first screen will be an instructional screen to be read by the examiner. The examiner should put the laminated sheet in front of the participant, *with the side with the practice items (SIDE 1) facing up*. The examiner should point to this sheet and

**SAY: Please look at the symbols at the top of the page. Each symbol is paired with a number.** (Point to the pairs and show how they are arranged across the row.)

**SAY: Now look here.** (Point to the row of symbols without numbers.) **Here there are symbols but no numbers. I would like you to tell me the number that goes with each symbol like this: You see this symbol** (point to the O), **it is matched with the number 6** (point to the key), **so you would say or tell me “6”; this next symbol** (point to the X), **is paired with an 8** (point), **so you would say or tell me 8. Does this make sense?** Answer any questions if the participant is unsure.

**SAY: Now you try the rest of the row for practice. Remember to say each number out loud so that I can hear you.**

The examiner should provide feedback after each response, indicating whether the response is correct with, **“That’s right,”** or correcting the response when it is wrong. Repeat practice items as necessary until the participant can answer them correctly.

After the participant has completed the practice row, say, **Good. Now that you know how to do this, I am going to ask you to do some more.**

**SAY: Now I will turn over this sheet and you will see more rows which have symbols, but not the numbers that go with them.**

At the bottom of the screen is a button *Touch and Hold Here to Continue. Touch and hold that button to continue to the next screen.*

The examiner should turn over the laminated sheet to SIDE 2 to reveal the test items.

**SAY: When I tell you to begin, I want you to do the rows on this page the same way – tell me the number that goes with each symbol. I want you to work as quickly as you can without skipping any of the boxes or making mistakes. When you are finished with the first row, move on to the next one. Continue working until you hear a bell sound on this iPad and I tell you to stop. If you make a mistake, just tell me the correct answer and keep going. Ready?**

At the bottom of the screen is a button *Touch and Hold Here to Continue. Touch and hold that button to move to the next screen, where you will begin the test.*

On the next screen, the examiner should touch **START TEST** and immediately, say, **Begin.**

As soon as the examiner touches **START TEST**, a timer will begin counting down from 120 seconds at the bottom of the screen (for the examiner’s information only). All items with the correct answers (144 in total) will appear in “scoring boxes” on the iPad screen. As the participant calls out answers to each item, the examiner should touch each item to mark it as correct, or leaves it unmarked if it is incorrect. Touching the item on the iPad screen adds a check mark by the number. If the examiner makes an error, he/she should simply touch the item again to deselect it.

As needed, the examiner should slide his/her finger on the screen to scroll to more items and to score each of them (for legibility, not all 144 items appear on the iPad screen at once, but all are accessible via scrolling).

At the end of 120 seconds, a tone will sound to alert the examiner and participant that time is up. The examiner should instruct the participant to stop. After the tone, a window will pop up on

the iPad screen that says: “Are you finished marking the correct answers from the participant? If you choose no, please touch *NEXT* when you are finished marking correct answers.” The examiner should touch *YES* if he/she has finished scoring items. Otherwise, the examiner should touch *NO* and continue recording any items that need to be scored. When finished scoring, the examiner should touch *NEXT* to end the test.

### **C.2.9 Auditory Verbal Learning Test (Rey)**

The NIH Toolbox Auditory Verbal Learning Test (Rey) is an adaptation of the RAVLT, a brief and easily administered measure of immediate memory and verbal learning. It consists of a list of 15 unrelated words (see list below) that are presented by audio recording on the iPad to the participant at a rate of one word per second. For the Toolbox version of this test, the list is repeated three times. All instructions for the participant appear on the iPad screen and are read by the examiner to the participant. In addition, the examiner records the participant's responses directly on the iPad using the touch screen, and the test results are automatically scored. The test is designed for ages 8 and above, but at the researcher's/examiner's discretion, it may be administered to children younger than 8.

Equipment and materials needed:

- iPad

#### **C.2.9.1 Auditory Verbal Learning Test (Rey) Instructions**

1. The introductory instructions as well as the instructions for each set of words to be played will be printed on the iPad screen and are to be read by the examiner. The words (stimuli) themselves are pre-recorded and will play from the iPad when the examiner touches **PLAY**.
2. The iPad should face toward the examiner. The participant does not interact with the iPad during this test.
3. All 15 words will appear in “scoring boxes” on the iPad screen, below the instructions. Once the audio recording of the words has finished playing, the examiner touches each word the participant says that corresponds to one of the words on the list (there is no score and no penalty for words stated that were not part of the list). Touching the word on the iPad screen adds a check mark by the word. If the examiner makes an error, he/she should simply touch the word again to deselect it.
4. Once the participant has finished recalling words for a trial and the examiner has completed the scoring of the items, the examiner touches **NEXT** to go to the next trial (or to end the test, if on trial 3). Note that **NEXT** will not be active on the screen until the audio recording has finished playing all 15 words in a given trial.
5. Before beginning, make sure the volume is loud enough so that participants can hear the pre-recorded presentation of the words.

The list of words used for the test is: Drum, Curtain, Bell, Coffee, School, Parent, Moon, Garden, Hat, Farmer, Nose, Turkey, Color, House, River.

#### **C.2.9.1.1 Instructions for ages 8+**

Trial 1:

At the top of the screen it will say “Trial 1.”

**SAY: Now we are going to do some memory for words. You will hear a list of words from this iPad. Listen carefully; when the voice stops, you are to repeat back as many words as you can remember. It does not matter in what order you repeat them. Just try to remember as many words as you can. Ready?**

Below these instructions, there are instructions to the examiner, which read: "Press PLAY to start. Then touch each word the participant says (touch again to deselect if needed)."

When the participant is ready, the examiner should touch the *PLAY* button, and the audio recording of the word list will commence from the iPad.

As soon as the participant starts repeating words, the examiner should record each word the participant says by touching the box next to the word on the iPad screen. This requires the examiner to work fast and keep pace with the participant. If the participant says a word that is not on the list, the examiner should ignore it.

After the participant finishes naming words from the first trial, the examiner should touch the *NEXT* button and administer the list two more times with the following instructions:

Trial 2:

**Say: Once again you will hear the same words from this iPad, and again when the voice stops, I want you to tell me as many words as you can remember, whether or not you said them before. Ready?**

The examiner should touch the *PLAY* button on the screen, and the iPad will start the audio with the list of words.

As soon as the participant starts repeating words, the examiner should record each word the participant says by touching the box next to the word on the iPad screen. If the participant says a word that is not on the list, the examiner should ignore it.

After the participant finishes naming words from the second trial, the examiner should touch the *NEXT* button and administer the list two more times with the following instructions:

Trial 3:

**Say: Again, you will hear the same words, and once again when the voice stops, I want you to tell me as many words as you can remember, whether or not you said them before. Ready?**

The examiner should touch the *PLAY* button on the screen, and the iPad will start the audio with the list of words.

As soon as the participant starts repeating words, the examiner should record each word the participant says by touching the box next to the word on the iPad screen. If the participant says a word that is not on the list, the examiner should ignore it.

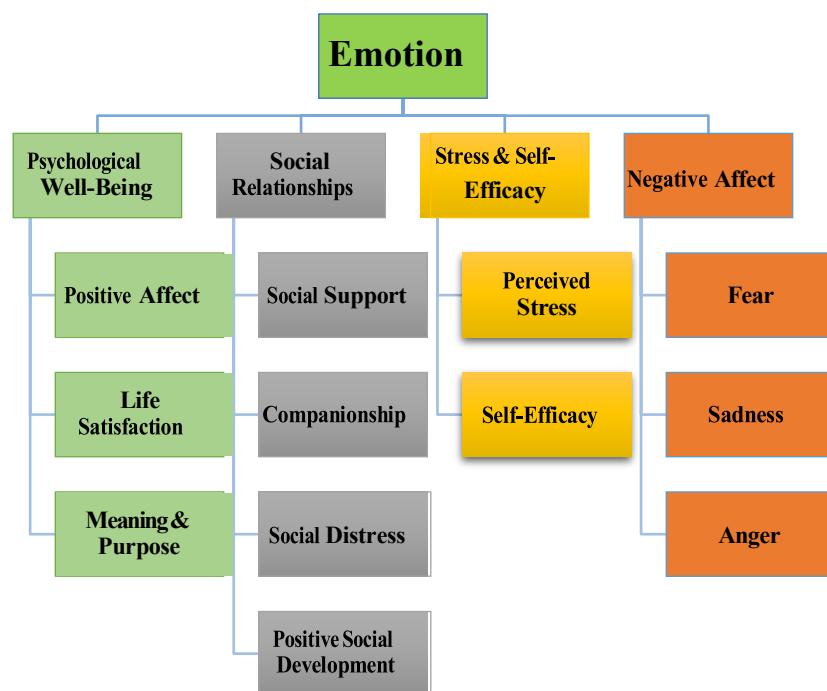
The test ends automatically after three trials.

### C.3 Emotion Domain

Emotion refers to any strong feeling, as of joy, sorrow, or fear. Emotion is an affective state of consciousness in which joy, sorrow, fear, hate, or the like is experienced, as distinguished from cognitive and volitional states of consciousness. Emotions can be negative and distressing, or positive emotions can be reflections of well-being in our lives, and positive social relationships can buffer stress and enhance health.

#### Emotion Domain Framework

NIH Toolbox Emotion consists of four subdomains: *Psychological Well Being*, *Social Relationships*, *Stress & Self Efficacy*, and *Negative Affect*. Each subdomain includes narrower constructs that are measured through appropriate versioned surveys for Adults (over 18); ages 13-17; ages 8-12 (self and parent-report) and ages 3-7 (parent-report only).



**Psychological Well-Being (PWB)** includes both **hedonic** and **eudaimonic** components. **Hedonic constructs** are more subjective and experiential and emphasize pleasure and positive affect (happiness, serenity, and cognitive engagement). **Eudaimonic well-being** is more evaluative and emphasizes fulfillment and purpose (e.g., meaning, life satisfaction).

**Social Relationships** refers to the interactions between two or more people. Dimensions of social relationships include structure, extent and quality.

**Stress & Self-Efficacy** describes individual perceptions about the nature of events and their relationship to the perceived coping resources of an individual.

**Negative Affect** refers to unpleasant feelings or emotions, which exist on a continuum ranging from common and normal feelings of sadness, fear, and anger to more extreme feelings along the same continuum.

### C.3.1 Emotion Constructs

NIH Toolbox Emotion constructs are defined below.

Psychological Well-Being	Definition
<b>Positive Affect</b>	Feelings that reflect a level of pleasurable engagement with the environment such as happiness, joy, excitement, enthusiasm, and contentment.
<b>General Life Satisfaction</b>	One's cognitive evaluation of life experiences; whether people like their lives or not. Life satisfaction includes both general (e.g., my life is going well) and domain-specific (e.g., I am satisfied with my family life) aspects.
<b>Meaning and Purpose</b>	Characterized by the extent to which people feel their life matters or makes sense.
Social Relationships	Definition
<b>Social Support</b>	The extent to which an individual views his/her social relationships as available to provide aid in times of need or when problems arise. It includes instrumental and emotional social support. <i>Emotional Support</i> : perception that people in one's social network are available to listen to one's problems with empathy, caring and understanding. <i>Instrumental Support</i> : perception that people in one's social network are available to provide material or functional aid in completing daily tasks.
<b>Companionship</b>	Characterized by self-reported perceptions of the availability of friends or companions with whom to interact or affiliate (i.e., friendship) and perceptions that one is alone, lonely or socially isolated (i.e., loneliness).
<b>Social Distress</b>	The extent to which an individual perceives his/her daily interactions as negative or distressing.
<b>Positive Social Development</b>	Characterized by parents' evaluation of their children's empathic behaviors.
Stress & Self Efficacy	Definition
<b>Perceived Stress</b>	Individual perceptions about the nature of events and their relationship to the values and coping resources of an individual.
<b>Self-Efficacy</b>	A person's belief in their capacity to manage their functioning and have control over meaningful events.
Negative Affect	Definitions
<b>Fear</b>	Characterized by symptoms of anxiety that reflect autonomic arousal and perceptions of threat.
<b>Sadness</b>	Distinguished by low levels of positive affect and comprised of symptoms that are primarily affective (poor mood) and cognitive (negative perceptions of self, the world, and the future) indicators of depression.
<b>Anger</b>	Characterized by attitudes of hostility and cynicism and is often associated with experiences of frustration impeding goal-directed behavior.

## Emotion Measure Formats

Each emotion measure is administered in either a computerized adaptive testing (CAT) or fixed form (FF) format:

**CATs** – Emotion CATs begin with a standard item (specific to that measure) and then select items to administer based on a respondent's previous answers. An algorithm is utilized to determine which item should be administered next. NIH Toolbox instruments, which use CAT as an administration method, are often referred to as Banks. CATS are usually 4-6 items long.

**Fixed Forms (FFs)** – fixed length form with all items administered in a set (sequential) order.

## Self- versus Proxy-Report

All Emotion items are presented in a *self-report* (i.e., the respondent answers questions about him/herself) or in a *proxy (parent)-report* (i.e., the respondent answers questions about someone else) format:

**Pediatric self-report** – measures completed by the participant, ages 8-17.

**Adult self-report** – measures completed by adult participants 18+ years of age.

**Parent report** – measures completed by parents for children ages 3-12.

## Time to administer

All individual emotion measures take approximately 1-2 minutes to complete.

## Emotion Batteries

The NIH Toolbox App includes 5 preset batteries: *NIH Toolbox Emotion Battery (age 18+)*, *NIH Toolbox Emotion Battery (ages 8-12)*, *NIH Toolbox Emotion Battery (ages 13-17)*, *NIH Toolbox Emotion Parent Report Battery (ages 3-7)*, and *NIH Toolbox Emotion Parent Report Battery (ages 8-12)*.

Users wishing to select specific measures or create custom batteries can find the complete list of available measures on [NIHToolbox.org](http://NIHToolbox.org).

 There are two versions of NIH Toolbox Emotion instructions: NIH Toolbox Emotion Instructions (Adult/Child) and NIH Toolbox Emotion Instructions (Parent Report). When using individual instruments to set up an assessment or build a custom battery, users must select the correct version to precede Emotion instruments. All preset Emotion batteries include appropriate instructions.

### **C.3.2 General Instructions**

The participant answers emotion measures at his/her own speed. An examiner need not be involved. After a question is answered, the screen advances automatically to the next question. All measures for the youngest age group (3-7) are parent (proxy) report measures. On these measures, the proxy (parent or guardian) responds to questions about the child according to how he/she thinks the child is doing.

For 8-12 year old children, measures come in both self- and parent-report versions. For ages 13+, only self-report measures are available.

### **C.3.3 NIH Toolbox Emotion Age-Specific Instructions and Instruments**

Self-report and parent-report instruments have slightly different instructions **on the screen**; these are given below:

#### NIH Toolbox Participant Instructions for Self-Report Measures (Children and Adults):

**“On the next screens, we will ask you questions about your thoughts, feelings and behaviors. Read each question carefully and answer as well as you can. There is no right or wrong answer, only what is true for you and describes your thoughts, feelings, and behaviors.**

**“Select an answer by touching your answer choice on the screen. After you make your choice, the computer will automatically go on to the next question. If you want to change your answer, touch the GO BACK button to return to the question, then touch a different answer choice.”**

A button at the bottom of the screen says: *Touch and Hold Here to Continue.*

The content and order of measures within the self-report batteries are shown in the following tables.

### C.3.3.1 NIH Toolbox Emotion Battery (age 18+)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions (Adult/Child)	--
NIH Toolbox Positive Affect CAT Age 18+ v2.0	CAT
NIH Toolbox General Life Satisfaction CAT Age 18+ v2.0	CAT
NIH Toolbox Meaning and Purpose CAT Age 18+ v2.0	CAT
NIH Toolbox Emotional Support FF Age 8+ v2.0	8
NIH Toolbox Instrumental Support FF Age 18+ v2.0	8
NIH Toolbox Friendship FF Age 8+ v2.0	8
NIH Toolbox Loneliness FF Age 8+ v2.0	5
NIH Toolbox Perceived Rejection FF Age 8+v2.0	8
NIH Toolbox Perceived Hostility FF Age 8+ v2.0	8
NIH Toolbox Self-Efficacy CAT Age 18+ v2.0	CAT
NIH Toolbox Perceived Stress FF Age 18+ v2.0	10
NIH Toolbox Fear-Affect CAT Age 18+ v2.0	CAT
NIH Toolbox Fear-Somatic Arousal FF Age 18+ v2.0	6
NIH Toolbox Sadness CAT Age 18+ v2.0	CAT
NIH Toolbox Anger-Affect CAT Age 18+ v2.0	CAT
NIH Toolbox Anger-Hostility FF Age 18+ v2.0	5
NIH Toolbox Anger-Physical Aggression FF Age 18+ v2.0	5
NIH TB Meaning and Purpose FF Age 18+	8
NIH TB Positive Affect FF Age 18+	15
NIH TB Anger-Affect FF Age 18+ v1.1	5
NIH TB Fear-Affect FF Age 18+	6
NIH TB Apathy FF Age 18+ v2.0	7
NIH TB General Life Satisfaction FF Age 18+	?
NIH TB Positive Affect FF Ages 8-17 v2.0	9
NIH TB Domain-Specific Life Satis. FF Age 18+	13

### C.3.3.2 NIH Toolbox Emotion Battery (Ages 8-12)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions (Adult/Child)	--
NIH Toolbox Positive Affect FF Ages 8-12 v2.0	9
NIH Toolbox General Life Satisfaction FF Ages 8-12 v2.0	5
NIH Toolbox Emotional Support FF Age 8+ v2.0	7
NIH Toolbox Friendship FF Age 8+ v2.0	5
NIH Toolbox Loneliness FF Age 8+ v2.0	7

NIH Toolbox Perceived Rejection FF Age 8+ v2.0	5
NIH Toolbox Perceived Hostility FF Age 8+ v2.0	5
NIH Toolbox Self-Efficacy CAT Ages 8-12 v2.0	CAT
NIH Toolbox Anger-Affect FF Ages 8-17 v2.0	5
NIH Toolbox Sadness FF Ages 8-17 v2.0	8
NIH Toolbox Fear FF Ages 8-17 v2.0	8
NIH TB Positive Affect FF Ages 8-17 v2.0	9
NIH TB Emotion Control FF Ages 8-17	10
NIH TB Maternal Relationship FF Ages 8-17	3
NIH TB Paternal Relationship FF Ages 8-17	3
NIH TB Emotion Control Parent Rpt FF Ages 8-12	10
NIH TB Sadness Parent Rpt FF ages 8-12	11
NIH TB Domain-Specific Life Satis. FF Ages 8-17	7

### C.3.3.3 NIH Toolbox Emotion Battery (Ages 13-17)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions (Adult/Child)	--
NIH Toolbox Positive Affect CAT Ages 13-17 v2.0	CAT
NIH Toolbox General Life Satisfaction CAT Ages 13-17 v2.0	CAT
NIH Toolbox Emotional Support FF Age 8+ v2.0	7
NIH Toolbox Friendship FF Age 8+ v2.0	5
NIH Toolbox Loneliness FF Age 8+ v2.0	7
NIH Toolbox Perceived Rejection FF Age 8+ v2.0	5
NIH Toolbox Perceived Hostility FF Age 8+ v2.0	5
NIH Toolbox Self-Efficacy CAT Ages 13-17 v2.0	CAT
NIH Toolbox Perceived Stress FF Ages 13-17 v2.0	10
NIH Toolbox Anger-Affect FF Ages 8-17 v2.0	5
NIH Toolbox Sadness FF Ages 8-17 v2.0	8
NIH Toolbox Fear FF Ages 8-17 v2.0	8
NIH TB General Life Satisfaction FF Age 13-17	?
NIH TB Domain-Specific Life Satis. FF Ages 8-17	7
NIH TB Positive Affect FF Ages 8-17 v2.0	9
NIH TB Emotion Control FF Ages 8-17	10
NIH TB Maternal Relationship FF Ages 8-17	3
NIH TB Paternal Relationship FF Ages 8-17	3

NIH Toolbox Emotion Instructions (Parent Report):

**“On the next screens, you will see questions about your child’s feelings and behaviors. Read each question carefully and answer as best you can. Please consider each question by itself and choose an answer that you believe honestly shows how your child feels and acts.**

**Select an answer by touching the answer choice on the screen. After you make your choice, the computer will automatically go on to the next question. If you want to change your answer, touch the GO BACK button to return to the question, then touch a different answer choice.”**

A button at the bottom of the screen says: *Touch and Hold Here to Continue.*

The content and order of measures within the parent report batteries are shown in the following tables.

#### C.3.3.4 NIH Toolbox Emotion Parent Report Battery (ages 3-7)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions(Parent Report)	--
NIH Toolbox Positive Affect Parent Report CAT Ages 3-7 v2.0	CAT
NIH Toolbox General Life Satisfaction Parent Report FF Ages 3-12 v2.0	5
NIH Toolbox Positive Peer Interaction Parent Report FF Ages 3-12 v2.0	4
NIH Toolbox Social Withdrawal Parent Report FF Ages 3-12 v2.0	4
NIH Toolbox Peer Rejection Parent Report FF Ages 3-12 v2.0	9
NIH Toolbox Empathic Behaviors Parent Report CAT Ages 3-12 v2.0	CAT
NIH Toolbox Fear-Over Anxious Parent Report FF Ages 3-7 v2.0	6
NIH Toolbox Fear-Separation Anxiety Parent Report FF Ages 3-7 v2.0	7
NIH Toolbox Sadness Parent Report FF Ages 3-7 v2.0	7
NIH Toolbox Anger Parent Report FF Ages 3-7 v2.0	9
NIH TB Pos. Parent Relat. Parent Rpt FF Ages 3-12	5
NIH TB Sibling Rejection Parent Rpt FF Ages 3-12	9
NIH TB Positive Affect Parent Rpt FF Ages 3-12	9
NIH TB Dom-Spec Life Satis Parent Rpt FF Ages 3-12	7

#### C.3.3.5 NIH Toolbox Emotion Parent Report Battery (ages 8-12)

Instrument name	CAT or # of Items in Fixed Form
NIH Toolbox Emotion Instructions (Parent Report)	--
NIH Toolbox Positive Affect Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox General Life Satisfaction Parent Report FF Ages 3-12 v2.0	5
NIH Toolbox Perceived Stress Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox Self-Efficacy Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox Positive Peer Interaction Parent Report FF Ages 3-12 v2.0	4
NIH Toolbox Social Withdrawal Parent Report FF Ages 3-12 v2.0	4
NIH Toolbox Peer Rejection Parent Report FF Ages 3-12 v2.0	9
NIH Toolbox Empathic Behaviors Parent Report CAT Ages 3-12 v2.0	CAT
NIH Toolbox Fear Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox Sadness Parent Report CAT Ages 8-12 v2.0	CAT
NIH Toolbox Anger Parent Report CAT Ages 8-12 v2.0	CAT
NIH TB Pos. Parent Relat. Parent Rpt FF Ages 3-12	5
NIH TB Sibling Rejection Parent Rpt FF Ages 3-12	9
NIH TB Positive Affect Parent Rpt FF Ages 3-12	9
NIH TB Dom-Spec Life Satis Parent Rpt FF Ages 3-12	7



When using preset batteries, correct instructions will be included automatically. When using individual instruments to set up an assessment or build a custom battery, users must select the correct version to precede Emotion instruments. There are two versions of NIH Toolbox instructions: NIH Toolbox Emotion Instructions (Adult/Child) and NIH Toolbox Emotion Instructions (Parent Report).

### C.3.4 Emotion measures available in the NIH Toolbox App

Sub-domain	Construct	NIH Toolbox Measure	CAT or # of Items in FF
<b>ADULT (18+) SELF-REPORT</b>			
	Positive Affect	NIH Toolbox Positive Affect CAT Age 18+ v2.0	CAT
	General Life Satisfaction	NIH Toolbox General Life Satisfaction CAT Age 18+ v2.0	CAT
	Meaning & Purpose	NIH Toolbox Meaning and Purpose CAT Age 18+ v2.0	CAT
<b>PEDIATRIC (13-17) SELF REPORT</b>			
	Positive Affect	NIH Toolbox Positive Affect CAT Ages 13-17 v2.0	CAT
	General Life Satisfaction	NIH Toolbox General Life Satisfaction CAT Ages 13-17	CAT
<b>PEDIATRIC (8-12) SELF REPORT</b>			
	Positive Affect	NIH Toolbox Positive Affect FF Ages 8-12 v2.0	9
	General Life Satisfaction	NIH Toolbox General Life Satisfaction FF Ages 8-12	5
<b>PEDIATRIC (8-12) PARENT REPORT</b>			
	Positive Affect	NIH Toolbox Positive Affect Parent Report CAT Ages 8-12 v2.0	CAT
	General Life Satisfaction	NIH Toolbox General Life Satisfaction Parent Report FF Ages 3-12	5
<b>PEDIATRIC (3-7) PARENT REPORT</b>			
	Positive Affect	NIH Toolbox Positive Affect Parent Report CAT Ages 3-7 v2.0	CAT
	General Life Satisfaction	NIH Toolbox General Life Satisfaction Parent Report FF Ages 3-12	5

<b>ADULT (18+) SELF-REPORT</b>			
Social Support	NIH Toolbox Emotional Support Fixed Form Age 18+ v2.0		8
	NIH Toolbox Instrumental Support Fixed Form Age 18+ v2.0		8
Companionship	NIH Toolbox Loneliness FF Age 18+ v2.0		5
	NIH Toolbox Friendship FF Age 18+ v2.0		8
Social Distress	NIH Toolbox Perceived Hostility FF Age 18+ v2.0		8
	NIH Toolbox Perceived Rejection FF Age 18+ v2.0		8
<b>PEDIATRIC (8-17) SELF REPORT</b>			
Social Support	NIH Toolbox Emotional Support FF Ages 8-17 v2.0		7
	NIH Toolbox Loneliness FF Ages 8-17 v2.0		7
Companionship	NIH Toolbox Friendship FF Ages 8-17 v2.0		5
	NIH Toolbox Perceived Hostility FF Ages 8-17 v2.0		5
Social Distress	NIH Toolbox Perceived Rejection FF Ages 8-17 v2.0		5
	NIH Toolbox Peer Rejection Parent Report FF Ages 3-12 v2.0		9
<b>PEDIATRIC (3-12) PARENT REPORT</b>			
Companionship	NIH Toolbox Social Withdrawal Parent Report FF Ages 3-12 v2.0		4
	NIH Toolbox Positive Peer Interaction Parent Report FF Ages 3-12 v2.0		4
Social Distress	NIH Toolbox Peer Rejection Parent Report FF Ages 3-12 v2.0		9
	NIH Toolbox Empathic Behaviors Parent Report CAT Ages 3-12 v2.0		CAT

STRESS & SELF-EFFICACY	Adult (18+) Self Report		
	Perceived Stress	NIH Toolbox Perceived Stress FF Age 18+ v2.0	10
	Self-Efficacy	NIH Toolbox Self-Efficacy CAT Age 18+ v2.0	CAT
	Pediatric (13-17) Self Report		
	Perceived Stress	NIH Toolbox Perceived Stress FF Ages 13-17 v2.0	10
	Self-Efficacy	NIH Toolbox Self-Efficacy CAT Ages 13-17 v2.0	CAT
	Pediatric (8-12) Self Report		
	Self-Efficacy	NIH Toolbox Self-Efficacy CAT Ages 8-12 v2.0	CAT
	Pediatric (8-12) Parent Report		
	Perceived Stress	NIH Toolbox Perceived Stress Parent Report CAT Ages 8-12 v2.0	CAT
	Self-Efficacy	NIH Toolbox Self-Efficacy Parent Report CAT Ages 8-12 v2.0	CAT

NEGATIVE AFFECT	Adult (18+) Self Report		
	Anger	NIH Toolbox Anger - Affect CAT Age 18+ v2.0	CAT
		NIH Toolbox Anger - Hostility FF Age 18+ v2.0	5
		NIH Toolbox Anger - Physical Aggression FF Age 18+ v2.0	5
	Fear	NIH Toolbox Fear - Affect CAT Age 18+ v2.0	CAT
		NIH Toolbox Fear - Somatic Arousal FF Age 18+ v2.0	6
	Sadness	NIH Toolbox Sadness CAT Age 18+ v2.0	CAT
	Pediatric (8-17) Self Report		
	Anger	NIH Toolbox Anger - Affect FF Ages 8-17 v2.0	6
	Fear	NIH Toolbox Fear FF Ages 8-17 v2.0	8
	Sadness	NIH Toolbox Sadness FF Ages 8-17 v2.0	8
	Pediatric (8-12) Parent Report		
	Anger	NIH Toolbox Anger Parent Report CAT Ages 8-12 v2.0	CAT
	Fear	NIH Toolbox Sadness Parent Report CAT Ages 8-12 v2.0	CAT
	Sadness	NIH Toolbox Fear Parent Report CAT Ages 8-12 v2.0	CAT
	Pediatric (3-7) Parent Report		
	Anger	NIH Toolbox Anger Parent Report FF Ages 3-7 v2.0	9
	Fear	NIH Toolbox Fear - Over Anxious Parent Report FF Ages 3-7 v2.0	6
		NIH Toolbox Fear - Separation Anxiety Parent Report FF Ages 3-7 v2.0	7
	Sadness	NIH Toolbox Sadness Parent Report FF Ages 3-7 v2.0	7

\*CATs are typically 4-6 items in length

### C.3.4.1 Supplemental Emotion Measures

Supplemental emotion measures represent instruments that are not part of any of the preset (standard) Emotion batteries. Supplemental measures include alternate formats (e.g. fixed length form versus CAT) of standard emotion instruments as well as additional measures.

Instrument Name	CAT or # of Items in Fixed Form
NIH TB Meaning and Purpose FF Age 18 +	8
NIH TB Positive Affect FF Age 18+	15
NIH TB Positive Affect FF Ages 8-12	9
NIH TB Emotion Control FF Ages 8-17	10
NIH TB Maternal Relationship FF Ages 8-17	3
NIH TB Paternal Relationship FF Ages 8-17	3
NIH TB Anger-Affect FF Age 18+ v1.1	5
NIH TB Fear-Affect FF Age 18+	29
NIH TB Sadness FF Age 18+	8
NIH TB Emotion Control Parent Rpt FF Ages 8-12	10
NIH TB Pos. Parent Relat. Parent Rpt FF Ages 3-12	5
NIH TB Sibling Rejection Parent Rpt FF Ages 3-12	9
NIH TB Positive Affect Parent Rpt FF Ages 3-12	9
NIH TB Sadness Parent Rpt FF ages 8-12	11
NIH TB Dom-Spec Life Satis Parent Rpt FF Ages 3-12	7
NIH TB General Life Satisfaction FF Age 13-17	5
NIH TB General Life Satisfaction FF Age 18+	4
NIH TB Domain-Specific Life Satis. FF Age 18+	13
NIH TB Domain-Specific Life Satis. FF Ages 8-17	7



Many NIH Toolbox Emotion Measures include items drawn from existing measures. These were used with their author's permission. Sources of items can be found on the NIH Toolbox website: [www.nihtoolbox.org](http://www.nihtoolbox.org).

#### C.4 Motor Domain

Motor function is the ability to use and control muscles and movements. Motor performance includes voluntary control of both fine and gross motor functions including dexterity, strength, balance, locomotion and endurance. Motor performance also requires the interaction of multiple body systems including the nervous, muscular, cardiovascular, and sensory-perceptual systems.

Motor Constructs	Definition
<b>Dexterity</b>	Dexterity is the coordination of small muscle movements that occur in body parts, such as the ability to coordinate fingers to manipulate objects quickly and accurately. It is measured by the <a href="#">NIH Toolbox 9-Hole Pegboard Dexterity Test</a> .
<b>Strength</b>	Strength refers to a muscle's ability to generate force against physical objects. Measuring handgrip assesses how strong one's hand grip is, which in turn provides a good approximation of overall muscle strength. It is measured by the <a href="#">NIH Toolbox Grip Strength Test</a> .
<b>Balance</b>	Balance refers to the ability to orient the body in space, maintain an upright posture under both static and dynamic conditions, and move and walk without falling. It is measured by the <a href="#">NIH Toolbox Standing Balance Test</a> .
<b>Locomotion</b>	Locomotion refers to the act of moving from one place to the other place, reflecting ambulation ability including walking distance, velocity, and quality of the gait over different environments and ground surfaces. It is assessed by the <a href="#">NIH Toolbox 4-Meter Walk Gait Speed Test</a> .
<b>Endurance</b>	Endurance refers to how long a person can perform a particular activity requiring cardiopulmonary function, biomechanical and neuromuscular function at a particular intensity. Endurance assesses overall cardiovascular endurance. It is measured by the <a href="#">NIH Toolbox 2-Minute Walk Endurance Test</a> .

Motor Battery Instruments	Ages	Time to Administer (minutes)
NIH Toolbox 9-hole Pegboard Dexterity Test	3-85	4
NIH Toolbox Grip Strength Test	3-85	3
NIH Toolbox Standing Balance Test	3-85	7
NIH Toolbox 4 Meter Walk Gait Speed Test	7-85	3
NIH Toolbox 2-Minute Walk Endurance Test	3-85	4

 The “**Time to Administer (minutes)**” column gives users an idea of how long each test might take; however, please note that testing times could vary based on how prepared the test administrator is going into the session, individual differences among participants, as well as other unplanned activities that may occur during testing.

### **C.4.1 NIH Toolbox 9-Hole Pegboard Dexterity Test**

The NIH Toolbox 9-Hole Pegboard Dexterity Test assesses fine motor dexterity. Dexterity is a central component of hand function and relates to both the speed and accuracy of hand movements during the manipulation of objects. In this task, a nine-hole pegboard is used to assess dexterity and the data are recorded using an on-screen timer on the iPad. The protocol includes one practice and one timed trial with each hand.

#### **Equipment and materials needed:**

- iPad
- Jamar® (or Rolyan) 9-Hole Peg Test kit
- Jamar® 9-Hole Peg Test kit replacement pegs

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

#### **Set-up:**

1. Place the pegboard on the table, positioning it in front and at the center of the participant's body. Place the cup with the 9 pegs on the side of the hand being tested.
2. The participant may use the hand not being tested to stabilize the board.
3. Make sure the hand being tested is flat on the table (palm down) until the administrator says **Go**.
4. Use a placemat or piece of rubber shelving to keep the pegboard from slipping on the table. This is a suggestion, but is not required.
5. All instructions as well as data screens are on the iPad.



#### **C.4.1.1 9-Hole Pegboard Test Instructions for Ages 3+**

The task is introduced with the Title Screen: *NIH Toolbox 9-Hole Pegboard Dexterity Test 3+*. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

**Handedness:** If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to [Appendix 3](#) for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that “RIGHT” or “LEFT” is displayed where appropriate.

Follow the set-up instructions outlined on the screen:

Place the pegboard on the table, positioning it in front and at the center of the participant’s body. Place the cup with the 9 pegs on the side of the hand being tested. The hand not being tested can be used to stabilize the board. The hand being tested should be flat on the table (palm down) until the administrator says **Go**.

At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

Say: **In this activity we are going to see how fast you work with your hands. You are going to use your RIGHT (or LEFT, as appropriate) hand only** (point to hand if needed for understanding), and then you will do it again with your LEFT (or RIGHT, as appropriate) hand (point to hand if needed).

Show participant the pegboard and say: **This is a pegboard and these are the pegs. All the pegs are the same. Pick up the pegs one at a time using your (RIGHT (or LEFT, as appropriate) hand only** (point to hand if needed). **Put them in the holes one at a time until all 9 holes are filled. Then take them all out, one at a time, like this.**

The examiner demonstrates the task and says as he/she is working: **The pegs can be put in the holes or taken out in any order. I have extra pegs, so if you drop a peg, don’t go after it. I’ll put in another one.**

At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

Dominant Hand Practice:

Have participant start with his/her hand flat on table beside pegboard. Remind participant that non-dominant hand can be used to stabilize board and continue: **Let’s practice with your RIGHT (or LEFT, as appropriate) hand** (point to hand if needed). **You can use your other hand to hold the board in place.**

At the bottom of the screen, it says: *Right (or Left as appropriate) Hand Practice* and there is a timer with *START* and *RESET* buttons.

Say: **Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as you say '**GO**'. As participant is placing the final peg, say: **And take them out**.

Touch the **STOP** button as soon as the final peg is placed back in the cup. After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

There is a **RESET** button if, for some reason, the participant needs to start again. If this happens, the examiner should touch **RESET** and confirm his/her choice in the pop-up window. Start the trial over again, removing all the pegs before starting.

Test Trial (dominant hand):

Say: **Now I will time how fast you can do this. Pick up the pegs one at a time using only your **RIGHT** (or **LEFT**, as appropriate) hand. Put them in the holes, one at a time, until all 9 holes are filled. Then take them all out, one at a time. The pegs can be put in the holes or taken out in any order. Remember to work as fast as you can.**

Have participant start with his/her hand flat on table beside pegboard.

At the bottom of the screen, it says: *Right (or Left as appropriate) Hand Trial* and there is a timer with **START** and **RESET** buttons.

Say: **Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as you say '**GO**'. As participant is placing the final peg, say: **And take them out**.

Touch the **STOP** button as soon as the final peg is placed back in the cup. After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

There is a **RESET** button if, for some reason, the participant needs to start again. If this happens, the examiner should touch **RESET** and confirm your choice in the pop-up window. Start the trial over again, removing all the pegs before starting.

Non-Dominant Hand Practice:

Turn pegboard around so that the cup with the pegs is on the side of the non-dominant hand.

Read: **Now we are going to do the same thing with your other hand. Again, pick up the pegs one at a time using only your **LEFT** (or **RIGHT**, as appropriate) hand (point to hand if needed). Put them in the holes, one at a time, until all 9 holes are filled. Then take them all out, one at a time. The pegs can be put in the holes or taken out in any order.**

Have participant start with his/her hand flat on table beside pegboard. Remind participant that dominant hand can be used to stabilize board and continue: **Let's practice.**

**Remember, you can use your other hand to hold the board in place.**

At the bottom of the screen, it says: *Right (or Left as appropriate) Hand Practice* and there is a timer with **START** and **RESET** buttons.

Say: **Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as you say '**GO**'. As participant is placing the final peg, say: **And take them out**.

Touch the **STOP** button as soon as the final peg is placed back in the cup. After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

There is a *RESET* button if, for some reason, the participant needs to start again. If this happens, the examiner should touch *RESET* and confirm your choice in the pop-up window. Start the trial over again, removing all the pegs before starting.

Test Trial (non-dominant hand):

**Say: Now I will time how fast you can do this. Pick up the pegs one at a time using only your LEFT (or RIGHT, as appropriate) hand. Put them in the holes, one at a time, until all 9 holes are filled. Then take them all out, one at a time. The pegs can be put in the holes or taken out in any order. Remember to work as fast as you can.**

Have participant start with his/her hand flat on table beside pegboard.

At the bottom of the screen, it says: *Right* (or *Left* as appropriate) *Hand Trial* and there is a timer with *START* and *RESET* buttons.

**Say: Are you ready? 3, 2, 1, Go!**

Make sure to touch the **START** button as soon as you say 'GO'. As participant is placing the final peg, say: **And take them out.**

Touch the **STOP** button as soon as the final peg is placed back in the cup. After timer stops, touch the **NEXT** button and confirm your choice in the pop-up window.

There is a *RESET* button if, for some reason, the participant needs to start again. If this happens, the examiner should touch *RESET* and confirm your choice in the pop-up window. Start the trial over again, removing all the pegs before starting.

Test ends.

### C.4.2 NIH Toolbox Grip Strength Test

This is a measure of upper extremity muscle strength that makes use of a dynamometer. It was originally adapted from the protocol of the American Society of Hand Therapy. The results are recorded on the iPad screen.

#### Equipment and materials needed:

- iPad
- Jamar® Plus+ (or Rolyan) Digital Hand Dynamometer

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

#### Set-up:

Before beginning, be sure the dynamometer is turned on.

The handle for gripping the dynamometer is adjustable, but should be initially set at the notch second closest to the unit (touch information button for picture).

Before each trial, press *RESET* button and then *TEST* button on the dynamometer to record the grip strength (force).



Support the dynamometer for the participant and ensure the participant is holding the arm being tested next to but not touching his/her side, with elbow bent at 90 degrees.



#### Procedure:

The testing involves one practice trial with each hand, followed by one test trial with each hand. The alternation allows the hand to recover strength between exertions.

#### C.4.2.1 Grip Strength Test Instructions Ages 3+

The task is introduced with the Title Screen: *NIH Toolbox Grip Strength Test 3+*. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

**Handedness:** If this was not entered during registration, the iPad app will not allow this test to be administered. Instead, the examiner will need to ask a set of questions to ascertain handedness and to enter it in the participant registration screen. Please refer to [Appendix 3](#) for details.

Once handedness is entered in the participant registration screen, it will automatically update the instructions on the test so that “RIGHT” or “LEFT” is displayed where appropriate.

Follow the set-up instructions outlined in the Grip Strength Introduction and on the iPad screen, specifically:

1. Before beginning, be sure to turn on the dynamometer.
2. The hand for gripping the dynamometer is adjustable, but should be set at the notch second closest to the unit (touch information button for picture).
3. Before each trial, press **RESET** button and then **TEST** button on the dynamometer to record the grip strength (force).
4. Have the participant sit down in the chair so his/her feet are on the floor or foot plate of the wheelchair and his/her knees are at a 90-degree angle.
5. Support the dynamometer for the participant and ensure that the participant is holding the arm being tested at a 90-degree angle, **next to but not touching** his/her body.

Touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

Say: **We will use this machine (show dynamometer) to measure how strong your hands are. You will squeeze the handle 2 times (one practice and one test trial) with each hand while your arm is against your side (see note below) and your elbow is bent like this (demonstrate 90 degrees). The handle won't move, but the machine will show how hard you squeezed. (Press *RESET* and *TEST*, then squeeze to demonstrate). See? (Show participant the force measurement.) Do you have any questions?**

After the participant demonstrates understanding, touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*.

**NOTE**

“Against your side” means next to but not touching your body.

Practice (*dominant hand*):

Press *RESET* and *TEST*.

Say: **Let's practice with your RIGHT (or LEFT as appropriate) hand** (point to hand if needed). **When I say 'squeeze,' I want you to squeeze the handle hard, but not as hard as you can.** (Support dynamometer.)

Continue: **Ready? 3-2-1-squeeze.** After 3-4 seconds, say: **Stop.**

Press *RESET* and *TEST* on dynamometer before continuing.

Practice (*non-dominant hand*):

Continue: **Now we're going to practice with your RIGHT (or LEFT as appropriate) hand** (point to hand if needed). **When I say 'squeeze,' I want you to squeeze the handle hard, but not as hard as you can.** (Support dynamometer.)

Continue: **Ready? 3-2-1-squeeze.** After 3-4 seconds, say: **Stop.**

Press **RESET** and **TEST** on dynamometer before continuing.

Test Trial (*dominant hand*):

Say: **Now we're going to test each hand, beginning with your RIGHT (or LEFT as appropriate) hand. When I say 'squeeze,' this time I want you to squeeze the handle as hard as you can.**

Support dynamometer during testing. Continue: **Ready? 3-2-1-squeeze! Harder, harder, harder!** After 3-4 seconds, say: **Stop.**

Record force to nearest tenth of a pound on the iPad screen.

Press **RESET** and **TEST** on dynamometer before next trial.

Touch **Next** button to record the data and move to non-dominant hand test trial.

Test Trial (*non-dominant*):

Say: **Now we're going to test your LEFT (or RIGHT as appropriate) hand (point to hand if needed). When I say 'squeeze,' this time I want you to squeeze the handle as hard as you can.**

Support dynamometer during testing. Continue: **Ready? 3-2-1-squeeze! Harder, harder, harder!** After 3-4 seconds, say: **Stop.**

Record force to nearest tenth of a pound on the iPad screen.

Touch **Next** button to record the data and end the test.

Turn off dynamometer when testing is completed.

### **C.4.3 NIH Toolbox Standing Balance Test**

This task is designed to assess postural sway and to determine participants' vestibulo-spinal function. Children ages 3-6 are asked to complete the first four poses; participants, ages 7-85 years, are asked to complete all five poses.

There are exclusion rules for participants who are not tested by a trained professional. These are:

- Weight over 250 pounds
- Diabetes, depending on comfort
- Joint replacement(s), depending on comfort
- Previous stroke
- Parkinson's disease
- Dizziness/vertigo
- Fallen in the last 6 months more than one time not as a result of an accident
- Multiple sclerosis
- Macular degeneration
- Glaucoma
- Cataracts
- Pregnancy

#### **Equipment and materials needed:**

- iPad
- iPod Touch (6<sup>th</sup> generation or later) or iPhone (iPhone 8 Plus, XR, or more recent models)
  - If collecting data for a study, it is strongly recommended to use the same iPod or iPhone device for the duration of the study.
- The BalancePod app, installed on the iPod Touch or iPhone. BalancePod is available at no additional cost through the App Store.
- Griffin Survivor protective case or similar
- AIREX Balance Pad Elite
- Scott Gait Belt w/Velcro
- Sanitary booties

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5.](#)

#### **Set-up:**

This task requires the examiner to set up the equipment before the participant arrives.

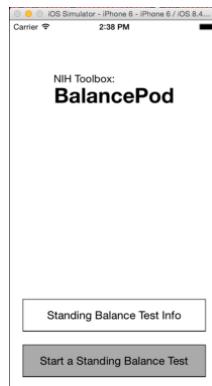
Ensure the batteries on the devices are fully charged prior to the participant's arrival. Always use the latest iOS and app versions on all devices. This can be done using the following steps in the Settings menu (not in Control Center) of both devices:

- a. Turn OFF Bluetooth.
- b. Turn ON Airplane mode.
- c. Turn ON Wi-Fi.
- d. Go to Wi-Fi > Your Network > and tap Forget This Network.  
Repeat this step as long as iOS keeps auto joining networks.

- e. Go to Settings – General – Background App Refresh - OFF
- f. Run latest NIH Toolbox on iPad and latest BalancePod app on iPod/iPhone.

Upon launching the BalancePod App, the iPod or iPhone will display a dashboard with two buttons at the bottom of the screen. One button: *Standing Balance Test Info* directs the user to an informational screen that includes a single text file that scrolls up and down. The second button: *Start a Standing Balance Test* directs the user to the connection server that communicates between the iPod or iPhone accelerometer and the iPad test administration.

The screen is illustrated below:



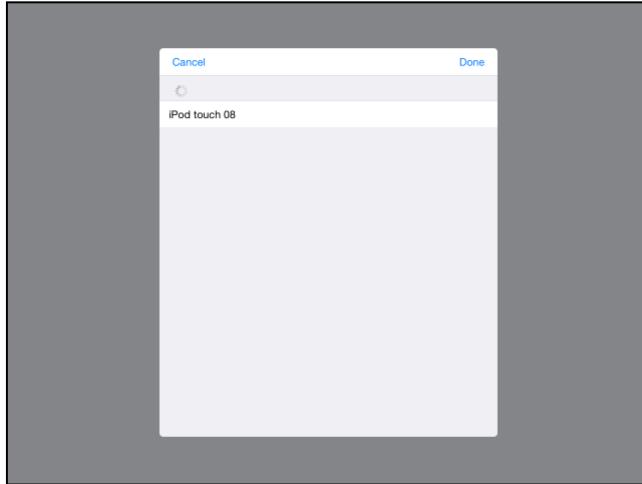
#### iPod or iPhone / iPad synchronization

A participant's movement (sway) is measured by an iPod or iPhone that is enclosed in a protective case. The iPod or iPhone is attached to the gait belt by a clip, as shown below. It is critical that the iPod or iPhone be inserted in the protective case in the correct orientation with the home button toward the floor as shown (not upside-down).



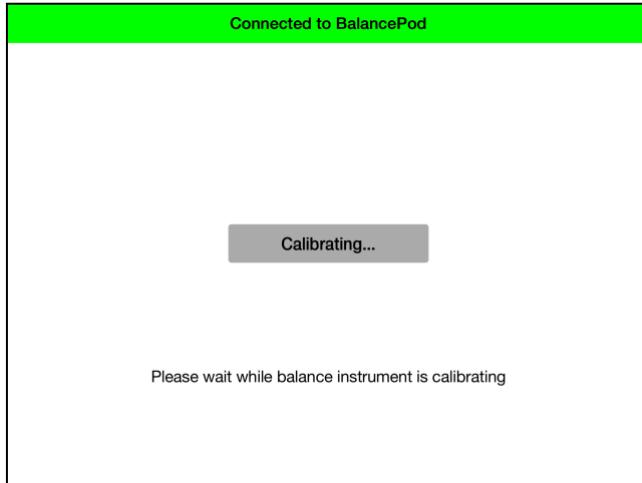
- Open the Standing Balance Test on the iPad and turn on the iPod or iPhone as described above.

- Open the BalancePod App and select Start a Standing Balance Test if you have not already done so.
- On the iPad, select the name of the iPod or iPhone with which you want to pair the iPad;



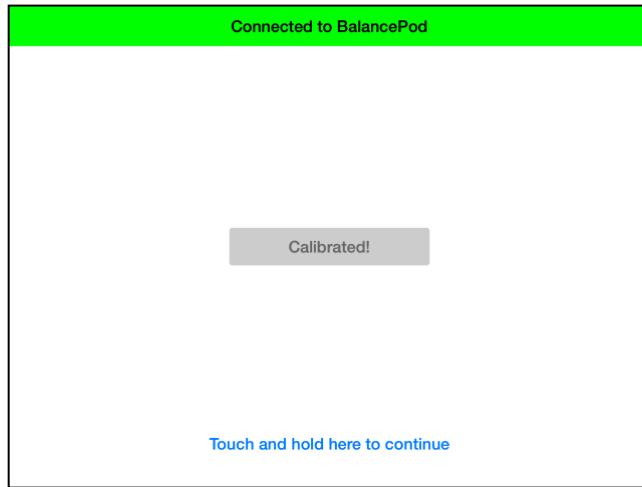
when they are connected, the *DONE* button becomes activated. Select *DONE*.

- A green band will appear at the top of both the iPad and the iPod or iPhone when they are paired and communicating.
- As the iPad and iPod or iPhone are being calibrated, a gray button tells you the status:

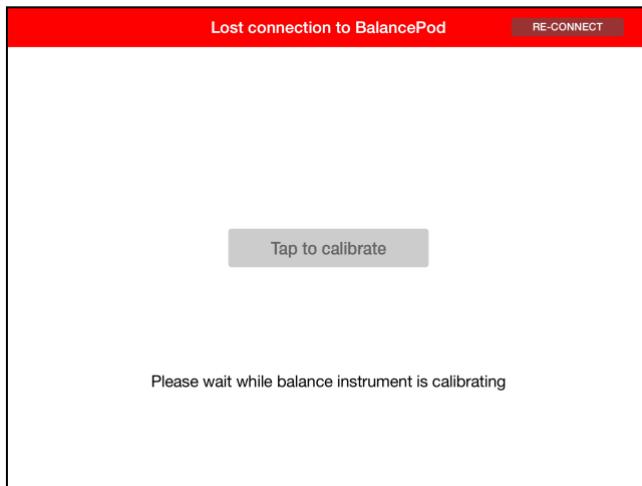


calibrating or calibrated.

- When the word **CALIBRATED** appears on the iPad screen, touch the *Touch and hold here to continue* button to start the test.



- It is possible but not common that the calibration might need to be repeated after the participant is prepared. If this happens, the following screen appears. Touch the re-connect button until the word **CALIBRATED** appears on the iPad screen and continue as described above.



#### Preparing the Participant:

Ask permission from the participant to put the gait belt on him/her. Strap the Velcro gait belt onto the participant so that the belt is fit tightly around the pelvis with the top of the belt at the top of the hip bones. The handles of the belt should be positioned behind the participant and may be used by the examiner in case of loss of balance by the participant. If the participant has a smaller waist, it may be necessary to wrap the belt a second time around the participant (or to use a smaller gait belt). If so, be sure the accelerometer is still positioned appropriately.

*For children ages 3-6, the iPod is worn on the back of the belt; when possible, the handles of the gait belt should be positioned on whichever side of the child is closest to where the examiner will be positioned.*



For participants ages 7-85, the iPod or iPhone is attached on the front of the belt (approximately where a typical belt buckle would be located). The handles should be to the back of the participant.



Participants are to stand in their bare/stocking feet (no shoes). They can wear paper booties if they wish. Place a chair placed behind the participant if rest is needed between trials.

The examiner should stand behind the participant (to the side of participants ages 3-6) to be ready to prevent the participant from falling. During testing, the iPad should be placed on a table in close proximity to the examiner.

It is crucial that the iPad is never greater than a few feet (certainly less than 15') away from the iPod or iPhone and gait belt unit the participant is wearing during testing. While it might be easiest to hold the iPad during testing, in the event that a participant requires help after a stumble or fall, the examiner might have to drop the iPad and endanger its integrity.

Each participant will be given up to two trials to be successful. Use the following guidelines to stop a trial, as any of these are evidence that the participant is no longer holding the pose and has failed the trial:

1. If the arms come off of the chest
2. If the knees bend

3. If the feet move out of original position (move or swivel out or are lifted)
4. If the participant bends forward at the waist (more than 45 degrees). If this happens, the examiner will have to support the participant with the belt
5. If the participant opens his/her eyes during an eyes-closed pose (poses 2 and 4)
6. If the participant says something like: "I cannot do that" or "I do not feel safe trying that"

***As needed throughout testing, remind the participant that he/she can step out of the pose, if he/she is feeling unsafe or unable to hold the pose.***

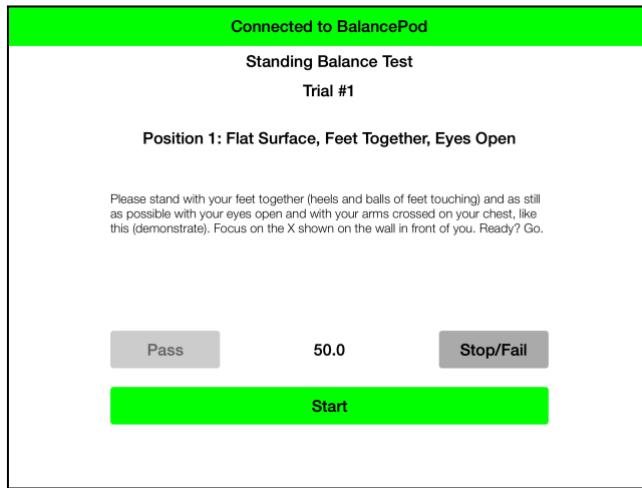
A second trial should be attempted if the first trial is not successfully completed; the examiner should stand close to the participant to prevent actual falls. Some participants will succeed on the second trial, even if they failed the first trial (particularly on the foam or in the tandem pose).

Each pose and trial is presented on a separate iPad screen.

These screens always have: a description of the pose, which trial, and three buttons: Start, Stop/Fail and Pass.

The Start and Stop/Fail are enabled at the beginning of each trial; the Pass button is only enabled after data is received from the balance pod. A tone is played on the iPod once 50 seconds have elapsed.

All the buttons are disabled during the interval between the 50 seconds tone and when data are received on the iPad.



Whenever the PASS or the STOP/FAIL button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice.

The task order is always the same:

- Pose 1: flat surface, feet together, eyes open
- Pose 2: flat surface, feet together, eyes closed
- Pose 3: on foam, feet together, eyes open
- Pose 4: on foam, feet together, eyes closed
- Pose 5: flat surface, tandem stance, eyes open (only given to participants ages 7+)

Throughout the task, the computer may invoke Discontinue Rules automatically. These are:

- Rule 1: *If the participant cannot successfully complete either trial of pose 1, the test will be discontinued.*
- Rule 2: *If the participant cannot successfully complete either trial of pose 2, he/she will not be asked to perform any more poses with eyes closed (i.e., will not be administered pose 4).*
- Rule 3: *If the participant cannot successfully complete either trial of pose 3, the test will skip ahead to pose 5.*



NOTE

A re-connect button is always enabled should the devices become disconnected.

**Age specific instructions:**

[Standing Balance Test Instructions Ages 3-6](#)

[Standing Balance Test Instructions Ages 7+](#)

#### **C.4.3.1 Standing Balance Test Instructions Ages 3-6**

The task is introduced with the following Title Screen: *NIH Toolbox Standing Balance Test 3-6.* At the bottom of the screen is a button *Touch and hold here to continue.* *Touch and hold that button to begin the test.*

Participants are to stand in their *bare/stocking feet (no shoes, but paper booties can be offered).*

While putting the belt and accelerometer on the participant, say: **This is a test of your balance. There are as many as 4 different poses that you will be asked to do. During each pose, you will be asked to stand as steady as possible for 50 seconds. You will have a second chance if you cannot hold the position for 50 seconds. Between each set of poses, you may rest in the chair if needed. Please try to do your best. I will demonstrate how I want you to stand before each pose.**

*Explain that the iPod or iPhone on the belt is used to measure balance and ask permission to put on the belt or ask the participant to help.* The belt should fit tightly around the pelvis. For ages 3-6, the iPod or iPhone should be placed on the *back* of the belt and when possible the handles on the belt should be on the participant's side.

A sheet of paper with an attractive picture or a large X should be placed on the wall at the participant's eye level. For the eyes open poses, the participant will be asked to focus on this picture or X. The participant is positioned one meter away from the wall, directly in front of the picture or X.

The examiner should proceed through each of the poses with the participant until the test is completed. After each trial or pose is completed, the examiner should ask: **Are you ready for the next one?**

If the participant says NO or otherwise indicates that he/she needs to rest, say: **Please sit in this chair to rest.** *The examiner should note the time the participant begins resting; a maximum of one minute of rest is permitted.*

Every 15 seconds or so, the examiner should ask: **Are you ready to continue?** If the participant indicates that he/she is ready, proceed with the next trial or pose. If the participant is not ready, wait and ask again in another 15 seconds.

If the participant is not ready by the end of the one-minute rest period, *the test should be discontinued.* In such a case, the examiner should say: **Let's go on to another activity.**

*As needed throughout the testing, the examiner should remind the participant that he/she can step out of the pose if he/she is feeling unsafe or unable to hold the pose.*

*When the participant is ready for testing, the examiner should touch and hold the button at the bottom of the screen to advance to the test itself.*

Pose 1 Screen: *Flat surface, feet together, eyes open*



The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate). **Focus on the X shown on the wall in front of you.**

**Ready?** After the participant assumes the position, the examiner touches the **START** button and says: **Go.**

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant. In addition, an audible tone will play when 50 seconds has elapsed, alerting both the examiner and the participant that the trial has ended.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate). **Focus on the X shown on the wall in front of you. Ready?** The examiner touches the **START** button and says: **Go. Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason.**

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS** or **STOP/FAIL** button.

Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.



If a participant fails both trials of Pose 1, the test is terminated.

Once the participant successfully completes a trial, say: **Are you ready for the next one?**

Proceed with the next pose or allow the participant to rest, following the procedures noted above. If participant fails trial 2, the discontinue rule is invoked; say: **We are done with this activity.**

Pose 2 Screen: *Flat surface, feet together, eyes closed.* The same as Pose 1, except this time the participant's eyes are closed.

The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes closed and with your arms crossed on your chest, like this** (demonstrate). **Ready?** After the participant assumes the position, the examiner touches the *START* button and says: **Go.**

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose *STOP/FAIL* if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes closed and with your arms crossed on your chest, like this** (demonstrate). **Ready?** The examiner touches the *START* button and says: **Go.** Again, choose *STOP/FAIL* if the participant did not successfully complete the trial for any reason.

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the *PASS* or *STOP/FAIL* button.

Whenever the *PASS* or the *STOP/FAIL* button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 3 Screen: *Foam surface, feet together, eyes open*



The examiner should pick up the blue pad and place it on the floor one meter in front of the picture on the wall. The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please step onto the foam and put your feet together (heels and balls**

**of feet touching) and stand as still as possible with your eyes open and your arms crossed on your chest, like this (demonstrate). Focus on the X shown on the wall in front of you. Ready?** After the participant assumes the position, the examiner touches the START button and says: Go.

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose STOP/FAIL if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your eyes open and your arms crossed on your chest, like this (demonstrate). Focus on the X shown on the wall in front of you. Ready?** The examiner touches the START button and says: Go. Again, choose STOP/FAIL if the participant did not successfully complete the trial for any reason.

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the PASS or STOP/FAIL button.

Whenever the PASS or the STOP/FAIL button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 4 Screen: *Foam surface, feet together, eyes closed.* The same as Pose 3 except that the participant's eyes are closed.

The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your arms crossed on your chest, and then close your eyes, like this** (demonstrate for participant). **Ready?** After the participant assumes the position, the examiner touches the START button and says: Go.

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose STOP/FAIL if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your arms crossed on your chest, then close your eyes, like this** (demonstrate for participant). **Ready?** The examiner touches the START button and says: Go. Again, choose STOP/FAIL if the participant did not successfully complete the trial for any reason.

After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the PASS or STOP/FAIL button.

Whenever the *PASS* or the *STOP/FAIL* button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice.

When the participant has completed pose 4, say: **We are done with this activity.**

#### **C.4.3.2 Standing Balance Test Instructions Ages 7+**

The task is introduced with the following Title Screen: *NIH Toolbox Standing Balance Test 7+*. At the bottom of the screen is a button *Touch and hold here to continue. Touch and hold that button to begin the test.*

Participants are to stand in their bare/stocking feet (no shoes, but paper booties can be offered).

While putting the belt and iPod or iPhone on the participant, say: **This is a test of your balance. There are as many as 5 different poses that you will be asked to do. During each pose, you will be asked to stand as steady as possible for 50 seconds. You will have a second chance if you cannot hold the position for 50 seconds. Between each set of poses, you may rest in the chair if needed. Please try to do your best. I will demonstrate how I want you to stand before each pose.**

Explain that the iPod or iPhone on the belt is used to measure balance and ask permission to put on the belt or ask the participant to help. The belt should fit tightly around the pelvis and the handles of the belt should be positioned to the back of the participant. For ages 7 and older, the iPod is placed on the *front* of the belt.

A sheet of paper with an attractive picture or large X should be placed on the wall at the participant's eye level. For the eyes open poses, the participant will be asked to focus on this picture. The participant is positioned one meter away from the wall, directly in front of the picture.

The examiner should proceed through each of the poses with the participant until the test is completed.

After each trial or pose is completed, the examiner should ask: **Are you ready for the next one?**

If the participant says "No" or otherwise indicates that he/she needs to rest, say: **Please sit in this chair to rest. The examiner should note the time the participant begins resting; a maximum of one minute of rest is permitted.**

Every 15 seconds or so, the examiner should ask: **Are you ready to continue?** If the participant indicates that he/she is ready, proceed with the next trial or pose. If the participant is not ready, wait and ask again in another 15 seconds.

If the participant is not ready by the end of the one-minute rest period, *the test should be discontinued*. In such a case, the examiner should say: **Let's go on to another activity.**

*As needed throughout the testing, the examiner should remind the participant that he/she can step out of the pose if he/she is feeling unsafe or unable to hold the pose.*

When the participant is ready for testing, the examiner should touch and hold the button at the bottom of the screen to advance to the test itself.

Pose 1 Screen: *Flat surface, feet together, eyes open*



The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate for participant). **Focus on this X shown on the wall in front of you. Ready?**

After the participant assumes the position, the examiner touches the START button and says: Go.

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant. In addition, an audible tone will play when time has elapsed, so the both the examiner and participant know the trial has ended. Choose STOP/FAIL if the participant did not successfully complete the trial for any reason.

If a second trial is needed, start the second trial of this pose; the examiner should say: **Let's try that one again. Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate). **Focus on the X shown on the wall in front of you. Ready?**

The examiner touches the START button and says: Go. Again, choose STOP/FAIL if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the PASS or STOP/FAIL button.

Whenever the PASS or the STOP/FAIL button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move on to the next trial.

**NOTE**

If a participant fails both trials of Pose 1, the test will be terminated.

Once the participant successfully completes a trial, say: **Are you ready for the next one?**

Proceed with the next pose or allow the participant to rest, following the procedures noted above. If participant fails trial 2, the discontinue rule is invoked; say: **We are done with this activity.**

Pose 2 Screen: Flat surface, feet together, eyes closed. The same as Pose 1, except this time the participant's eyes are closed.

The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes closed and with your arms crossed on your chest, like this** (demonstrate). **Ready?**

After the participant assumes the position, the examiner touches the *START* button and says: **Go**. The examiner should check the participant's posture and that the eyes remain closed. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please stand with your feet together (heels and balls of feet touching) and as still as possible with your eyes closed and with your arms crossed on your chest, like this** (demonstrate). **Ready?**

The examiner touches the *START* button and says: **Go**. Again, choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the **PASS** or **STOP/FAIL** button. Whenever the **PASS** or the **STOP/FAIL** button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 3 Screen: *Foam surface, feet together, eyes open*



The examiner should pick up the blue pad and place it on the floor one meter in front of the picture on the wall. The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your eyes open and your arms**

**crossed on your chest, like this (demonstrate). Focus on the X shown on the wall in front of you. Ready?**

After the participant assumes the position, the examiner touches the START button and says: Go.

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose **STOP/FAIL** if the participant did not successfully complete the trial for any reason. If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your eyes open and your arms crossed on your chest, like this** (demonstrate). **Focus on the X shown on the wall in front of you. Ready?**

The examiner touches the START button and says: Go. Again, choose STOP/FAIL if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the PASS or STOP/FAIL button. Whenever the PASS or the STOP/FAIL button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 4 Screen: *Foam surface, feet together, eyes closed.* The same as Pose 3 except that the participant's eyes are closed.

The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your arms crossed on your chest, and then close your eyes, like this** (demonstrate). **Ready?**

After the participant assumes the position, the examiner touches the START button and says: Go.

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant. Choose STOP/FAIL if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please step onto the foam and put your feet together (heels and balls of feet touching) and stand as still as possible with your arms crossed on your chest, then close your eyes, like this** (demonstrate). **Ready?**

The examiner touches the START button and says: Go. Again, choose STOP/FAIL if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the PASS or STOP/FAIL button. Whenever the PASS or the STOP/FAIL button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice to move onto the next trial.

After participant completes one or both trials, say: **Are you ready for the next one?** Proceed with the next pose or allow the participant to rest, following the procedures noted above.

Pose 5: *Flat surface, tandem stance, eyes open*



The examiner should demonstrate the pose describing what he/she is doing as it is being done.

The participant's turn is next; the examiner should ask the participant to stand in the desired position, saying: **Please stand with the heel of one foot touching the toes of the other foot on the ground. Keep them in a straight line. Stand as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate for participant). **Before you do this, try each foot in front and decide for yourself which one is more comfortable. Then, focus on the X on the wall in front of you. Ready?**

After the participant assumes the position, the examiner touches the START button and says: **Go.**

The examiner should check the participant's posture. The iPad screen will display the elapsed time of the trial so the examiner can easily see it while assuring the safety of the participant.

Choose STOP/FAIL if the participant did not successfully complete the trial for any reason.

If the first trial is failed for any reason, start the second trial of this pose; the examiner should say: **Let's try that one again. Please stand with the heel of one foot touching the toes of the other foot on the ground. Keep them in a straight line. Stand as still as possible with your eyes open and with your arms crossed on your chest, like this** (demonstrate for participant). **Focus on the X shown on the wall in front of you. Ready?**

The examiner touches the START button and says: **Go.** Again, choose STOP/FAIL if the participant did not successfully complete the trial for any reason. After 50 seconds of elapsed trial time, a tone will sound. After a few more seconds, the examiner will be able to touch the PASS or STOP/FAIL button. Whenever the PASS or the STOP/FAIL button is touched, a pop-up window asking for confirmation of the choice will appear. The examiner must confirm his/her choice.

When the participant has completed pose 5, say: **We are done with this activity.**

#### **C.4.4 NIH Toolbox 4-Meter Walk Gait Speed Test**

This measure of gait speed is administered in an open hallway and can use part of the same course as the 2-Minute Walk Endurance Test (See [Appendix 7](#)). The test is administered two times, both at the participant's normal pace. A practice trial precedes the timed trials.

The instructions are on and a timer is embedded in the iPad screen. The timing begins (START button) when the participant steps over the starting line. The foot does not need to be flat on the floor. Timing stops when one of the participant's feet is completely across the end/finish line (the line at 4 meters, not at 5 meters where the cone is).

The examiner should be positioned so that he/she can easily see when the participant steps across each line. If necessary, walk behind and to the side of the participant as he/she walks.

**Participants should not do this walk in bare feet, high-heeled or open-back shoes, sandals, or flip-flops. Paper booties may be offered.**

#### **Equipment and materials needed:**

- iPad
- Measuring tape with meters and feet
- Set of two cones
- Walking course set up diagram

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

Detailed information on setting up the walking courses for the NIH Toolbox 4-Meter Walk Gait Speed Test and 2-Minute Walk Endurance Test can be found in [Appendix 7](#).

#### **C.4.4.1 4-Meter Walk Gait Speed Test Instructions Ages 7+**

The task is introduced with the following Title Screen: *NIH Toolbox 4-Meter Gait Speed Test 7+*. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

The examiner should observe how participants walk normally. If they use a cane or other walking device and feel they need it for the walking test, they may use it. If the participant uses such a device, the examiner should note its use.

First Screen:

The examiner should show the participant the walking course and say: **This activity involves walking from one place to another. This is our walking course** (point to the course). **I want you to walk to the other end of the course at your usual speed, just as if you were walking down the street to go to the store.**

Touch and hold button for next screen.

Demonstration Screen:

The examiner explains the walk: **Let me show you what I want you to do. Put both your feet together behind this line (point to starting line). Walk all the way past the cone on the other end before you stop.**

Before the demonstration, say: **3, 2, 1, Go!** Examiner should demonstrate the walk. After returning, examiner presses Touch and hold button for next screen.

Practice Screen:

After demonstration, have the participant stand with both feet touching the start line; say: **Now you try. Remember to walk at your usual speed and keep walking until you pass the cone. When I want you to start, I will say: 3, 2, 1, go. Do you have any questions?** (Answer any questions.) **Ready? 3, 2, 1, Go!**

When the participant passes the cone, say: **That's good. Do you have any questions?** (Answer any questions.) Touch and hold that button for next screen.

After practice is completed, the following screens will then be presented. As below, each shows what the examiner is to say and do.

Test Intro Screen:

Begin timing (press START/STOP button) when the participant steps over (first footfall) the starting line. Stop timing when one of the participant's feet is completely across the end/finish line (the line at 4.0 meters – not the line at 5.0 meters).

Position yourself so that you can easily see when the participant steps across each line. If necessary, walk behind and to the side of the participant as he/she walks.

If the participant stumbles or tries to run, void that trial and ask the participant to do another trial. To do this on the screen, press the *RESET* button to set the timer back to zero (confirming when the pop-up screen appears). Then give the trial again following all instructions.

Test Trial 1 Screen:

Say: **This time, I am going to time you as you walk at your usual speed. Are you ready? 3, 2, 1, Go!**

Make sure to touch the *START* button as soon as the participant steps over the starting line.

Touch the *STOP* button as soon as one of the participant's feet is completely across the finish line.

After timer stops, touch the *NEXT* button and confirm your choice in the pop-up window.

Test Trial 2 Screen:

Say: **Now I want you to repeat the walk. Remember to walk at your usual pace and go all the way past the cone at the other end of the course. Are you ready? 3, 2, 1, Go!**

Make sure to touch the *START* button as soon as the participant steps over the starting line.

Touch the *STOP* button as soon as one of the participant's feet is completely across the finish line.

After timer stops, touch the *NEXT* button and confirm your choice in the pop-up window.

If needed, have the participant rest in a chair for at least one minute before the next task.

#### **C.4.5 NIH Toolbox 2-Minute Walk Endurance Test**

This measure of endurance can be administered to participants ages 3 to 85. It is administered in an open hallway. The participant should be wearing comfortable shoes such as athletic shoes. A timer and grid for marking the number of feet traversed is embedded on the iPad screen. All the instructions appear on the iPad screen.

**Participants should not do this test in bare feet, high-heeled or open-back shoes, sandals, or flip-flops.**

**Equipment and materials needed:**

- iPad
- Two cones
- Chair
- Measuring tape
- Masking tape

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

Detailed information on setting up the walking courses for the NIH Toolbox 4-Meter Walk Gait Speed Test and 2-Minute Walk Endurance Test can be found in [Appendix 7](#).

##### **C.4.5.1 NIH Toolbox 2-Minute Walk Endurance Test Instructions Ages 3+**

The task is introduced with the following Title Screen: *NIH Toolbox 2-Minute Walk Endurance Test 3+*. At the bottom of the screen is a button *Touch and Hold Here to Continue. Touch and hold that button to begin the test.*

The examiner should observe how participants normally walk. If they use a cane or other walking device and feel they need it for the walking test, they may use it. If the participant uses such a device, the examiner should make a note of this.

First Screen:

Examiner should have participant sit in a chair near the beginning of the walking course.

Introduce the task; say: **This is an activity that shows how physically fit you are by seeing how far you can walk in 2 minutes. I will ask you to walk as fast as you can until I ask you to stop. I know this is hard for some people so don't worry if you have to slow down or rest. If you do stop or slow down, start walking again as soon as you feel you are ready do so.**

Continue: **Is there any reason you cannot do the walk? Does anything hurt or are you in pain? What I would like here is to have you walk as far as you can in this short period of time.** If participant does not feel he/she can do this task, note this and continue with another measure.

Continue: **You and I will not talk while you are walking because this might make you walk more slowly. I will, however, let you know how much time you have to walk and when you are almost done.**

Touch and hold button to go to next screen.

Demonstration & Practice Screen:

While demonstrating the first part of the task, say: **Let me show you what you are going to do. You will start with your feet behind this line** (Point to starting line). **When I say 'Go,' you will walk back and forth around the cones as fast as you can without running or hurting yourself.**

**You will begin after I say 'Ready, 3, 2, 1, Go!' As you pass the cone, do not stop or slow down. When I tell you to stop, stop where you are on the path until I come to you.**

Demonstrate task and say: **Watch me as I show you. You see that I am walking fast but not running and that I am not slowing or stopping when I pass the cone. Do you have any questions?** Answer questions as necessary.

Practice: Ask participant to walk course once down and back; say: **Now you can practice. Walk the path, out and back one time; go around the cone without slowing down. Ready, 3, 2, 1, Go!** When participant is finished, say: **Do you have any questions?** Answer any questions participant has. Touch and hold the button to move to the next screen.

Test Trial Screen:

- The test trial screen has a timer centered in the middle of the screen that shows 2:00 automatically when the screen appears.
- The timer has a *START/STOP* button and a *RESET* button.
- Touching *START* turns the button into a *STOP* button.
- Touching *STOP* activates the *RESET* button, meaning *START* cannot be activated again until *RESET* is touched.

Once the *RESET* button is touched, a pop-up will appear that asks the examiner to confirm the *RESET* and if confirmed, the timer will be reset.

- Resetting also presents the initial instructions at the top of the screen again.
- Directly below the timer is the '*LAP/TURN*' button that records the number of times a user has passed a cone and next to the *lap/turn* button is a '+' button and below that is a '-' button.
- The + and - buttons allow the user to add or subtract laps in case an error was made.
- A counter actively keeps track of how many times lap was touched or what the + and - buttons added or subtracted from that total.
- At the bottom of the screen, there is text saying: *Each time the participant makes a turn press the "Lap" button to record it and If you make a mistake press the "+" or "-" button to add or subtract one lap.*

Below is the test trial screen:

EXAMINER SAYS: "This time, I will be timing you. Remember, when I say 'Go,' walk back and forth around the cones as fast as possible for 2 minutes without running or hurting yourself. Ready, 3, 2, 1, Go!"

Timer:  Start

# Turns:  Turn - +

Each time the participant makes a turn press the 'Turn' button to record it.

If you make a mistake press the '+' or '-' button to add or subtract one turn.

Next

Continue by saying: **This time, I will be timing you. Remember, when I say 'Go,' walk back and forth around the cones as fast as possible for 2 minutes without running or hurting yourself. Ready, 3, 2, 1, Go!** Start the timer and keep track of the laps as described above.

At the same time, examiner should provide the following feedback:\*

- When 1 minute remains, say: **You are doing well. You have 1 minute to go.**
  - If participant is resting at one-minute reminder, encourage him/her to continue and change statement to: **You have only 1 minute left. Rest as long as you need; start walking again as soon as you feel able to do so.**
- When time reads 0:15, tell the participant: **In a moment, I'm going to ask you to stop. When I do, just stop right where you are and I will come to you.**
- When five seconds remain, examiner should count down: **5, 4, 3, 2, 1, stop. Please stay where you are and rest.**

The examiner put a piece of tape on the floor to mark where participant stopped; the tape should be placed behind the participant's heel.

The examiner should direct participant to sit in the chair while the examiner measures the distance from the last cone passed to the piece of tape. The examiner should press **NEXT** button on the test trial screen to submit the trial data (the laps). The **NEXT** button becomes active at the end of the trial (when 2 minutes have elapsed). Once **NEXT** is pressed, the app proceeds to the screen where more detailed measurements can be entered.

A new screen will appear. This screen is a data screen that shows the Laps that were recorded on the previous screen and number wheels for the number of 10 feet, single feet, and inches measured after the participant completes the two minutes.

This data entry screen is given below:

Count the number of 10ft intervals from the last cone passed to the tape marking where the participant stopped, and record that in the field "10 ft Marks" below. Then measure the distance from the last 10ft interval passed to where the participant stopped and record feet and inches in the corresponding fields below.

# turns:  - +

# 10 ft marks:

additional feet walked:

additional inches walked:

Next

The examiner should record the distance from the last cone to where the participant stopped on this data screen and press *NEXT* to submit the data. All the fields can be adjusted until *NEXT* is pressed.

### C.5 *Sensation Domain*

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.

Sensation & Pain Constructs	Definition
Pain	Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage. It is measured by the <a href="#">NIH Toolbox Pain Interference Survey</a> and the <a href="#">NIH Toolbox Pain Intensity Survey</a> .
Olfaction	The human olfactory system allows us to detect odors, to recognize and discriminate odor qualities, and to identify the sources of odors in our world. It is measured by the <a href="#">NIH Toolbox Odor Identification Test</a> .
Vision	Vision is a complex sensation that provides us with a personal, conscious representation of our surrounding environment. Visual impairment can impose various limitations on a person's functional ability including reading, mobility (which includes driving), visual information processing (also called "seeing"), and visually guided motor behavior (also called "manipulation"). It is measured by the <a href="#">NIH Toolbox Visual Acuity Test</a> .
Audition	Audition, or hearing, is the processing of sound in the environment. It is measured by the <a href="#">NIH Toolbox Words-in-Noise (WIN) Test</a> .
Taste	Taste perception, also known as gustation, arises from stimulation of taste receptors, which are composed of epithelial cells, found most frequently on the papillae of the tongue throughout the oral cavity. It is measured by the <a href="#">NIH Toolbox Regional Taste Test</a> .

Sensation & Pain Instruments	Ages	Time to Administer (minutes)
NIH Toolbox Pain Interference Survey	18-85	3
NIH Toolbox Pain Intensity Survey	18-85	1
NIH Toolbox Odor Identification Test	3-85	4-5
NIH Toolbox Visual Acuity Test	3-85	3
NIH Toolbox Words-in-Noise (WIN) Test	6-85	6
NIH Toolbox Regional Taste Intensity Test	12-85	6



The *Time to Administer (minutes)* column gives users an idea of how long each test might take; however, please note that testing times could vary based on how prepared the test administrator is going into the session, individual differences among participants, as well as other unplanned activities that may occur during testing.



Only the individual Sensation instruments listed above are available through the NIH Toolbox App at this time. The Sensation Battery will be released later in 2015.

### **C.5.1 NIH Toolbox Pain Interference Survey (18+) & NIH Toolbox Pain Intensity Survey (18+)**

#### **Equipment and materials needed:**

- iPad

Two instruments, *NIH Toolbox Pain Interference CAT Age 18+* and *NIH Toolbox Pain Intensity FF Age 18+*), make up the measurement of this construct. Each is self-administered; for each, instructions are presented on the iPad screen. Each instrument is presented separately to the participant.

*Pain Intensity* consists of one item asking about the participant's level of pain in the past seven days. Participants are asked to rate their pain on a scale from 0 (no pain) to 10 (worst imaginable pain).

*NIH Toolbox Pain Interference CAT* asks participants about how their experience of pain interfered with or affected their enjoyment of various daily activities in the past seven days. The scale is computer-adaptive and has a minimum of four questions and a maximum of 12 questions. The questions ask for a response on a 5-point scale. Some of the items are rated: *Not at all; A little bit; Somewhat; Quite a bit; Very much;* other items are rated: *Never; Rarely; Sometimes; Often; Always.*

#### **Administration:**

Since there is no specific introduction to the Pain Surveys, the NIH Toolbox Emotion Instructions should be selected from the instrument list, to introduce them. These instructions read:

**“On the next screens, we will ask you questions about your thoughts, feelings and behaviors. Read each question carefully and answer as well as you can. There is no right or wrong answer, only what is true for you and describes your thoughts, feelings, and behaviors. Select an answer by touching your answer choice on the screen. After you make your choice, the computer will automatically go on to the next question. If you want to change your answer, touch the GO BACK button to return to the question, then touch a different answer choice.”**

After this introduction, the surveys are automatically presented, first with the question from the Pain Intensity survey followed by the questions from the Pain Interference survey.

### **C.5.2 NIH Toolbox Odor Identification Test**

This task assesses the ability to identify various odors. Before identifying the odors, the child participants (ages 3-9 years) are asked to identify the eight pictures that are used as answer choices. Having identified the pictures, they are asked if they have smelled the objects or foods depicted. The examiner needs to have an iPad, scratch 'n' sniff cards, and a scratcher (e.g., guitar pick) to administer this measure.

#### **Equipment and materials needed:**

- iPad
- NIH Toolbox Odor Identification Cards
- Scratcher

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

For the test items, all participants (ages 3-85 years) use scratch 'n' sniff cards. These cards are numbered to match not only the order in which they are presented but the number on the iPad screen as well. After scratching them, participants are asked to identify which of four pictures on the screen matches the odor they have just smelled.

Children ages 3 to 9 are handed cards that the examiner scratched and are asked to identify five odors; participants ages 10 and above are asked to scratch and identify nine odors.

There are two versions of the instructions: one for ages 3-9 and one for ages 10 and above. In both versions, the participant is allowed to go back to the last item he/she attempted.

If either a child or adult participant has difficulty touching the pictures on the iPad screen, he/she may point and the examiner may touch the iPad. When this happens, the examiner should say something like the following to the participant: **You can point to the picture you want and then I will touch it for you.** Similarly, if a participant has trouble reading picture labels, the examiner may read the labels for him/her.

#### **Age-specific Instructions:**

[NIH Toolbox Odor Identification Test Ages 3-9](#)

[NIH Toolbox Odor Identification Test Ages 10+](#)

### **C.5.2.1 NIH Toolbox Odor Identification Test Instructions Ages 3-9**

The task is introduced with the following Title Screen: *NIH Toolbox Odor Identification Test 3-9*. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

**For this age group, there are two parts to the instructions: picture identification and odor identification.**

Part 1: Picture Identification:

The child is presented with a screen that shows eight pictures: *Popcorn, Flower, Lemon, Play Doh, Bubble Gum, Chocolate, Coffee, and Cinnamon*. A voice on the iPad asks the child to: **'Touch the picture of....'**

The examiner should read the screen: **Now we are going to look at some pictures. I want to see if you know what they are.** At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin.

Question 1:

The voice on the iPad says: **Touch the picture of a flower.**

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of a flower will flash and the voice will say: **This is a flower.**

The screen will change to the Flower picture and a voice on the iPad will ask: **Have you ever smelled a flower?**

Touch YES or NO on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between NO and YES until CONTINUE is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 2:

The voice on the iPad says: **Touch the picture of popcorn.**

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of popcorn will flash and the voice will say: **This is popcorn.**

The screen will change to the Popcorn picture and a voice on the iPad will ask: **Have you ever smelled popcorn?**

Touch YES or NO on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between NO and YES until CONTINUE is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 3:

The voice on the iPad says: **Touch the picture of a lemon.**

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of lemons will flash and the voice will say: **This is a lemon.**

The screen will change to the Lemon picture and a voice on the iPad will ask: **Have you ever smelled a lemon?**

Touch YES or NO on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between NO and YES until CONTINUE is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 4:

The voice on the iPad says: **Touch the picture of Play Doh.**

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of Play Doh will flash and the voice will say: **This is Play Doh.**

The screen will change to the Play Doh picture and a voice on the iPad will ask: **Have you ever smelled Play Doh?**

Touch YES or NO on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between NO and YES until CONTINUE is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 5:

The voice on the iPad says: **Touch the picture of cinnamon.**

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of cinnamon will flash and the voice will say: **This is cinnamon.**

The screen will change to the cinnamon picture and a voice on the iPad will ask: **Have you ever smelled cinnamon?**

Touch YES or NO on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between NO and YES until CONTINUE is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 6:

The voice on the iPad says: **Touch the picture of coffee.**

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of coffee will flash and the voice will say: **This is coffee.**

The screen will change and a voice on the iPad will ask: **Have you ever smelled coffee?**

Touch YES or NO on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between NO and YES until CONTINUE is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 7:

The voice on the iPad says: **Touch the picture of chocolate.**

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of chocolate will flash and the voice on the iPad will say: **This is chocolate.**

The screen will change to the chocolate picture and a voice on the iPad will ask: **Have you ever smelled chocolate?**

Touch YES or NO on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between NO and YES until CONTINUE is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

Question 8:

The voice on the iPad says: **Touch the picture of bubble gum.**

If correct, the voice on the iPad will say: **That's right!** Or **Great Job!** (Alternating throughout this part of the task).

If incorrect, the picture of bubble gum will flash and the voice will say: **This is bubble gum.**

The screen will change to the bubble gum picture and a voice on the iPad will ask: **Have you ever smelled bubble gum?**

Touch YES or NO on the screen to indicate the child's answer, then touch NEXT at the bottom of the screen to go on to the next item. The answer choice can be changed between NO and YES until CONTINUE is pressed to advance to next screen. No Go Back is permitted in Picture Identification component.

At the end of these questions, the iPad screen will refresh and the voice on the iPad will ask the child to touch those pictures that were not correctly identified on the first trial.

These requests will be made one by one until all the items are presented with the instruction: **'Touch the picture of....'** There are no corrections in this part, nor are there questions about whether the child has smelled the item. Regardless of the child's performance on the picture identification task, the iPad will then move on to odor identification.

After this section, there is a button *Touch and Hold Here to Continue* at the bottom of the screen. Touch and hold that button to continue.

Part 2: Odor Identification:

**Scratch 'n' Sniff Card Note:** The odor on the card is strongest immediately after being scratched; the examiner may need to remind the participant to smell the card as quickly as possible after scratching it. If the child says he/she does not smell anything, the examiner should scratch the card one more time and place it directly under the child's nose, then ask the child to **make his/her best guess if he/she is not sure.**

For this age group, the examiner will scratch the card and hand it to the participant, saying: **I am going to give you some stickers to smell. After you have smelled the sticker, touch the picture that shows what you just smelled. If you want to change your choice, touch the hand, also called the GO BACK button. Let's begin.**

If the child has difficulty touching the iPad screen, the examiner may register the participant's choice by touching the screen for him/her.

**NOTE:** The child is not permitted to go back beyond the last item he/she attempted; if the child attempts to go back beyond the previous item, say: **You can only go back to the last item you smelled.**

When the child has completed all five cards, say: **We are done with the smells.**

The five odors presented are: *Lemon, Play Doh, Bubble Gum, Chocolate, and Popcorn.*

### C.5.2.2 NIH Toolbox Odor Identification Test Instructions Ages 10+

The task is introduced with the following Title Screen: *NIH Toolbox Odor Identification Test 10+*. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

Instruction Screen:

The examiner says: **This task involves smelling various odors, one at a time, and then trying to identify them. The odors that you will smell are chosen from a variety of foods and objects that people experience in everyday life. We are using scratch 'n' sniff cards to present the odors.**

The examiner continues: **Take the scratcher and scratch the card. Smell it right after you scratch it, then look at the pictures on the screen. Touch the picture that best shows the odor you smelled on the card. A new set of pictures will then appear on the screen and you will be asked to identify the odor on the next card. If you want to change your last answer, touch the GO BACK button.**

**NOTE**

For the first item, the GO BACK button is deactivated as there is no item before this one.

**Scratch 'n' Sniff Card Note:** The odor on the card is strongest immediately after being scratched. The examiner may need to remind the participant to smell the card as quickly as possible after scratching it. If the participant says he/she does not smell anything, the examiner should scratch the card one more time and place it directly under the participant's nose, then ask the participant to **make his/her best guess if he/she is not sure**.

The examiner should encourage the participant to smell the card more than once if needed.

If the participant has difficulty using the scratcher, the examiner may scratch the card and hand it to the participant. Similarly, if the participant has difficulty touching the iPad screen, the examiner may register the participant's choice by touching the screen for him/her.

The examiner should repeat the sequence of handing the cards to the participant to scratch, smell, and identify until all the cards have been used. For each trial, or as needed, repeat what was said above: **Take the scratcher and scratch this card; smell it, then look at the pictures on the screen. Touch the picture that best shows the odor that you smelled on the card. If you want to change your last answer, touch the GO BACK button.**

**NOTE**

The participant is not permitted to go back beyond the last item he/she attempted. If the participant attempts to go back beyond the previous item, say: **You can only go back to the last item you smelled.**

When the participant has completed all nine cards, say: **You have finished this activity.**

The nine odors presented are: *Lemon, Play Doh, Bubble Gum, Chocolate, Popcorn, Coffee, Smoke, Natural Gas, and Flower.*

### C.5.3 NIH Toolbox Visual Acuity Test

This activity is intended to measure visual acuity in adults and children.

Testing will use different sets of optotypes (letters) for children and adults. For the *Visual Acuity Test*, the participant is seated **3 meters** away from the iPad and the display should be at eye level.

#### Equipment and materials needed:

- iPad
- Wireless keyboard (with extra AA batteries)
- Tablet stand
- Table
- Measuring tape
- Laminated HOTV letters for young children

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

#### Setting up Bluetooth Wireless Keyboard:

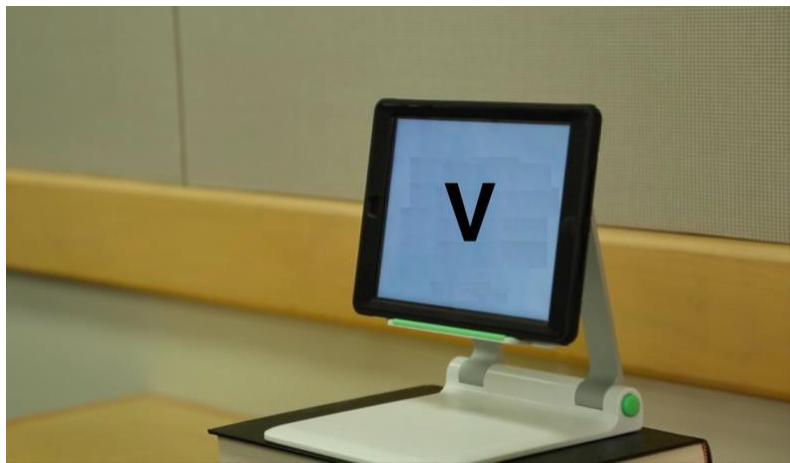
- Go to the Settings app of the iPad and make sure Bluetooth is turned on.
- Make sure the keyboard is in discovery mode by pressing the round button at the top right end of the keyboard and the small green light to the left of the button begins flashing.
- Select the Keyboard when it appears on the My Devices list on the iPad.
- When a pop up window appears on the iPad screen, follow the instructions and enter the required code on the keyboard.

The usual keyboard on the iPad will not work when the external keyboard is working. To turn off the external keyboard, press the round button at the top right end of the keyboard, move at least 15 meters from the iPad with the keyboard, or touch the “information” button on the iPad and touch “forget this device.”

#### Before testing begins:

- The examiner should move the iPad to a portable tablet stand that is placed on a table, or use another method such that the iPad is 3 meters from the participant and at eye level (this may also necessitate adjusting the participant’s chair height).
- It is recommended that the examiner have a printed copy of all instructions close at hand before beginning this measure. This is particularly important for the training and practice for the young children and may be important for older participants as well.
- Alternatively, for adults and older children, the examiner may hold the iPad and read the initial instructional screens to the participant, after which the iPad should be placed on the stand. If using this procedure, the examiner should try to stay close to the participant while reading from the iPad (since explaining something from a distance of 3 meters may seem unusual and very different from other measures where the participant and examiner are sitting side by side), and then walk over to the stand (3 meters away) and place the iPad on it before starting the items.
- Since the participant’s responses are recorded on the wireless keyboard, the wireless keyboard must be paired by Bluetooth with the iPad.

- The examiner should ascertain if the participant wears corrective lenses for distance, and ensure he/she is wearing them. If the participant wears lenses but indicates he/she has forgotten them (or does not have them for any reason), the examiner may choose to continue testing or not; it is at the examiner's discretion. However, if the participant requires a very strong correction, testing without corrective lenses will not likely be valid. The examiner should note any such irregularities and, if testing is completed, should interpret results with caution.



iPad on stand



Visual Acuity set-up showing 3 meters distance

The examiner records the participant's response on the wireless keyboard; specifically, once the participant names (for young children, points on the HOTV sheet) the letter on the screen, the examiner types that letter into the keyboard. After typing the letter, the examiner presses the spacebar to move on to the next letter. The iPad software automatically scores the response and displays the next letter accordingly.

**Age-Specific Instructions:**

[NIH Toolbox Visual Acuity Test Instructions Ages 3-7](#)

[NIH Toolbox Visual Acuity Test Instructions Ages 8+](#)

### **C.5.3.1 NIH Toolbox Visual Acuity Test Instructions Ages 3-7**

Before beginning the testing, set up the iPad on a stand that sits on a table, such that the iPad is 3 meters from the participant. Pair the wireless keyboard by Bluetooth with the iPad if it has not already been paired.

The task is introduced with the Title Screen: *NIH Toolbox Visual Acuity Test 3-7*. At the bottom of the screen is a button that instructs the examiner to Press the Spacebar to continue.

Because some children may not be able to name one or more of the letters **HOTV**, a laminated card is also used with young participants, allowing them to point to what they saw on the screen without verbalizing. The examiner should be seated next to the child so that he/she can see or hear what letter the child chooses.

A brief training is included before the test, followed by a practice, to assure that the child knows what needs to be done to complete the assessment. If the child does not succeed with the practice (as outlined below), testing should be discontinued.

Training:

Once the child is seated in a chair that is 3 meters from the iPad, say: **Now we are going to do an activity that shows us how well you can see pictures on the iPad screen. Press Spacebar to continue.**

Hand the child the laminated card and say: **Everything you will see is shown on this card. This is a picture of an H, this is a picture of an O, this is a picture of a T, and this is a picture of a V** (point to each letter while naming). **Now, you try to name the pictures.**

Encourage the child to name the letters as best he/she can. If the child names all four letters correctly, say: **Good job.**

If any are named incorrectly, point to each letter and say **only one time** as before: **This is a picture of an H, this is a picture of an O, this is a picture of a T, and this is a picture of a V.** (Because letter naming is not required to complete the test, it is OK if the child does not correctly name each letter. Encourage the child's efforts without providing negative feedback.) Then say: **Let's do some more. Press Spacebar to continue.**

Say: **You are going to look on this screen** (point to iPad); **then, you will see a picture or letter** (for children who clearly know the alphabet, it is OK to say letter instead of 'picture'). **Each time, I want you to tell me (or point on this card) what you saw on the screen. If you are not sure, it is OK to guess. Are you ready to start? Press Spacebar to continue.**

Practice:

The iPad will present one set of practice visual acuity trials (four letters) at a large size.

Rules:

1. If the child gets three or more correct, the program will continue automatically to visual acuity testing.
2. If the child misses two or more of four, review the laminated pointing chart and ask him/her to identify (either orally or by pointing) the four letters HOTV. If all are done correctly, see step c below. If child cannot correctly identify the optotypes on the HOTV set, repeat the training above one more time.

3. Proceed to a second practice trial set. If three or more of four are done correctly, proceed to live visual acuity testing.
4. If not, repeat (third practice trial set). If three or more are correct on the third practice trial, begin visual acuity testing. If two or more are incorrect, stop the test, since this is the third practice trial and the criterion of three or more of four correct is not achieved.

#### Visual Acuity Testing:

The examiner should say: **You did great. Now, the letters will get smaller and smaller until you cannot really see them. That is ok. We want to know how small they can get before you cannot see them.** Press Spacebar to continue.

Each time a letter is displayed, say: **Tell me or point to what you see.**

The examiner records the correctness of the participant's response on the wireless keyboard; specifically, once the participant names (for young children, points on the HOTV sheet) the letter on the screen, the examiner types that letter into the keyboard. After typing the letter, the examiner presses the spacebar to move on to the next letter.

The next item will not appear until the examiner has recorded the child's response to the item currently on screen. If the child is trying but struggling to verbalize the letters, remind him/her that pointing is OK, saying: **You can show me what you see.**

The test will progressively present smaller letters if the child answers correctly or larger ones if the child answers incorrectly, until an acuity score is established. The test will automatically end when the program has calculated the acuity score.

 If a child's Visual Acuity Test score is equivalent to 20/400 vision or worse, it suggests serious uncorrected distance vision deficits exist. A follow-up evaluation by a vision professional is suggested.

### C.5.3.2 NIH Toolbox Visual Acuity Test Instructions Ages 8+

Before beginning the testing, set up the iPad on a stand that sits on a table, such that the iPad is 3 meters from the participant. Pair the wireless keyboard by Bluetooth with the iPad if it has not already been paired.

The task is introduced with the Title Screen: *NIH Toolbox Visual Acuity Test 8+*. At the bottom of the screen is a button that instructs the examiner to Press the Spacebar to continue.

Ask the participant if he/she wears glasses or contact lenses for distance vision. If the participant does wear lenses but indicates he/she has forgotten them (or does not have them for any reason), the examiner may choose to continue testing or not; it is at the examiner's discretion. Moreover, if the participant requires a very strong correction, testing will not likely be valid without the corrective lenses. The examiner should note any such irregularities and, if testing is completed in such a case, the results should be interpreted with caution.

Once the participant is seated in a chair that is 3 meters from the iPad, say: Now we are going to do an activity where you will tell me what letters you see on the screen. You are going to look on this screen (point to iPad) and you will see a letter. Each time, I want you to tell me the letter you saw on the screen. If you are not sure, it is OK to guess. The letters will get smaller and smaller until you cannot really see them. That is ok. We are trying to determine how small they can get before you cannot see them. Are you ready to start? Press Spacebar on keyboard to continue.

Visual Acuity Test (with glasses or contact lenses if usually worn for distance vision): The examiner should record the participant's response on the keyboard by entering the letter said.

Each time a letter is displayed, say: **Tell me what you see.** At the examiner's discretion, this can be replaced by: **Go ahead** after a few letters have been displayed.

The examiner records the participant's response on the wireless keyboard; specifically, once the participant names the letter on the screen, the examiner types that letter into the keyboard. After typing the letter, the examiner presses the spacebar to move on to the next letter. The iPad software will automatically score the response and present the next item accordingly.

The next item will not appear until the examiner has recorded the participant's response to the item currently on screen. The test will progressively present smaller letters if the participant answers correctly or larger ones if the participant answers incorrectly, until an acuity score is established. The test will automatically end when the program has calculated the acuity score.



If a participant's Visual Acuity Test score is equivalent to 20/400 vision or worse, it suggests serious uncorrected distance vision deficits exist. A follow-up evaluation by a vision professional is suggested.

#### C.5.4 NIH Toolbox Words-in-Noise Test

This measure quantifies a participant's ability to hear words in a noisy environment.

##### Equipment and materials needed:

- iPad
- Sennheiser HD201 headphones or similar

Detailed information on equipment and materials needed for all tests can be found in [Appendix 5](#).

A female speaker instructs the participant to say a one-syllable word while in the background, there is the noise of multiple people speaking at the same time. At the beginning of the test, the speaker's voice is much louder than the background noise; as the test progresses, the speaker's voice gradually becomes softer and eventually is the same level as the background noise.

There are seven levels of word/noise ratios and five words at each level. Each ear is tested separately and the test is concluded when a participant cannot repeat any of the five words at a given level in each ear separately.

Each screen represents a different background noise level and on each, the examiner touches the word(s) that the participant correctly identifies. If the participant correctly repeats at least one word at a level, the audio files will continue to present words to that ear. If all five words at a given level are incorrect, the iPad will begin testing the second ear.

For the second ear, a series of five words will appear on the iPad screen as before and the associated audio files will play in the participant's earphones. If all five words at a given level are incorrect for the second ear, the examiner should touch the FINISH button.

If the participant repeats some words correctly from each of the seven levels, after all the levels have been presented, the examiner should touch the FINISH button.

The computer will automatically score the participant's performance.

 If a participant wears hearing aids, they should be removed for the duration of this test.

 Before a testing session, the examiner should confirm that the iPad volume is turned ON and set to a mid-range level (i.e., a comfortable listening level).

#### **C.5.4.1 NIH Toolbox Words-in-Noise Test Instructions Ages 6+**

The test begins with a Title Screen: *NIH Toolbox Words-in-Noise Test 6+*. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

Before placing the headphones on the participant's head, the examiner should make sure that he/she can see the participant's face and hear his/her responses; at the same time, the participant should **not** be able to read the iPad screen.

Since the headphones will block communication between the examiner and the participant, the examiner should instruct the participant that if he/she does not hear anything in the headphones, he/she should take them off and the examiner will try to rectify the situation (most likely by pressing the button on the side of the iPad to increase the volume).

The examiner should introduce the task, reading the screen: **You will hear a woman asking you to repeat various words. Repeat the words she asks out loud so that I can hear you. For example, if you hear her say, 'Say the word dog,' you would say, 'dog.' If you are not sure what she said, just say what you think you heard. You will also hear people talking in the background. Do your best to ignore them and to focus on the woman's voice asking you to repeat the words. You will hear words in only one ear and then in the other. Do you have any questions?** Answer any questions and say: **Let's begin.**

The examiner should place the earphones on the participant's head, making sure that the right earphone is over the right ear and the left earphone is over the left ear.

Touch the button at the bottom of the screen that says *Touch and Hold Here to Continue*. This will start the test.

First Ear:

A series of five words will appear on the iPad screen, along with the current dB level and the ear being tested. The associated audio files will play in the participant's earphones. The examiner should listen carefully to the participant's responses and touch any word that is said correctly. **Incorrect words are not marked.**

Each screen represents a different background noise level and on each, the examiner touches the word(s) that the participant correctly identifies. If the participant correctly repeats at least one word at a level, the audio files will continue to present words to that ear. If all five words at a given level are incorrect, the iPad will begin testing the second ear.

Second Ear:

As before, a series of five words will appear on the iPad screen, along with the current dB level and the ear being tested. The associated audio files will play in the participant's earphones. The examiner should listen carefully to the participant's responses and touch any word that is said correctly.

If the participant correctly repeats at least one word at a level, the audio files will continue to present words to that ear. **Incorrect words are not marked.** If all five words at a given level are incorrect, the iPad will stop playing the audio files, at which point the examiner should touch the **FINISH** button.

If the participant repeats some words correctly from each of the seven levels, after all the audio files are presented, the examiner should touch the **FINISH** button.

The iPad will automatically score the participant's performance.

### C.5.5 NIH Toolbox Regional Taste Intensity Test

This activity assesses a participant's sensitivity to bitter and salty solutions in the mouth generally, as well as specifically on the tip of the tongue. *The participants should not have had drinks or food in the 30 minutes prior to the testing.*

All the instructions are shown on the iPad. The participant's responses are registered directly on the iPad screen using a calibrated scale that ranges from *No sensation* to *Strongest sensation of any kind*.

Initially the participant is taught to use the scale and then is asked to rate the solutions as they are presented in different areas of the mouth using the same scale.

This activity requires more preparation and uses more materials than other tests; the examiner needs to have the following equipment nearby before beginning the test:

- iPad with stand (to minimize the possibility that liquid gets on the iPad)
- Laminated pictures of procedure
- Gloves (latex free)
- 2 sterile cotton swabs
- Bottle of purified water at room temperature
- Disposable cup for each participant
- Cup, basin, spittoon, or sink for spitting solutions and rinse water
- Quinine solution in small cups\*\*
- Salt solution (NaCl) in small cups\*\*

\*\*The equipment needed and instructions for mixing the Salt and Quinine Solution are provided in [Appendix 8](#). In the past, these were produced by a third party; that party is no longer producing the solutions. The solutions can be mixed by any user or third party having the appropriate equipment to do so. Most pharmacies and some universities have the necessary equipment and supplies to produce the solutions.

### C.5.5.1 NIH Toolbox Regional Taste Intensity Test Instructions Ages 12+

The task is introduced with the following Title Screen: *NIH Toolbox Regional Taste Test 12+*. At the bottom of the screen is a button *Touch and Hold Here to Continue*. Touch and hold that button to begin the test.

The iPad should be positioned so that both the examiner and the participant can see the screen, since all instructions are on the screen and read together by both parties.

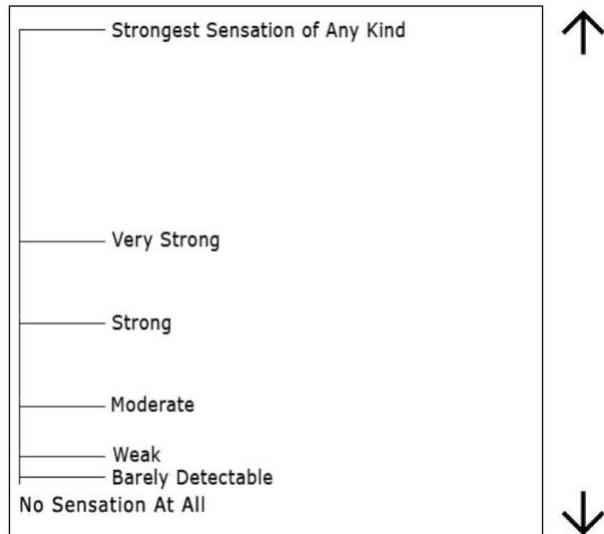
Say: **Now I am going to test your sense of taste. To do this, we will be using a salty flavor and a flavor found in tonic water.** Touch and hold button at the bottom of the screen to move to next screen.

Demonstration of the scale:

Say: **Before the tasting, I am going to ask you to use this scale to rate how weak or strong some sensations are to you. Some of these sensations are things that you will experience. Some of these sensations are what you will recall experiencing in the past.**

Continue: **This scale ranges from 'no sensation' at the bottom to the 'strongest sensation of any kind' at the top. The top of the scale (Strongest Sensation of Any Kind) refers to any kind of experience, for example sound, brightness of light, even those sensations that might be painful.** Touch and hold button at the bottom of the screen to advance to the next screen.

Point to the scale on the screen and use one finger to indicate the bottom to the top, saying, **This is how you use this scale.** Demonstrate how the participant can use his/her finger on the scale. Then touch and hold button at the bottom of the screen to advance to the next screen.



Show the scale and say: You can use your finger to choose a word on the scale that describes what you experience or what you remember. You can touch anywhere on the line.

For example, if the sensation you experience is more than 'moderate' but not quite 'strong,' you can use your finger to touch a spot between moderate and strong. Demonstrate for the participant.

Then say: **Move your finger until you think it best represents how you feel, and then remove your finger. If you like, you can fine-tune your rating by using the up and down arrows to the right of the scale. When you are happy with the position of the mark, touch the OK button.**

Once the participant has touched the OK button, the practice screens appear preceded by a screen that the examiner reads: **Let's try some examples.** The scale on the screen will no longer have instructions on it. The examiner should touch and hold button at the bottom of the screen to advance to the next screen.

Practice Screen 1:

Say: **Use this scale to rate the brightness of a well-lit room. How strong or intense is the brightness to you? When you are finished, touch the OK button.**

Practice Screen 2:

Say: **Please remember the brightness of a dimly lit restaurant, where the only light is from candles on the table. Would you say the intensity of a dimly lit restaurant is less bright or brighter than the light in a well-lit room? Use the scale to rate the brightness of a dimly lit restaurant. When you are finished, touch the OK button.**

Practice Screen 3:

Say: **Now think about the brightest light you have ever seen. Use the scale to rate the intensity or strength of the brightest light you have ever seen. When you are finished, touch the OK button.**

If a participant has difficulty touching the screen, he/she may point and the examiner may touch. The examiner should say something like the following to the participant: **You can point to your choice and then I can touch the screen for you.**

Test Items:

There are four trials: quinine on the tongue tip, salt on the tongue tip, quinine in the whole mouth, and salt in the whole mouth. The examiner should follow the prescribed order.

Preparation for test items: Read: **Now we are going to do the taste test. Before we begin, please rinse out your mouth two times with the bottled water and then spit the rinse water into this container (show container).**

Continue: **Now, I am going to ask you to rate the strength of these tastes. First, I will put some of the solution across the tip of your tongue and ask for a rating. To begin, I will put on these gloves. (See steps below).**

Step 1:

The examiner should *put on gloves* for the remainder of this measure.

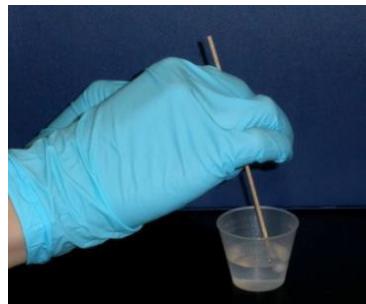
Step 2:

**Say: Then, I will put this sterile cotton swab into the solution.** Put the swabs into the cups of solution.

The examiner should touch and hold button at the bottom of the screen to advance to next screen.



Step 1



Step 2



Step 3

Test item 1:

**Say: Now hold your tongue out.** If the participant has difficulty doing this, show him/her the picture or demonstrate. **Say: I am going to start on your left side and gently put some solution across the tip of your tongue.**

The examiner should carefully and gently apply the solution in a slow, continuous motion from the left side of the tongue across the tip and finishing on the right side of the tongue



Move from left side      to the middle      to the right side.

Using the cotton swab, paint the *quinine* on the tip of the tongue as described earlier, and say: **Now, show me the strength or intensity of the taste on the scale you used before. Keep your tongue out while you make the rating on the scale. Touch the OK button when you are finished. If you should accidentally swallow any, it will not hurt you.**

Transition screen 1:

Have the participant rinse out his/her mouth with the bottled water between Items 1 and 2 and read: **Please rinse out your mouth two times with the bottled water and spit the rinse water into this container.**

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

Test Item 2:

Read: **Now hold your tongue out again. I am going to gently put some solution across the tip of your tongue.** Using the cotton swab, paint the *salt solution (NaCl)* on the tip of the tongue as described earlier, and say: **Now, show me the strength or intensity of the taste on the scale you used before. Keep your tongue out while you make the rating on the scale. Touch the OK button when you are finished. If you should accidentally swallow any, it will not hurt you.**

Transition screen 2:

Have the participant rinse out his/her mouth with the bottled water between Items 2 and 3 and read: **Please rinse out your mouth two times with the bottled water and spit the rinse water into this container.**

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

Test Item 3:

Hand the participant a small cup with *quinine* and say: **Next, I would like you to sip all the solution in this cup. Try not to drink the solution, but hold it and gently move it around in your mouth until I tell you to spit it out in this container. If you should accidentally swallow any, it will not hurt you.**

After the participant sips the solution, the examiner should count for three seconds (one-thousand-one, one-thousand-two, one-thousand-three), and then say: **Spit out the solution in your mouth and swallow whatever remains. Then, rate the strength or intensity of the taste on the same scale you used before. Touch the OK button when you are finished.**

Transition screen 3:

Have the participant rinse out his/her mouth with the bottled water between Items 4 and 4 and say: **Please rinse out your mouth two times with the bottled water and spit the rinse water into this container.**

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

Test Item 4:

Hand the participant a small cup with *salt solution (NaCl)* and say: **Next, I would like you to sip all the solution in this cup. Try not to drink the solution, but hold it and gently move it around in your mouth until I tell you to spit it out in this container. If you should accidentally swallow any, it will not hurt you.**

After counting one-thousand-one, one-thousand-two, one-thousand-three once the participant has sipped the solution, the examiner should say: **Spit out the solution in your mouth and swallow whatever remains. Then, rate the strength or intensity of the taste on the same scale you used before. Touch the OK button when you are finished.**

Final Screen:

After the last item is administered, give the participant the bottle of water and encourage him/her to drink it and/or rinse some more. The examiner should say: **Now that we have finished, you might want to drink some more water to clean out your mouth.**

The examiner should touch and hold button at the bottom of the screen to advance to next screen.

The participant may be offered a candy to help overcome any remaining taste in his/her mouth.

(Sugar-free candy may be needed for diabetic participants)

## D. Administering PROMIS

The Patient Reported Outcomes Measurement Information System (PROMIS) is a system of highly reliable, precise measures of patient-reported health status for physical, mental, and social well-being. PROMIS tools measure what patients are able to do and how they feel by asking questions. PROMIS measures can be used as primary or secondary endpoints in clinical studies of the effectiveness of treatment (see more at [www.HealthMeasures.net](http://www.HealthMeasures.net)).

### **PROMIS Domains**

PROMIS instruments measure outcomes by domains. A domain can be defined as the trait or conceptual area that represents an instrument's or item's content (e.g., Fatigue).

### **PROMIS Instrument Formats**

Each PROMIS instrument is administered in either a computerized adaptive testing (CAT), short form (SF), Profile or Instruction format (see below). All currently included PROMIS instruments are self-report (i.e., the respondent answers questions about him/herself).

**Computer Adaptive Testing (CATs)** – PROMIS CATs adapt to the examinee's trait level by selecting items based on a respondent's previous answers. CATs begin with a standard item (specific to that measure). An algorithm is utilized to determine which item should be administered next. PROMIS instruments, which use CAT as an administration method, are often referred to as "Banks." CATs are usually 4-6 items long.

**Short Forms (SFs)** – SFs are a more traditional instrument in that all items are administered in a set (sequential) order.

**Profiles** – Profiles are similar to SFs, but they include sets of items from multiple domains. Therefore, these instruments produce more than one IRT score, i.e., one score per domain. Profile instruments are classified as Preset batteries, i.e., made up on individual short form instruments. See section 3 for a more detailed description of Preset Batteries and a list of the short form instruments which make up the PROMIS-29 Profile v2.1 preset battery.

The PROMIS-29 Profile v2.1 is the only PROMIS preset battery to be included in the App. It is made up of 8 instruments. Each of the instruments in the battery is named for the short form, which together comprise the Profile instrument. The short forms are also standalone instruments in the App. The short form scoring procedure is used to score 7 of the instruments in the PROMIS-29 Profile v2.1 preset battery. Scores appear per instrument in the data export.

**Instructions** – Instructions for PROMIS instruments are listed as an instrument. PROMIS Instructions are optional and inclusion is at the discretion of users. It is recommended that if more than one instrument is to be administered, these instructions should only be presented prior to the beginning of the first instrument.

### **Time to administer**

All individual PROMIS CAT and SF instruments take less than 5 minutes to complete. PROMIS Profile instruments take less than 10 minutes to complete.

### **General Instructions**

The participant answers PROMIS instruments at his/her own speed. An examiner need not be present. After a question is answered, the screen advances automatically to the next question.

## D.1 PROMIS Instruments List

Instrument Name	
PROMIS Ped-25 Profile v2.0	PROMIS CAT v1.0 – Phys Func Samples w Mobility Aid
PROMIS Ped-49 Profile v2.0	PROMIS CAT v2.0 – Pain Behavior
PROMIS 29 Profile v2.1	PROMIS Ped CAT v1.0 – Pain Behavior
PROMIS 43 Profile v2.1	PROMIS SF v1.0 – Anxiety 7a
PROMIS 57 Profile v2.1	PROMIS SF v1.0 – Anxiety 8a
PROMIS CAT v2.0 – Ability to Participate Social	PROMIS SF v1.0 – Anxiety 4a
PROMIS SF v2.0 – Ability to Participate Social 4a	PROMIS Ped CAT v2.0 – Anxiety
PROMIS SF v2.0 – Ability to Participate Social 8a	PROMIS Ped SF v2.0 – Anxiety 8a
PROMIS CAT v1.0 – Alcohol: Alcohol Use	PROMIS Parent Proxy CAT v2.0 – Anxiety
PROMIS CAT v1.0 – Alcohol: Negative	PROMIS Parent Proxy SF v2.0 – Anxiety 8a
PROMIS CAT v1.0 – Alcohol: Negative Expectancies	PROMIS Parent Proxy SF v2.0 – Asthma Impact 8a
PROMIS CAT v1.0 – Alcohol: Positive Consequences	PROMIS Ped SF v2.0 – Asthma Impact 8a
PROMIS CAT v1.0 – Alcohol: Positive Expectancies	PROMIS CAT v1.0 – Depression
PROMIS SF v1.0 – Alcohol: Alcohol Use 7a	PROMIS SF v1.0 – Depression 8b
PROMIS CAT v1.1 – Anger	PROMIS SF v1.0 – Depression 4a
PROMIS SF v1.1 – Anger 5a	PROMIS SF v1.0 – Depression 8a
PROMIS Ped SF v2.0 – Anger 5a	PROMIS Ped CAT v2.0 – Depressive Sx
PROMIS Parent Proxy Scale v2.0 – Anger 5a	PROMIS Ped SF v2.0 – Depressive Sx 8a
PROMIS CAT v1.0 – Anxiety	PROMIS Parent Proxy CAT v2.0 – Depressive Sx
PROMIS SF v1.0 – Anxiety 6a	PROMIS Parent Proxy SF v2.0 – Depressive Symptoms 6a
PROMIS Ped CAT v2.0 – Fatigue	PROMIS Ped CAT v1.0 – Cognitive Function
PROMIS Ped SF v2.0 – Fatigue 10a	PROMIS Parent Proxy CAT v1.1–Cognitive Function
PROMIS Parent Proxy CAT v2.0 – Fatigue	PROMIS CAT v1.0 – Fatigue
PROMIS Parent Proxy SF v2.0 – Fatigue 10a	PROMIS SF v1.0 – Fatigue 8a
PROMIS SF v1.2 – Global Health	PROMIS SF v1.0 – Fatigue 7a
PROMIS CAT v1.1 – Pain Interference	PROMIS SF v1.0 – Fatigue 4a
PROMIS SF v1.0 – Pain Interference 6a	PROMIS CAT v2.0 – Physical Function
PROMIS SF v1.0 – Pain Interference 6b	PROMIS CAT v2.0 – Upper Extremity
PROMIS SF v1.0 – Pain Interference 8a	PROMIS SF v1.0 – Phys Func Samples w Mobility Aid
PROMIS SF v1.0 - Pain Interference 4a	PROMIS SF v2.0– Phys. Function 10a
PROMIS Ped CAT v2.0 – Pain Interference	PROMIS SF v2.0 – Phys. Function 20a
PROMIS Ped Cat v2.0 – Pain Quality	PROMIS SF v2.0 - Physical Function 4a
PROMIS Ped SF v2.0 – Pain Interference 8a	PROMIS SF v2.0 – Physical Function 6b
PROMIS Parent Proxy CAT v2.0 – Pain Interference	PROMIS SF v2.0 – Physical Function 8b
PROMIS Parent Proxy SF v2.0 – Pain Interfere 8a	PROMIS Ped CAT v.10 – Physical Activity
PROMIS Scale v1.0 – Pain Intensity 3a	PROMIS Parent Proxy SF v1.0 – Physical Activity 8a

Instrument Name	
PROMIS Ped SF v1.0 – Physical Activity 8a	PROMIS Bank v1.0 – Lubrication
PROMIS Ped CAT v2.0 – Mobility	PROMIS Pool v1.0 – Orgasm
PROMIS Ped CAT v2.0 – UpperExtremity	PROMIS Parent Proxy CAT v2.0 – Upper Extremity
PROMIS Ped SF v2.0 – Mobility 8a	PROMIS CAT v2.0 - Mobility
PROMIS Ped SF v2.0 – Upper Extremity 8a	PROMIS Parent Proxy SF v2.0 – Mobility 8a
PROMIS Parent Proxy CAT v2.0 – Mobility	PROMIS Parent Proxy SF v2.0 – Upper Extremity 8a
PROMIS SF v1.0 – Psychosoc Illness Impact-Neg 4a	PROMIS SF v2.0 – Social Isolation 8a
PROMIS SF v1.0 – Psychosoc Illness Impact-Neg 8a	PROMIS Ped CAT v2.0 – Peer Relationships
PROMIS SF v1.0 – Psychosoc Illness Impact-Pos 4a	PROMIS Ped SF v2.0 – Peer Relationships 8a
PROMIS CAT v2.0 – Emotional Support	PROMIS Parent Proxy CAT v2.0 – Peer Relations
PROMIS Parent Proxy SF v1.0 Psych Stress Exp 8a	PROMIS Parent Proxy SF v2.0 – Peer Relations 7a
PROMIS Ped SF v1.0 – Psych Stress Experiences 8a	PROMIS Parent Proxy SF v1.0-Fam Relationship 4a
PROMIS Ped CAT v1.0 - Psych Stress Experiences	PROMIS Ped SF v1.0 – Fam Relationships 4a
PROMIS Parent Proxy CAT v1.0 - Psych Stress Exp	PROMIS Ped CAT v1.0 – Family Relationships
PROMIS Ped Cat v1.0 – Physical Stress Experiences	PROMIS Parent Proxy SF v1.0-Fam Relationships 8a
PROMIS Parent Proxy CAT v1.0 – Phys Stress Exp	PROMIS Parent Proxy CAT v1.0 – Family Relationships
PROMIS CAT v2.0 – Informational Support	PROMIS Ped SF v1.0 – Fam Relationships 8a
PROMIS CAT v2.0 – Instrumental Support	PROMIS CAT v2.0 – Satisfaction Roles Activities
PROMIS CAT v2.0 – Social Isolation	PROMIS SF v1.0 – Social Sat Role 4a
PROMIS SF v2.0 – Companionship 4a	PROMIS SF v2.0 – Satisfaction Roles Activities 4a
PROMIS SF v2.0 – Companionship 6a	PROMIS SF v2.0 – Satisfaction Roles Activities 8a
PROMIS SF v2.0 – Emotional Support 4a	PROMIS CAT v1.0 – General Self-Efficacy
PROMIS SF v2.0 – Emotional Support 8a	PROMIS CAT v1.0 – Self-Efficacy Manage Emotions
PROMIS SF v2.0 – Informational Support 4a	PROMIS CAT v1.0 – Self-Efficacy Manage Meds/Tx
PROMIS SF v2.0 – Informational Support 8a	PROMIS CAT v1.0 – Self-Efficacy Manage Soc Inter
PROMIS SF v2.0 – Instrumental Support 4a	PROMIS CAT v1.0 – Self-Efficacy Manage Symptoms
PROMIS SF v2.0 – Instrumental Support 6a	PROMIS SF v1.0 – Self-Efficacy Manage Day Activ 4a
PROMIS SF v2.0 – Instrumental Support 8a	PROMIS CAT v1.0 – Self-efficacy Manage Day Activ
PROMIS SF v2.0 – Social Isolation 4a	PROMIS SF v1.0 – Self-Efficacy Manage Emotions 4a
PROMIS SF v2.0 – Social Isolation 6a	PROMIS SF v1.0 – Self-Efficacy Manage Meds/Tx 4a
PROMIS Bank v1.0 – Vaginal Discomfort	PROMIS SF v1.0 – Self-Efficacy Manage Soc Inter 4a
PROMIS CAT v1.0 – Erectile Function	PROMIS SF v1.0 – Self-Efficacy Manage Symptom 4a
PROMIS Bank v1.0 – Global Satisfaction w Sex Life	PROMIS CAT v1.0 – Sleep-Related Impairment
PROMIS Bank v1.0 – Interest in Sexual Activity	PROMIS Ped CAT v1.0 – Sleep-Related Impairment
PROMIS Sexual Function Profile v1.0 – Female	PROMIS CAT v1.0 – Sleep Disturbance
PROMIS Sexual Function Profile v1.0 – Male	PROMIS PED CAT v1.0 – Sleep Disturbance

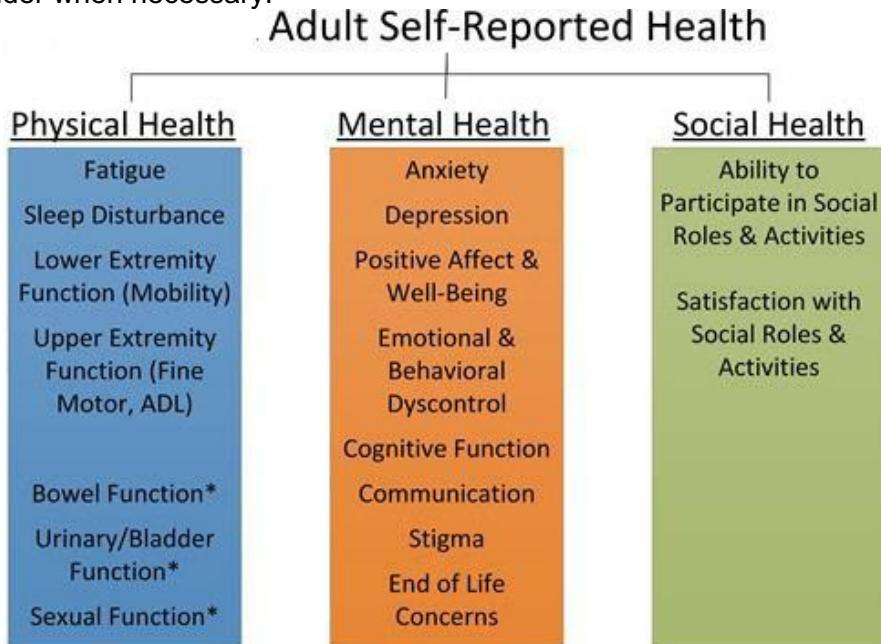
Instrument Name	
PROMIS SF v1.0 – Sleep Disturb 8b	PROMIS Ped SF v1.0 – Life Satisfaction 8a
PROMIS SF v1.0 – Sleep Disturbance 8a	PROMIS Ped Cat v1.0 – Life Satisfaction
PROMIS SF v1.0 – Sleep-Related Impairment 8a	PROMIS Ped CAT v1.0 – Meaning and Purpose
PROMIS SF v1.0-Sleep Disturbance 4a	PROMIS Ped SF v1.0 – Meaning and Purpose 8a
PROMIS Scale v1.2 – Global Mental 2a	PROMIS Parent Proxy CAT v1.0 – Meaning and Purpose
PROMIS Scale v1.2 – Global Physical 2a	PROMIS Ped CAT v1.0 – Positive Affect
PROMIS Parent Proxy SF v1.0 – Life Satisfaction 8a	PROMIS Parent Proxy CAT v1.0 – Positive Affect

## E. Neuro-QoL

Neuro-QoL (Quality of Life in Neurological Disorders) is a measurement system that evaluates and monitors the physical, mental, and social effects experienced by adults and children living with neurological conditions.

### ***Adult Assessment***

Neuro-QoL developed a set of health-related quality of life measures for use with adults who have a neurological condition or disorder. The self-report measures can be completed by a proxy responder when necessary.



\*Untested Item Pools

### ***Pediatric Assessment***

Neuro-QoL developed a set of health-related quality of life measures for use with 8-17 year olds who have a neurological condition or disorder. The self-report measures can be completed by a parent or caregiver when necessary.



## ***Neuro-QoL is Appropriate for Use Across a Range of Neurological Conditions***

Neuro-QoL measures can be used in a range of adult and pediatric neurological conditions including but not limited to: stroke, multiple sclerosis, Parkinson's disease, epilepsy, amyotrophic lateral sclerosis (ALS), traumatic brain injury (TBI), military deployment-related traumatic brain injury (MDR-TBI), spinal cord injury (SCI), and Huntington's disease (HD).

Neuro-QoL measures can be administered alongside PROMIS® or NIH Toolbox® measures that assess other aspects of health and function.

To learn more you can watch a video located here:

<https://www.youtube.com/watch?v=LTkDP6yZ18o>

### **E.1 Neuro-QoL Instrument List**

<b>List of Adult Measures</b>
Neuro-QoL Item Bank v1.0 – Ability to Participate in Social Roles and Activities
Neuro-QoL Item Bank v1.0 – Anxiety
Neuro-QoL Item Bank v1.0 – Depression
Neuro-QoL Item Bank v1.0 – Emotional and Behavioral Dyscontrol
Neuro-QoL Item Bank v1.0 – Fatigue
Neuro-QoL Item Bank v1.0 – Lower Extremity Function – Mobility
Neuro-QoL Item Bank v1.0 – Positive Affect and Well-Being
Neuro-QoL Item Bank v1.0 – Stigma
Neuro-QoL Item Bank v1.0 – Upper Extremity Function – Fine Motor, ADL
Neuro-QoL Item Bank v1.1 – Satisfaction with Social Roles and Activities
Neuro-QoL Item Bank v2.0 – Cognitive Function
Neuro-QoL Scale v1.0 – Communication
Neuro-QoL Short Form v1.0 – Ability to Participate in Social Roles and Activities
Neuro-QoL Short Form v1.0 – Anxiety
<b>List of Adult Measures</b>
Neuro-QoL Short Form v1.0 – Depression
Neuro-QoL Short Form v1.0 – Emotional and Behavioral Dyscontrol
Neuro-QoL Short Form v1.0 – Fatigue
Neuro-QoL Short Form v1.0 – Lower Extremity Function – Mobility
Neuro-QoL Short Form v1.0 – Positive Affect and Well-Being
Neuro-QoL Short Form v1.0 – Sleep Disturbance
Neuro-QoL Short Form v1.0 – Stigma
Neuro-QoL Short Form v1.0 – Upper Extremity Function – Fine Motor, ADL
Neuro-QoL Short Form v1.1 – Satisfaction with Social Roles and Activities
Neuro-QoL Short Form v2.0 – Cognitive Function

<b>List of Pediatric Measures</b>
Neuro-QoL Item Bank v1.0 – Pediatric Anxiety
Neuro-QoL Item Bank v1.0 – Pediatric Social Relationships – Interaction with Peers
Neuro-QoL Item Bank v1.0 – Pediatric Stigma
Neuro-QoL Item Bank v1.1 – Pediatric Depression
Neuro-QoL Item Bank v2.0 – Pediatric Cognitive Function
Neuro-QoL Item Bank v2.1 – Pediatric Fatigue
Neuro-QoL Scale v1.1 – Pediatric Lower Extremity Function – Mobility
Neuro-QoL Scale v1.1 – Pediatric Upper Extremity – Fine Motor, ADL
Neuro-QoL Short Form v1.0 – Pediatric Anger
Neuro-QoL Short Form v1.0 – Pediatric Anxiety
Neuro-QoL Short Form v1.0 – Pediatric Depression
Neuro-QoL Short Form v1.0 – Pediatric Pain
Neuro-QoL Short Form v1.0 – Pediatric Social Relationships – Interaction with Peers
Neuro-QoL Short Form v1.0 – Pediatric Stigma
Neuro-QoL Short Form v2.0 – Pediatric Cognitive Function
Neuro-QoL Short Form v2.1 – Pediatric Fatigue

## F. TBI-QOL

### ***Traumatic Brain Injury – Quality of Life Measurement System***

The Traumatic Brain Injury – Quality of Life (TBI-QOL) measurement system is a patient reported outcome measurement system that assesses 23 areas of physical, cognitive, emotional, and social functioning specific to persons who have sustained a traumatic brain injury. The TBI-QOL measurement system can be used for clinical care and research in traumatic brain injury (TBI) rehabilitation. Some scales are unique to the needs of individuals with TBI (e.g., headache pain) while other scales are linked to PROMIS and Neuro-QoL items recalibrated to optimize assessment within the TBI population (e.g., pain interference, depression, anxiety).

### ***TBI-QOL Instrument Formats***

The TBI-QOL is available in two basic formats: a computer adaptive test (CATs) and/or fixed length short-form version (SF). Item banks have been calibrated using item response theory (IRT) and are available as either CATs or SFs. Scales have also been calibrated using IRT but are only available as fixed-length forms.

The TBI-QOL measurement system was developed with funding from the National Institutes of Health (National Institute of Child Health and Human Development /National Center for Medical Rehabilitation Research and the National institute of Neurological Disorders and Stroke) and the National Institute on Disability and Rehabilitation Research.

### ***TBI-QOL Overlap with PROMIS and Neuro-QoL***

Overlap with PROMIS and Neuro-QoL: When there is a TBI-QOL item bank in an area that is also assessed by PROMIS or Neuro-QoL, the TBI-QOL item bank should be used as it has been optimized for a TBI population. For these “optimized” PROMIS/Neuro-QoL item banks, scores have been transformed back to the Neuro-QoL or PROMIS metric so that scores reference the original population (i.e., general population or mixed general + neurological population). The TBI-QOL also includes new, TBI-specific item banks that are not part of the Neuro-QoL or PROMIS systems. These are:

<ul style="list-style-type: none"><li>• Communication/Comprehension</li><li>• Independence</li><li>• Grief/Loss</li></ul>	<ul style="list-style-type: none"><li>• Resilience</li><li>• Headache Pain</li><li>• Self-Esteem</li></ul>
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These new item banks reference the TBI population. In other words, the mean of 50 on the Headache Pain bank is relative to a sample of individuals with TBI.

Item banks that produce a redundant score with PROMIS (but are optimized for TBI) are as follows:

<ul style="list-style-type: none"><li>• Anger</li><li>• Fatigue</li><li>• Anxiety</li></ul>	<ul style="list-style-type: none"><li>• Pain Interference</li><li>• Depression</li></ul>
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Item banks that produce a redundant score with Neuro-QoL (but are optimized for TBI) are as follows:

- Ability to Participate in Social Roles/Activities
- Positive Affect & Well-Being
- Cognition – General Concerns
- Satisfaction w/Social Roles/Activities
- Cognition – Executive Function
- Stigma
- Emotional & Behavioral Dyscontrol
- Upper Extremity Function
- Mobility

### ***General Instructions***

The TBI-QOL was developed with and for adults ages 18 and over who have sustained a traumatic brain injury (TBI). The measures may be completed in interview format (either in person or over the phone) or by independent self-report. Each instrument takes approximately 2-3 minutes to complete.

### **F.1 TBI-QOL Instrument List**

List of TBI-QOL Measures
TBI-QOL Bank v1.0 – Ability to Participate in SRA
TBI-QOL Bank v1.0 – Anger
TBI-QOL Bank v1.0 – Anxiety
TBI-QOL Bank v1.0 – Communication
TBI-QOL Bank v1.0 – Depression
TBI-QOL Bank v1.0 – Emotional & Behavioral Dyscontrol
TBI-QOL Bank v1.0 – Executive Function
TBI-QOL Bank v1.0 – Fatigue
TBI-QOL Bank v1.0 – General Concerns
TBI-QOL Bank v1.0 – Grief – Loss
TBI-QOL Bank v1.0 – Headache
TBI-QOL Bank v1.0 – Independence
TBI-QOL Bank v1.0 – Mobility
TBI-QOL Bank v1.0 – Pain Interference
TBI-QOL Bank v1.0 – Positive Affect and Well-Being
TBI-QOL Bank v1.0 – Resilience
TBI-QOL Bank v1.0 – Satisfaction with SRA
TBI-QOL Bank v1.0 – Self-Esteem
TBI-QOL Bank v1.0 – Stigma
TBI-QOL Bank v1.0 – Upper Extremity/ADL
TBI-QOL Scale v1.0 – Asking For Help
TBI-QOL SF v1.0 – Ability to Part. In SRA SF10a
TBI-QOL SF v1.0 – Anger SF10a

List of TBI-QOL Measures
TBI-QOL SF v1.0 – Anxiety SF10a
TBI-QOL SF v1.0 – Cognition – General Concerns SF10a
TBI-QOL SF v1.0 – Communication SF9a
TBI-QOL SF v1.0 – Depression SF10a
TBI-QOL SF v1.0 – Emotional & Behavioral Dyscontrol SF10a
TBI-QOL SF v1.0 – Executive Function SF10a
TBI-QOL SF v1.0 – Fatigue SF10a
TBI-QOL SF v1.0 – Grief – Loss SF9a
TBI-QOL SF v1.0 – Headache SF10a
TBI-QOL SF v1.0 – Independence SF8a
TBI-QOL SF v1.0 – Mobility SF9a
TBI-QOL SF v1.0 – Pain Interference SF10a
TBI-QOL SF v1.0 – Pos. Affect and Well-Being SF9a
TBI-QOL SF v1.0 – Resilience SF10a
TBI-QOL SF v1.0 – Satisfaction with SRA SF10a
TBI-QOL SF v1.0 – Self-Esteem SF10a
TBI-QOL SF v1.0 – Stigma SF7a
TBI-QOL SF v1.0 – Upper Extremity/ADL SF9a

## **G. SCI-QOL**

### ***Spinal Cord Injury – Quality of Life Measurement System***

The Spinal Cord Injury – Quality of Life (SCI-QOL) measurement system is a patient reported outcomes measurement system that assesses 22 areas of physical, emotional, and social functioning specific to persons who have sustained a spinal cord injury. The SCI-QOL measurement system was developed using the PROMIS standards of development and can be used for clinical care and research in spinal cord injury (SCI) rehabilitation. Some scales are unique to the needs of individuals with SCI (e.g., bladder management difficulties, grief and loss, independence) while other scales are linked to PROMIS and Neuro-QoL but items have been recalibrated to optimize assessment within the SCI population (e.g., pain interference, depression, anxiety).

### ***SCI-QOL Instrument Formats***

SCI-QOL instruments are available in two basic formats: as a computer adaptive test (CAT) and/or fixed length short-form version (SF). Item banks have been calibrated using item response theory (IRT) and are available as either CATs or SFs. Scales have also been calibrated using IRT but are only available as fixed-length forms.

The SCI-QOL measurement system was developed with funding from the National Institutes of Health (National Institute of Child Health and Human Development /National Center for Medical Rehabilitation Research and the National institute of Neurological Disorders and Stroke) and the National Institute on Disability and Rehabilitation Research.

### ***SCI-QOL Overlap with PROMIS and Neuro-QoL***

When there is a SCI-QOL item bank in an area that is also assessed by PROMIS or Neuro-QoL, the SCI-QOL item bank should be used as it has been optimized for a SCI population. For these “optimized” PROMIS/Neuro-QoL item banks, scores have been transformed back to the Neuro-QoL or PROMIS metric so that scores reference the original population (i.e., general population or mixed general + neurological population).

Item banks that produce a redundant score with PROMIS (but are optimized for SCI) are as follows:

- Anxiety
- Pain Behavior (Scale)
- Depression
- Pain Interference

Item banks that produce a redundant score with Neuro-QoL (but are optimized for SCI) are as follows:

- Ability to Participate in Social Roles/Activities
- Positive Affect & Well-being
- Satisfaction with Social Roles/Activities
- Stigma

The SCI-QOL also includes new, SCI-specific item banks/scales that are not part of the Neuro-QoL or PROMIS systems. These are:

- Ambulation (*SCI-FI v1.0*)
- Independence
- Basic Mobility (*SCI-FI v1.0*)
- Pressure Ulcers
- Bladder Complications Scale
- Psychological Trauma
- Bladder Management Difficulties
- Resilience
- Bowel Management Difficulties
- Self Care (*SCI-FI v1.0*)
- Fine Motor Function (*SCI-FI v1.0*)
- Self Esteem
- Grief/Loss
- Wheelchair Mobility (*SCI-FI v1.0*)

These new item banks reference the SCI population. In other words, the mean of 50 on the Bladder Management Difficulties item bank is relative to a sample of individuals with SCI.

### ***General Instructions***

The SCI-QOL was developed with and for adults ages 18 and over with spinal cord injury (SCI). The measures may be completed in interview format (either in person or over the phone) or by independent self-report. Each instrument takes approximately 2-3 minutes to complete.

#### **G.1 SCI-QOL Instrument List**

List of SCI-QOL Measures
SCI-QOL Bank v1.0 – Ability to Participate in SRA
SCI-QOL Bank v1.0 – Anxiety
SCI-QOL Bank v1.0 – Bladder Mgmt. Difficulties
SCI-QOL Bank v1.0 – Bowel Mgmt. Difficulties
SCI-QOL Bank v1.0 – Depression
SCI-QOL Bank v1.0 – Grief-Loss
SCI-QOL Bank v1.0 – Independence
SCI-QOL Bank v1.0 – Pain Interference
SCI-QOL Bank v1.0 – Positive Affect and Well-Being
SCI-QOL Bank v1.0 – Resilience
SCI-QOL Bank v1.0 – Satisfaction with SRA
SCI-QOL Bank v1.0 – Self-Esteem
SCI-QOL Bank v1.0 – Stigma
SCI-QOL Bank v1.0 – Trauma
SCI-QOL Scale v1.0 – Bladder Complications
SCI-QOL Scale v1.0 – Pain Behavior
SCI-QOL Scale v1.0 – Pressure Ulcers
SCI-QOL SF v1.0 – Ability to Part. In SRA SF10a
SCI-QOL SF v1.0 – Anxiety SF9a

SCI-QOL SF v1.0 – Bladder Mgmt. Difficulties SF8a
SCI-QOL SF v1.0 – Bowel Mgmt. Difficulties SF9a
SCI-QOL SF v1.0 – Depression SF10a
SCI-QOL SF v1.0 – Grief-Loss SF9a
SCI-QOL SF v1.0 – Independence SF8a
SCI-QOL SF v1.0 – Pain Interference SF10a
SCI-QOL SF v1.0 – Pos. Affect and Well-Being SF10a
SCI-QOL SF v1.0 – Resilience SF8a
SCI-QOL SF v1.0 – Satisfaction with SRA SF10a
SCI-QOL SF v1.0 – Self-Esteem SF8a
SCI-QOL SF v1.0 – Stigma SF10a
SCI-QOL SF v1.0 – Trauma SF8a

## H. SCI-FI

### ***Spinal Cord Injury – Functional Index***

The Spinal Cord Injury – Functional Index (SCI-FI) version 1.0 is the Physical Function domain of the larger SCI-QOL measurement system and is comprised of 5 item response theory (IRT)-calibrated item banks: Basic Mobility, Self Care, Fine Motor Functioning, Wheelchair Mobility, and Ambulation. The SCI-FI has incorporated items from the PROMIS and Neuro-QoL measurement systems verbatim that have been optimized for SCI and supplemented by several items targeted to this specific population. Instructions direct participants to respond to items with the amount of difficulty they have performing various tasks without the use of special equipment or help from another person and as such these measures are intended to capture underlying physical capacity in each area. The exception is Wheelchair Mobility which asks questions about how they are able to move with the assistance of a wheelchair.

The SCI-FI v1.0 item banks can be used for clinical care and research in spinal cord injury (SCI) rehabilitation. The SCI-FI v1.0 is available in two basic formats: computer adaptive test (CAT) and/or fixed length short-form version (SF). Since the NIH Toolbox iPad app does not support CATs with skip patterns, the NIH Toolbox iPad app contains the abbreviated SCI-FI v1.0 CORE ITEMS CATs. These are CATs in which certain items (i.e., those that are only appropriate for a subset of participants and thus require skip logic to administer) have been omitted from the banks. The scores on the CORE ITEMS CATs are very highly correlated with scores on CATs which draw from the full item banks.

The SCI-FI v1.0 measurement system was developed with funding from the US Department of Education and the National Institute on Disability and Rehabilitation Research.

### ***General Instructions***

The SCI-FI item banks were developed with and for adults ages 18 and over who have sustained a spinal cord injury (SCI). The measures may be completed in interview format (either in person or over the phone) or by independent self-report. Each instrument takes approximately 2-3 minutes to complete.

List of SCI-FI Measures
SCI-FI v1.0 Ambulation – Core Items CAT
SCI-FI v1.0 Basic Mobility – Core Items CAT
SCI-FI v1.0 Basic Mobility SF 11a
SCI-FI v1.0 Fine Motor Function – Core Items CAT
SCI-FI v1.0 Fine Motor SF 10b – Tetra
SCI-FI v1.0 Fine Motor SF 11b – Para
SCI-FI v1.0 Fine Motor SF 9a
SCI-FI v1.0 Power Wheelchair SF 10b – Para
SCI-FI v1.0 Power Wheelchair SF 10b – Tetra
SCI-FI v1.0 Self Care – Core Items CAT
SCI-FI v1.0 Self Care SF 10b – Para
SCI-FI v1.0 Self Care SF 11a
SCI-FI v1.0 Self Care SF 11b – Tetra
SCI-FI v1.0 Wheelchair Mobility Manual Wheelchair Core Items CAT
SCI-FI v1.0 Wheelchair Mobility Power Wheelchair Core Items CAT

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Effective Date/Last Updated: April 29 2022

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Phone Number: (773) 242-9130  
Email: [ToolboxAssessments@gmail.com](mailto:ToolboxAssessments@gmail.com)

## Appendix 2 – Good Testing Practices for the NIH Toolbox

Whether testing adults or children, to be successful, examiners:

- Need to establish and maintain rapport with the child or adult being tested; and
- Need to create a testing environment that is comfortable and supportive; and
- Should enjoy interacting with people, whether young or old.

Additionally, examiners need to remember the purposes of the testing. Particularly, when testing in a research setting, it is of paramount importance for examiners need to administer tests in a standardized fashion. Examiners should attempt to elicit optimal performance from the examinee, while ensuring that the interaction does not compromise the data obtained.

Testing should not be burdensome for either the examiner or the examinee. The NIH Toolbox testing protocol attempts to accomplish this by building in variety and breaks. During testing sessions, examiners should project their enjoyment working with examinees; if not, testing becomes robotic and rarely effective. Additionally, regular feedback is built into the NIH Toolbox to help the examinee understand the requirements of the task.

As a part of the NIH Toolbox protocol, the practice trials provide positive reinforcement of correct performances and correction of errors. In contrast, feedback during test trials should be non-directive and provided by the examiner. This feedback should be interspersed every so often and should focus on effort rather than accuracy of performance (e.g., “Good work” or “Good job” for children, or “Well done” or “Good job” for adults).

In all situations (research and clinical), interruptions and other unexpected events need to be reported to the project manager or on whatever forms are generally used in the particular setting.

### **The Testing Environment**

1. Having a quiet, comfortable, and uncluttered physical environment is important to obtaining reliable test data. The room should not be sterile; it should be conducive to easy interaction between the examiner and the examinee, as well as between the examinee and the testing equipment.
2. To create such an environment means that the room itself should be away from noisy hallways, mechanical equipment, and other auditory distractions.
3. Similarly, there should be few visual distractions, both inside and outside of the room. While windows and glass doorways provide natural light, they should not open onto attractive environments that contain distractions such as playgrounds or an active street.
4. The room and the testing table should support only the equipment needed to complete the testing protocol. Extraneous computer equipment, flashy posters, foodstuffs, and the like are also distractions. Nonetheless, having a box of Kleenex and a wastebasket nearby is often helpful. Similarly, having stickers to reward otherwise uncommitted children and/or a ball for an active child’s non-dominant hand may increase the likelihood of positive engagement.
5. For children, it is helpful to have furniture that is adapted to the child’s size. In some settings, however, both adults and children use the testing room. Moreover, some examiners cannot sit comfortably at a low table. In this case, the easiest adaptation is to

include a step stool on the floor to ensure the child's feet are not dangling so both adults and children can work at a full-size table.

6. Children should sit in straight-back chairs; swivel chairs are often too deep for children and always provide an additional distraction for the already distractible examinee.
7. For adults, the furniture set-up is also important. Generally, adults, like children, should sit in straight-back chairs. Persons who use a wheelchair should be able to remain in their chair, should they want to do so. The wheelchair needs to fit under the table.
8. Both children and adults should be seated at a table (surface) under which they can put their feet. Sitting in front of the file drawers of a desk is not only uncomfortable but also not suited to the correct placement of the iPad.
9. Adults more than children are sensitive to where the examiner is sitting. While not crowding the examinee, examiners need to be able to reach the iPad while demonstrating certain tasks. Test sites might want to experiment with different table arrangements. Some like round tables, while others like sitting at the corner of a square table.
10. Using a stand for the iPad makes it easier to view the iPad from different angles and provides protection, should the iPad fall. During all tests using the iPad, the examiner should center the iPad on the middle of the child or adult examinee's body.
11. It is imperative that the examiner be able to see the iPad and demonstrate instructions front of the iPad. The examiner may use handedness of the examinee to determine where to sit, as sometimes the examiner and the examinee appear to be dueling for space in front of the iPad screen. This is particularly true when each party is using the hand to the far side of the screen. If either the examiner or the examinee move the iPad for practice items, the examiner should re-center the iPad on the examinee before beginning test items.
12. Adults are also more sensitive than children to what the examiner is doing on the keyboard. When setting up the table and chairs, the examiner needs to ensure that the examinee cannot see the scoring sheets for List Sorting Working Memory and Oral Reading Recognition.

### **Establishing and Maintaining Rapport**

Testing is not an activity that stands alone; it is a part of something bigger, a clinical assessment or a research project. Whatever the overall endeavor, each session should begin with an introduction between not only the examiner and the examinee, but an introduction to the tasks presented in the particular session as well.

It is the examiner's responsibility to make sure all the equipment is close-at-hand and working correctly before introducing him/herself to the examinee. The equipment for the Cognition and Motor Domains includes the Bluetooth keyboard, home base, List Sorting Working Memory answer sheet, Oral Reading Recognition pronunciation guide, pegboard, Dynamometer, iPod touch, blue AEREX pad, gait belt, booties, measuring tape, cones, diagrams, and masking tapes. The iPad used for the testing should be dedicated to the NIH Toolbox and not have notifications or email on it.

Examiners and examinees should not have access to their cell phones during the testing session. Similarly, when an examiner is completing a test, the examiner should not be checking email or otherwise be disconnected for the testing itself.

It is the examiner's responsibility to reassure both adults and children, either before the actual testing (during the practice items) or at the end of the testing, that the tests are designed so that no one correctly answers all the questions. No participant should walk away with the impression that he or she "failed" either the test or the examiner.

At the end of the session, examiners should thank both children and adults for their efforts and for their help with the activities. This should make the participant feel successful at the end. If a parent accompanies a child, examiners should thank parents for helping their child participate. The parents should feel good about their child's participation.

### Testing with Children

1. Testing children, particularly young ones, poses a challenge to all examiners, as it is necessary to ensure that the child understands the task, is engaged in task performance, and maintains a positive attitude toward testing across multiple tasks.
2. Clearly, not all tasks are "fun and games" for the child. However, by creating an experience that is as enjoyable as possible, even reluctant children can become engaged and cooperative. A skillful examiner can use breaks and/or other incentives to redirect the child's attention to the tasks before them. Simple stickers offered at the end of each task is often enough to engage the child.
3. It is important to motivate the child to engage in each individual activity as well as the course of the entire testing session. Examiners must make task participation pleasurable, without setting up false expectations. The examiner may not want to describe a difficult activity as a "game," but calling a fun activity a "game" may help make the session seem more playful and enjoyable. Clearly, the rapport that is established between examiner and child is important for maintaining the child's motivation and engagement. Conversations not related to the task should be discouraged. Both adults and children can be redirected to chat when the task is completed.
4. As is common with younger children, if the child is reluctant to separate from the adult accompanying her/him, that adult may be present when the child is tested. The adult must not intervene in any way. He or she should sit in such a way that he or she does not make eye contact with the child, nor see the iPad, nor review the examiner's activity.
5. With older children, there is no expectation that accompanying adult sit in the room with the child. If the parent/caretaker insists on being present, then the parent/caretaker's seating should be oriented in the same way as described above. Specifically, it is best for the parent/caretaker to sit behind and to the side of the examiner.
6. It is best that the parent/caretaker sit behind and to the side of the examiner. With this setup, the parent/caretaker can be a reassuring presence for the child, without actively interfering with the testing. A parent/caretaker should not be directly in view of the child; he or she should not talk to the child (or urge the child to participate), or otherwise make comments on the child's performance during the testing. If the adult is not able to remain in the background and be silent, the data collected may not be usable. Different sites may have different policies about how to use data like this. In any case, the examiner should report the adult's interference to the project manager or on whatever forms are generally used.
7. It is normal that some children will become restless, will have a relatively short attention span, or will present other challenges. The younger the child, the more this is likely. There are a number of strategies to help calm active children. Most examiners can

overcome these challenges with short breaks. These breaks may involve something as simple as inviting the child to talk about his/her favorite activities, toys, books, TV shows, or animals.

8. A more physical break might offer the child “wiggle time” to be silly and stand or move a bit after sitting still. A simple walk to the drinking fountain may be sufficient to refresh the child’s engagement. Active children often have difficulty figuring out what to do with their non-dominant hand. Offering them a small ball to hold in their non-dominant hand sometimes solves this difficulty. Having them put their non-dominant hand behind their back sometimes works as well. If snacks are used as rewards, they should never be eaten near the testing table and materials.
9. Timing the breaks must consider not only the child’s needs but the test requirements as well. Ideally, a break should be between tasks. However, when testing a young child, breaks sometimes fall at a less-than-ideal time to be sensitive to the child’s needs (e.g., a child may insist on a bathroom break). Particularly on timed tests, taking a break in the middle invalidates the test. If the child cannot be encouraged to continue to a more appropriate break point, the examiner should report the interruption to the project manager or on whatever forms are generally used. Unless directed to by the project manager, a test should not be given a second time during a given testing session. It is the examiner’s responsibility to reassure the child, should the child become concerned that he or she did not answer some of the questions correctly. Generally, the message should be that the tasks are difficult for persons of all ages and that this particular child gave a really good performance.
10. The examiner should thank the child for his or her efforts and for his or her help with the activities. Similarly, the examiner should thank parent/caretaker for helping the child participate. The child and the parent/caretaker should feel good about the child’s participation at the end.
11. Remember: Children have the right to refuse to participate or to withdraw from participation, even when parents have granted permission for the child’s participation. A child’s refusal does not have to be verbal; young children often show their refusal with their behavior. That said, the examiner should try to understand a child’s reluctance to participate and reassure the child in an attempt to gain the child’s cooperation to continue. Sometimes a child will complete all tasks except one. The examiner should attempt another task before allowing a child to withdraw.

### Testing with Adults

1. Testing adults is not so different from testing children. Adults, however, are more sensitive to their own performance and engage in strategies to avoid embarrassment. Some adults try to engage the examiner in this effort by making the activities into a game that minimizes their effort. Establishing good rapport between the examiner and adult examinee is imperative for maintaining motivation and engagement.
2. Even with adults, examiners must make task participation pleasurable, while not setting up false expectations. The examiner may not want to describe a difficult activity as a “game,” but calling a fun activity a “game” may help make the session seem more playful and enjoyable. As with children, it is essential that the adult examinee understands the task, is engaged in task performance, and maintains a positive attitude toward testing across multiple tasks.
3. It is the examiner’s responsibility to explain to the adult examinee, that no one knows all the correct answers on the NIH Toolbox tests. Either before the actual testing (e.g.,

during the practice items) or at the end of the testing, persons being tested should be reassured that the tests are designed so that no one correctly answers all the questions. No respondent should walk away with the impression that he or she has “failed” either the test or the examiner. Participants who want definitive feedback about their performances should speak with the project managers as the examiners rarely have access to the scores and/or their interpretations.

4. Some adult examinees, like child examinees, become restless and present other challenges. Most examiners can overcome these challenges with short breaks for the restroom, a walk to the drinking fountain, or a brief conversation about the local sports team or a television show. It is inappropriate to discuss sensitive topics such as politics or religion.
5. Timing of the breaks must consider not only the examinee’s needs but the test requirements as well. Ideally, a break should be only between tasks. However, it is possible that a request for a break falls at a less-than-ideal time. The examiner may want to ask the examinee if he or she needs a break before a timed test as taking a break in the middle of a timed-test invalidates the results. If the examinee cannot be encouraged to continue to a more appropriate break point, the examiner should report the interruption to the project manager or on whatever forms are generally used.
6. Examiners should thank all examinees for their efforts and for their help with the activities. This should make them feel successful at the end.

### **Testing with Older Participants**

1. Healthcare settings routinely use technology with patients. Nonetheless, it is important to establish whether an older examinee is familiar with a device such as an iPad. Built into the NIH Toolbox are opportunities to practice responses before administration of the actual test items. During the practice items, the examiner can work with the examinee to make sure he or she understands the task. During the test items, feedback should focus on effort rather than accuracy of performance with comments such as “Well done” to encourage continued effort.
2. Older subjects may be more sensitive to issues of respect. Therefore, unless told otherwise, the examiner should address the examinee with more formal language like “Mr. or Mrs. Jones” and use phrases such as “Well done” instead of “Good job”.
3. It is important for the examiner to introduce himself or herself clearly and remind the examinee why he or she is doing the tests. Older adults may be sensitive to being embarrassed. It is the examiner’s responsibility to explain that no one knows all the correct answers on the NIH Toolbox tests. Either before the actual testing (e.g., during the practice items) or at the end of the testing, persons being tested should be reassured that the tests are designed so that no one correctly answers all the questions. No respondent should walk away with the impression that he or she has “failed” either the test or the examiner.
4. When testing older adult, it is important to be alert for signs of fatigue and physical distress. Similarly, it is important to take into consideration that medication use or time of day may affect performance. Always allow the examinee time to take his or her medications on schedule or if the examinee feels he/she needs a dose. Generally, examiners should remember not to push older adults beyond their physical tolerance and capacity; this means giving frequent breaks, even if the breaks extend the session longer than usual.

5. Some older examinees become restless and present other challenges. Most examiners can overcome these challenges with short breaks for the restroom, a walk to the drinking fountain, or a brief conversation about the local sports team or a television show. It is inappropriate to discuss sensitive topics such as politics or religion.
6. Timing of the breaks must consider not only the examinee's needs but the test requirements as well. Ideally, a break should be only between tasks. However, it is possible that a request for a break falls at a less-than-ideal time. The examiner may want to ask the examinee if he or she needs a break before a timed test as taking a break in the middle of a timed-test invalidates the results. If the examinee cannot be encouraged to continue to a more appropriate break point, the examiner should report the interruption to the project manager or on whatever forms are generally used.
7. The testing environment for older adults should be safe and minimize risk of falls. When scheduling an older adult, make sure to tell him or her to wear comfortable clothing and appropriate footwear.
8. It is advisable to avoid hurrying older people. The examiner may find that speaking at a pace slower and somewhat louder than normal is helpful as older examinees often process at a slower pace. It is also important not to interrupt older examinees, although sometimes the examiner will need to redirect an examinee who wants to have a conversation about something unrelated to the testing.
9. The examiner should avoid psychological and other specialized jargon. It is often helpful to check that the older examinee understands the instructions and tasks.
10. It is important to be alert for sensory impairments in older examinees. While the examiner cannot change the test protocol, there are ways to compensate for hearing deficits. These include making sure that you can be heard, speaking slowly and clearly, facing the examinee more directly when speaking, keeping your hands away from your face, reducing background noise, raising the volume on the iPad, indicating when you are changing the subject, and lowering vocal pitch.
11. There are also ways to compensate for visual deficits, such as providing lighting that is more adequate and making sure the examinee has the glasses he or she wears for reading.
12. Older persons may exhibit higher levels of stress and fear than other examinees. They may not express their concerns directly, but may appear irritable or withdrawn and uninvolved. It is important to provide positive reinforcement and encouragement, and to reassure them that all examinees find these tasks challenging. At the same time, it is important not to minimize their concerns or patronize these examinees.
13. The examiner should listen carefully; if an examinee expresses overwhelming concerns about loss of function (and independence), then it might be helpful to suggest that they speak with their primary care physician about their concerns. Examiners should stress that the findings of the testing are confidential and are only released to others with the examinee's permission. If the examinee is part of a research project, then reassure them that their performance is for the use of the project only and that particular persons are not identifiable.
14. Examiners should thank all examinees for their efforts and for their help with the activities. This should make them feel successful at the end.

## **Appendix 3 – Determining Handedness**

If a participant does not know or cannot tell the examiner his/her handedness, the following questions should be used to determine it:

- Which foot do you use to kick a ball? Left/Right
- Which hand do you use to pick up and throw a ball? Left/Right
- Which hand do you use to write or draw? Left/Right

Whichever is selected at least two times, from the above three questions (right or left) is determined to be the dominant hand.

## Appendix 4 – Pausing, Stopping, Resuming Rules

Different instruments may behave differently if *Resume Instrument* is selected. In most cases, users will be taken back to where they were before pausing the assessment. In some cases (e.g., timed tests), users will be taken back to the beginning of the instrument. In select cases, an instrument may not be restarted once paused. Detailed rules for skipping, pausing or stopping each test are provided below.

### **Cognition**

#### **NIH Toolbox Picture Vocabulary Test**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Participant sees item equivalent to last item shown. Dichotomous engine will find the un-administered item whose difficulty setting is closest to the user's theta, which will be used for restarting. On restart, the engine is provided with the user's existing theta score (instead of the starting theta value).

#### **NIH Toolbox Flanker Inhibitory Control and Attention Test**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees last practice item not responded to.
  - During Live Items
    - Participant sees last live item not responded to.

### NIH Toolbox List Sorting Working Memory Test

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Participant sees last live item not responded to.
  - During Live Items
    - Participant sees last live item not responded to.
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Live Items
    - Participant sees last live item not responded to. This restart will also always play the list's introduction screen before showing the screens again.

### NIH Toolbox Dimensional Change Card Sort Test

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees last practice item not responded to.
  - During Live Items
    - Participant sees last live item not responded to.

### NIH Toolbox Pattern Comparison Processing Speed Test

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Participant sees last live item not responded to.
  - During Live Items
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).

- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees last live item not responded to.
  - During Live Items
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).

### **NIH Toolbox Picture Sequence Memory Test**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - If the user stops during the first practice item, they will return to the start of the instrument. If the user stops during the second practice item they will return to the last sequence they did not respond to; this includes that sequence's introduction.
  - During Live Items
    - If the user stops during a live item, they will return to the last sequence they did not respond to; this includes that sequence's introduction.

### **NIH Toolbox Oral Reading Recognition Test**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - NO PRACTICE IN OR
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - NO PRACTICE IN OR
  - During Live Items
    - Participant sees item equivalent to last item shown. Dichotomous engine will find the un-administered item whose difficulty setting is closest to the user's theta, which will be used for restarting. On restart, the engine is provided with the user's existing theta score (instead of the starting theta value).

## **Emotion**

### **Emotion Fixed Form**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - NO PRACTICE IN EMOTION
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - NO PRACTICE IN EMOTION
  - During Live Items
    - Participant sees last live item not responded to.

### **Emotion CAT**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - NO PRACTICE IN EMOTION
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - NO PRACTICE IN EMOTION
  - During Live Items
    - Participant sees item equivalent to last item shown

## **Motor**

### **NIH Toolbox 9-Hole Pegboard Dexterity Test**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data

- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Live Items
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.

### NIH Toolbox Grip Strength Test

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Live Items
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.

### NIH Toolbox Standing Balance Test

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).
  - During Practice
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).
  - During Live Items

- Resume not allowed- mark instrument as "completed," go to next instrument (if applicable).

### NIH Toolbox 4-meter Walk Gait Speed Test

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Live Items
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted

### NIH Toolbox 2-Minute Walking Endurance Test

- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - NO PRACTICE ITEMS IN ENDURANCE TEST
  - During Live Items
    - Resume not allowed- mark instrument as "completed", go to next instrument (if applicable). Can never be restarted
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - NO PRACTICE ITEMS IN ENDURANCE TEST
  - During Live Items
    - Resume not allowed- mark instrument as "completed", go to next instrument (if applicable). Can never be restarted

## *Sensation*

### NIH Toolbox Pain Intensity Fixed Form

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions

- Return to active screen; pause not recorded in data
- During Practice
  - NO PRACTICE IN PAIN INTENSITY
- During Live Items
  - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - NO PRACTICE IN PAIN INTENSITY
  - During Live Items
    - Participant sees last live item not responded to.

### **NIH Toolbox Pain Interference CAT**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - NO PRACTICE IN PAIN INTERFERENCE
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - NO PRACTICE IN PAIN INTERFERENCE
  - During Live Items
    - Participant sees item equivalent to last item shown

### **NIH Toolbox Odor Identification Test**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting 'stop' or 'skip')
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting 'stop' with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice
    - Participant sees last practice item not responded to.
  - During Live Items
    - Participant sees last live item not responded to.

### **NIH Toolbox Visual Acuity Test**

- Skip
  - Resume not allowed – mark instrument as “completed,” go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice/Screening
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
  - During instructions
    - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
  - During Practice/Screening
    - Participant sees item from last optotype size not responded to.
  - During Live Items
    - Participant sees item equivalent to last item shown.

### **NIH Toolbox Words-In-Noise Test**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - NO PRACTICE ITEMS IN WIN TEST
  - During Live Items
    - Participant sees last live item not responded to.
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
  - During instructions
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted
  - During Practice
    - NO PRACTICE ITEMS IN WIN TEST
  - During Live Items
    - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted

### **NIH Toolbox NIH Toolbox Regional Taste Intensity Test**

- Skip
  - Resume not allowed- mark instrument as "completed," go to next instrument (if applicable). Can never be restarted.
- Pause (perform admin gesture, and return to instrument without selecting ‘stop’ or ‘skip’)
  - During Instructions
    - Return to active screen; pause not recorded in data
  - During Practice
    - Return to active screen; pause not recorded in data
  - During Live Items
    - Return to active screen; pause not recorded in data
- Stop (exit the instrument by selecting ‘stop’ with the intention of resuming at a later time)
  - During instructions

- Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
- During Practice
  - Participant sees first item (aka resume at beginning of instrument). Previous data are overwritten.
- During Live Items
  - Participant sees last live item not responded to.

## Appendix 5 – NIH Toolbox Equipment and Materials

In most cases when using the NIH Toolbox app, all you will need to administer the tests and surveys to participants is an iPad. However, there are some additional supplies needed for the cognition, motor and sensation instruments as outlined below. Keep in mind the following guidelines when purchasing additional supplies:

- Unless recommended otherwise, all materials and equipment can be purchased from any vendor of your choosing.
- Adhere to the minimum requirements for the materials and equipment where applicable.
- Some materials and equipment can be reused for multiple tests (e.g., Bluetooth wireless keyboard).
- Vendors may provide discounts for educational institutions, non-profits, etc.

### General Recommended Equipment and Materials

It is recommended that the NIH Toolbox is only used on the supported 9.7" and 11" iPad models listed on [NIHToolbox.org](http://NIHToolbox.org).

An iPad case (such as Otterbox or Blok) that allows for different viewing angles and provides protection is recommended for all NIH Toolbox administrations. We recommend the iPad sit at/around a 60 degree viewing angle during administration, though this may be adjusted to facilitate the participant's comfort (and therefore a better testing experience).

**NIH Toolbox Cognition Instruments—Additional Equipment and Materials:**

Instrument	Equipment and Materials	Vendor Suggestion	Approximate Cost
NIH Toolbox Picture Vocabulary Test	None	---	---
NIH Toolbox Flanker Inhibitory Control and Attention Test	Home Base	Download from <a href="http://www.nihtoolbox.org">www.nihtoolbox.org</a>	Free
NIH Toolbox List Sorting Working Memory Test	Bluetooth Wireless Keyboard	Apple	\$99.00
	Extra AA batteries for the keyboard	Any	Varies
	NIH Toolbox List Sorting Working Memory Test Examiner Answer Sheet	Contact <a href="mailto:help@nihtoolbox.org">help@nihtoolbox.org</a>	Free
NIH Toolbox Dimensional Change Card Sort Test	Home Base	Download from <a href="http://www.nihtoolbox.org">www.nihtoolbox.org</a>	Free
NIH Toolbox Pattern Comparison Processing Speed Test	None	---	---
NIH Toolbox Picture Sequence Memory Test	None	---	---
Auditory Verbal Learning Test (Rey)	None	---	---
Oral Symbol Digit Test	Laminated sheet containing key and nine practice items on one side and the key and test items on the other side		
NIH Toolbox Oral Reading Recognition Test	Bluetooth Wireless Keyboard	Apple	\$99.00
	Extra AA batteries for the keyboard	Any	Varies
	NIH Toolbox Oral Reading Recognition Test Training Materials	Contact <a href="mailto:help@nihtoolbox.org">help@nihtoolbox.org</a>	Free

**NIH Toolbox Emotion Instruments—Additional Equipment and Materials:**

None

**NIH Toolbox Motor Instruments—Additional Equipment and Materials:**

Instrument	Equipment/Materials	Vendor Suggestion	Approximate Cost
NIH Toolbox 9-hole Pegboard Dexterity Test	Jamar® 9-Hole Peg Test Kit (item number A8515)  (also known as Rolyan 9-hole Peg Test Kit)	Patterson Medical	\$80.75
	Jamar® 9-Hole Peg Test Kit Replacement Pegs (item number A8516)	Patterson Medical	\$11.65
NIH Toolbox Grip Strength Test	Jamar® Plus+ Digital Hand Dynamometer (item number 563213)	Patterson Medical	\$363.55
NIH Toolbox Standing Balance Test	iPod touch (6 <sup>th</sup> generation or later)  or  iPhone 8+ (or more recent models)	Apple Store	\$199.00
	Griffin Survivor protective case (part # 3611154) or similar	CDW	Varies
	AIREX Balance Pad Elite (item number ARX-23431)	Medex Supply or Amazon	\$99.00
	Scott Gait Belt w/Velcro (item number 177 0089, various sizes)	Promedxpress	\$14.99-19.99
	Sanitary booties	Any	Varies
NIH Toolbox 4 Meter Walk Gait Speed Test and 2-Minute Walk Endurance Test	Measuring tape with meters and feet	Any. Sufficient to set up a 50' walking course.	Varies
	Set of 2 cones	Any. Small plastic cones..	Varies
	Walking course set up diagram.	See <a href="#">Appendix 7</a>	Free
	Colored masking tape to set up the walking course	Any	Varies

### NIH Toolbox Sensation Instruments—Additional Equipment and Materials:

Instrument	Equipment/Materials	Vendor Suggestion	Approximate Cost
NIH Toolbox Pain Interference Test	None	---	---
NIH Toolbox Pain Intensity Test	None	---	---
NIH Toolbox Odor Identification Test	NIH Toolbox Odor Identification Cards	Download ordering instructions from <a href="http://NIHToolbox.org">NIHToolbox.org</a>	Varies by the size of the order
	Scratcher (e.g., guitar pick)	Any	\$0.25
NIH Toolbox Visual Acuity Test	Belkin Portable Tablet Stage or similar	---	\$97.99
	Bluetooth Wireless Keyboard	Apple	\$99.00
	Table	Any	Varies
	Measuring Tape	Any	Varies
	Laminated HOTV letters for young children	Download from <a href="http://NIHToolbox.org">NIHToolbox.org</a>	Free
NIH Toolbox Words-in-Noise (WIN) Test	Sennheiser HD201 headphones or any others that meet or exceed these specifications:  <b>Bandwidth/Frequency Response:</b> 10 Hz – 10,000 Hz Isolation = 10 dB or <b>Greater Sensitivity:</b> 96 dB SPL/V or greater.  <b>Standard phone/laptop plug (3.5 mm)</b>	Any vendor or <a href="http://Headphones.com">Headphones.com</a>	Varies. Approximately \$30.00
NIH Toolbox Regional Taste Test	Please refer to <a href="#">Appendix 7</a> for the detailed list of materials		

## Appendix 6 – Key to Instrument Name Abbreviations

Title Screen Displayed in the App	Corresponding Instrument Name
<b>NIH Toolbox Touch Screen Tutorial 3+</b>	NIH Toolbox Touch Screen Tutorial Age 3+
<b>NIH Toolbox PVT 3+</b>	NIH Toolbox Picture Vocabulary Test Age 3+ v2.1
<b>NIH Toolbox OR 3+</b>	NIH Toolbox Oral Reading Recognition Test Age 3+ v2.1
<b>NIH Toolbox LS 3-6</b>	NIH Toolbox List Sorting Working Memory Test Ages 3-6 v2.1
<b>NIH Toolbox LS 7+</b>	NIH Toolbox List Sorting Working Memory Test Age 7+ v2.1
<b>NIH Toolbox PC 7+</b>	NIH Toolbox Pattern Comparison Processing Speed Test Age 7+ v2.0
<b>NIH Toolbox PSM 3-4 Form A</b>	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form A v2.0
<b>NIH Toolbox PSM 3-4 Form B</b>	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form B v2.0
<b>NIH Toolbox PSM 3-4 Form C</b>	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form C v2.0
<b>NIH Toolbox PSM 5-6 Form A</b>	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form A v2.0
<b>NIH Toolbox PSM 5-6 Form B</b>	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form B v2.0
<b>NIH Toolbox PSM 5-6 Form C</b>	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form C v2.0
<b>NIH Toolbox PSM 7 Form A</b>	NIH Toolbox Picture Sequence Memory Test Age 7 Form A v2.0
<b>NIH Toolbox PSM 7 Form B</b>	NIH Toolbox Picture Sequence Memory Test Age 7 Form B v2.0
<b>NIH Toolbox PSM 7 Form C</b>	NIH Toolbox Picture Sequence Memory Test Age 7 Form C v2.0
<b>NIH Toolbox PSM 8+ Form A</b>	NIH Toolbox Picture Sequence Memory Test Age 8+ Form A v2.0
<b>NIH Toolbox PSM 8+ Form B</b>	NIH Toolbox Picture Sequence Memory Test Age 8+ Form B v2.0
<b>NIH Toolbox PSM 8+ Form C</b>	NIH Toolbox Picture Sequence Memory Test Age 8+ Form C v2.0
<b>NIH Toolbox FL 3-7</b>	NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 3-7 v2.0
<b>NIH Toolbox FL 8-11</b>	NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 8-11 v2.0
<b>NIH Toolbox FL 12+</b>	NIH Toolbox Flanker Inhibitory Control and Attention Test Age 12+ v2.0
<b>NIH Toolbox DCCS 3-7</b>	NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 v2.1
<b>NIH Toolbox DCCS 8-11</b>	NIH Toolbox Dimensional Change Card Sort Test Ages 8-11 v2.1
<b>NIH Toolbox DCCS 12+</b>	NIH Toolbox Dimensional Change Card Sort Test Age 12+ v2.1
<b>NIH Toolbox 4-Meter Walk Gait Speed Test 7+</b>	NIH Toolbox 4-Meter Walk Gait Speed Test Age 7+ v2.0
<b>NIH Toolbox 9-Hole Pegboard Dexterity Test 3+</b>	NIH Toolbox 9-Hole Pegboard Dexterity Test Age 3+ v2.0
<b>NIH Toolbox Grip Strength Test 3+</b>	NIH Toolbox Grip Strength Test Age 3+ v2.0

Title Screen Displayed in the App	Corresponding Instrument Name
<b>NIH Toolbox Standing Balance Test 3-6</b>	NIH Toolbox Standing Balance Test Ages 3-6 v2.0
<b>NIH Toolbox Standing Balance Test 7+</b>	NIH Toolbox Standing Balance Test Age 7+ v2.0
<b>NIH Toolbox 2-Minute Walk Endurance Test 3+</b>	NIH Toolbox 2-Minute Walk Endurance Test Age 3+ v2.0
<b>NIH Toolbox Odor Identification Test 10+</b>	NIH Toolbox Odor Identification Test Age 10+ v2.0
<b>NIH Toolbox Odor Identification Test 3-9</b>	NIH Toolbox Odor Identification Test Ages 3-9 v2.0
<b>NIH Toolbox Words-In-Noise Test 6+</b>	NIH Toolbox Words-In-Noise Test Age 6+ v2.1
<b>NIH Toolbox Regional Taste Test 12+</b>	NIH Toolbox Regional Taste Intensity Test Age 12+ v2.0
<b>NIH Toolbox Visual Acuity Test 3-7</b>	NIH Toolbox Visual Acuity Test Ages 3-7 v2.0
<b>NIH Toolbox Visual Acuity Test 8+</b>	NIH Toolbox Visual Acuity Test Age 8+ v2.0
<b>NIH Toolbox Dynamic Visual Acuity Test 3-7</b>	NIH Toolbox Dynamic Visual Acuity Test Ages 3-7 v2.0
<b>NIH Toolbox Dynamic Visual Acuity Test 8+</b>	NIH Toolbox Dynamic Visual Acuity Test Age 8+ v2.0
<b>NIH Toolbox Pain Intensity FF Age 18+</b>	NIH Toolbox Pain Intensity FF Age 18+ v2.0
<b>NIH Toolbox Pain Interference CAT Age 18+</b>	NIH Toolbox Pain Interference CAT Age 18+ v2.0
<b>NIH Toolbox Touch Screen Tutorial 3+</b>	NIH Toolbox Touch Screen Tutorial Age 3+
<b>NIH Toolbox PVT 3+</b>	NIH Toolbox Picture Vocabulary Test Age 3+ v2.0
<b>NIH Toolbox OR 3+</b>	NIH Toolbox Oral Reading Recognition Test Age 3+ v2.0
<b>NIH Toolbox LS 7+</b>	NIH Toolbox List Sorting Working Memory Test Age 7+ v2.0
<b>NIH Toolbox PC 7+</b>	NIH Toolbox Pattern Comparison Processing Speed Test Age 7+ v2.0
<b>NIH Toolbox PSM 3-4 Form A</b>	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form A v2.1
<b>NIH Toolbox PSM 3-4 Form B</b>	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form B v2.1
<b>NIH Toolbox PSM 3-4 Form C</b>	NIH Toolbox Picture Sequence Memory Test Ages 3-4 Form C v2.1
<b>NIH Toolbox PSM 5-6 Form A</b>	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form A v2.1
<b>NIH Toolbox PSM 5-6 Form B</b>	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form B v2.1
<b>NIH Toolbox PSM 5-6 Form C</b>	NIH Toolbox Picture Sequence Memory Test Ages 5-6 Form C v2.1
<b>NIH Toolbox PSM 7 Form A</b>	NIH Toolbox Picture Sequence Memory Test Age 7 Form A v2.1
<b>NIH Toolbox PSM 7 Form B</b>	NIH Toolbox Picture Sequence Memory Test Age 7 Form B v2.1

Title Screen Displayed in the App	Corresponding Instrument Name
<b>NIH Toolbox PSM 7 Form C</b>	NIH Toolbox Picture Sequence Memory Test Age 7 Form C v2.1
<b>NIH Toolbox PSM 8+ Form A</b>	NIH Toolbox Picture Sequence Memory Test Age 8+ Form A v2.1
<b>NIH Toolbox PSM 8+ Form B</b>	NIH Toolbox Picture Sequence Memory Test Age 8+ Form B v2.1
<b>NIH Toolbox PSM 8+ Form C</b>	NIH Toolbox Picture Sequence Memory Test Age 8+ Form C v2.1
<b>NIH Toolbox FL 3-7</b>	NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 3-7 v2.1
<b>NIH Toolbox FL 8-11</b>	NIH Toolbox Flanker Inhibitory Control and Attention Test Ages 8-11 v2.1
<b>NIH Toolbox FL 12+</b>	NIH Toolbox Flanker Inhibitory Control and Attention Test Age 12+ v2.1
<b>NIH Toolbox DCCS 3-7</b>	NIH Toolbox Dimensional Change Card Sort Test Ages 3-7 v2.0
<b>NIH Toolbox DCCS 8-11</b>	NIH Toolbox Dimensional Change Card Sort Test Ages 8-11 v2.0
<b>NIH Toolbox DCCS 12+</b>	NIH Toolbox Dimensional Change Card Sort Test Age 12+ v2.0
<b>NIH Toolbox 4-Meter Walk Gait Speed Test 7+</b>	NIH Toolbox 4-Meter Walk Gait Speed Test Age 7+ v2.0
<b>NIH Toolbox 9-Hole Pegboard Dexterity Test 3+</b>	NIH Toolbox 9-Hole Pegboard Dexterity Test Age 3+ v2.0
<b>NIH Toolbox Grip Strength Test 3+</b>	NIH Toolbox Grip Strength Test Age 3+ v2.0
<b>NIH Toolbox Standing Balance Test 3-6</b>	NIH Toolbox Standing Balance Test Ages 3-6 v2.0
<b>NIH Toolbox Standing Balance Test 7+</b>	NIH Toolbox Standing Balance Test Age 7+ v2.0
<b>NIH Toolbox 2-Minute Walk Endurance Test 3+</b>	NIH Toolbox 2-Minute Walk Endurance Test Age 3+ v2.0
<b>NIH Toolbox Odor Identification Test 10+</b>	NIH Toolbox Odor Identification Test Age 10+ v2.0
<b>NIH Toolbox Odor Identification Test 3-9</b>	NIH Toolbox Odor Identification Test Ages 3-9 v2.0
<b>NIH Toolbox Words-In-Noise Test 6+</b>	NIH Toolbox Words-In-Noise Test Age 6+ v2.1
<b>NIH Toolbox Regional Taste Test 12+</b>	NIH Toolbox Regional Taste Intensity Test Age 12+ v2.0
<b>NIH Toolbox Visual Acuity Test 3-7</b>	NIH Toolbox Visual Acuity Test Ages 3-7 v2.0
<b>NIH Toolbox Visual Acuity Test 8+</b>	NIH Toolbox Visual Acuity Test Age 8+ v2.0
<b>NIH Toolbox Dynamic Visual Acuity Test 3-7</b>	NIH Toolbox Dynamic Visual Acuity Test Ages 3-7 v2.0
<b>NIH Toolbox Dynamic Visual Acuity Test 8+</b>	NIH Toolbox Dynamic Visual Acuity Test Age 8+ v2.0

## Appendix 7 – NIH Toolbox 4-Meter Walk Gait Speed Test and 2-Minute Walk Endurance Test Walking Course

The NIH Toolbox *Four-Meter Walk Gait Speed Test* and *Two-Minute Walk Endurance Test* each use walking courses. The walking courses differ from each other but, if both measures are being administered, the courses can be laid out at the same time.

### Equipment and materials needed:

- Tape measure with both feet and meter measurements
- Colored masking tape
- Two cones
- Chair

If administering the *Two-minute Walk Endurance Test*, you need an open space of at least 60 feet in length.

Following the schematic diagram attached, at 5 feet from the start, put a piece of tape 2' to 3' long across the hallway.

Put shorter pieces of tape at four 10-foot intervals from that piece of tape.

At the fifth 10-foot interval, put another piece of tape 2' to 3' long across the hallway.

If administering the *Four-Meter Walk Gait Speed Test*, you can superimpose the course on the course above or make another course.

Following the schematic diagram attached, at 5 feet from the start, put a piece of tape 2' to 3' long across the hallway.

Measure 4 meters from the piece of tape, and put another piece of tape 2' to 3' long across the hallway.

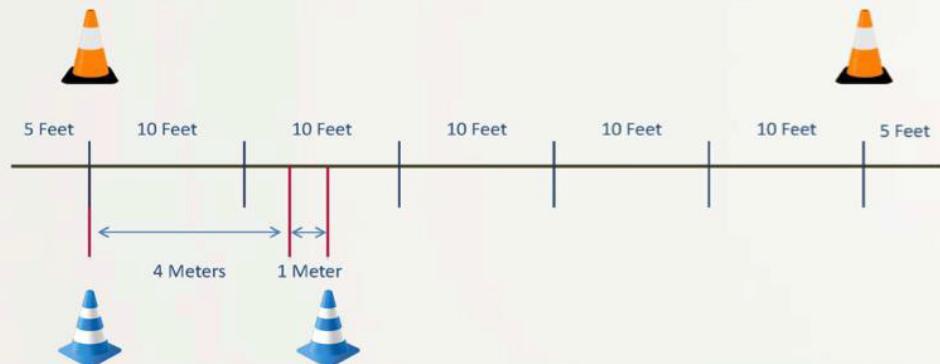
Lastly, measure 1 meter from that piece of tape and put another piece of tape 2' to 3' long across the hallway.

For the *Two-minute Walk Endurance Test*, the cones should be placed at the sides of the first long mark and the last long mark of that course.

For the *Four-Meter Walk Gait Speed Test*, the cones should be placed at the side of the first long mark and the last long mark of that course.

For both measures, a chair should be placed near the beginning of the course.

## Setup for 2-Min and 4-M Walking Test



## Appendix 8 – NIH Toolbox Regional Taste Test Materials and Taste Solutions Mixing Instructions

### Equipment and materials needed:

- An electronic balance (scale) readable to at least 0.01 grams, and preferably 0.001 grams
  - Examples: Ohaus Aventurer Pro Series or Denver Instrument Summit Series prices run around \$1000+
- Magnetic stirrer
  - Example: Fisher Scientific Isotemp Basic Magnetic Stirrer 7 x 7 in, 120 volt
- Stir bar (1 or 1.5 inches in length)
  - Example: Fisher Scientific Stir Bars 9.5 dia X 25.4 mm L
- Plastic-coated magnetic retrieving rod
  - Example: Fisher Brand Stir Bar Retriever, 12 inch
- A 1-liter graduated cylinder
  - Example: Fisherbrand Serialized Class A Graduated Cylinder. A more affordable Polypropylene graduated cylinder is an option if cost is factor.
- Solution storage bottles, light-occluding are required for quinine
  - Example: Pyrex Brown Solution Storage Bottles
- A lab spoon
  - Example: Fisherbrand Lab Spoon
- Plastic weigh boats
  - Example: Large (needed for NaCl) and small (needed for quinine) Anti-Static Weighing Boats
- Food, Kosher or USP grade Quinine monohydrochloride dihydrate
  - Example: Aldrich Quinine monohydrochloride dihydrate
- USP grade NaCl
  - Example: Spectrum Sodium Chloride Granular, USP
- Distilled or deionized water
  - Example: EarthH2O Distilled Water available in grocery stores,
    - **Note:** NIH Toolbox norms were collected using USP grade NaCl (formula weight 58.44) available from Spectrum Chemicals and Kosher grade quinine monohydrochloride dihydrate (formula weight 396.9) available from Sigma-Aldrich.
- Sterile cotton swabs
- Distilled, deionized or other purified water for rinsing.
  - Example: Aquafina. Dasani is NOT recommended because minerals are added back in after the purification.
- Spittoon
- iPad stand
  - Example: Belkin Portable Tablet Stage

#### Mixing Instructions:

Make sure that balance is on a level surface. Add weigh boat to balance pan, and carefully zero the balance. Then add 58.44 grams of NaCl to the weigh boat. To mix the 1 Molar NaCl solution, you will need to add the NaCl to 1 liter of purified water. To do this, place pre-measured NaCl crystals in a 1-liter graduated cylinder. Make sure all the crystals are emptied from the weigh boat into the graduated cylinder. Slowly add distilled or deionized water to the 1-liter mark by bringing the meniscus (bottom) of the solution to the 1000 ml mark. Gently add the stir bar and then stir on a magnetic stirrer until the NaCl is completely dissolved (approximately 5 to 10 minutes). Once NaCl is fully dissolved, turn off the stirrer, and use the retrieving rod to remove the stir bar from the solution. Transfer the solution to labeled storage bottles. Wash and rinse graduated cylinder, stir bar, and retrieving rod thoroughly before reusing.

To mix 0.001 M quinine hydrochloride dihydrate, dissolve 0.397 grams quinine in purified water. To do this, weigh out 0.397 grams of quinine HCl dihydrate as described above. If you do not have access to an analytical balance that goes to four decimal points, weigh out 0.40 grams of quinine HCl on a standard top-loading electronic balance. Do not use a triple-beam balance for quinine. Place the pre-measured quinine in a 1-liter cylinder, add distilled or deionized water to the 1000 milliliter mark, gently add the stir bar and then stir on a magnetic stirrer until the quinine is completely dissolved, and no visible crystals can be seen (at least 15 to 20 minutes). Transfer the solution to labeled storage bottles. When finished, wash and rinse graduated cylinder, stir bar, and retrieving rod thoroughly before reusing.

#### Solution Storage Requirements:

Taste solutions should be made fresh each week, stored under refrigeration when not in use, and should be warmed to room temperature prior to use for testing. Please do not freeze the solutions because the container may crack (Note: 3-4 hours is generally required for solutions to warm to room temperature.)

Taste solutions should be stored in glass bottles with a non-reactive lid. Quinine is light sensitive, so quinine should be stored in a light-occluding glass bottle or a bottle wrapped in aluminum foil to minimize light exposure.

#### Use of Solutions for Taste Testing:

Each participant will be tested with 10 ml of quinine solution and 10 ml of NaCl solution. Solutions should be at room temperature for testing. Two labeled medicine cups should be used to hold the solutions for testing each participant. 10 ml of quinine solution should be poured into one cup and 10 ml of NaCl solution should be poured into the second cup.

For tongue tip testing, a clean cotton swab will be dipped once in the quinine solution and then used to paint the solution across the anterior tongue.

After the participant rinses his/her mouth, a second clean cotton swab will be dipped once in the NaCl solution and used to paint the solution across the anterior tongue.

The solution remaining in each of the two cups will then be used for whole-mouth testing, first with quinine and then with NaCl.