

MICK



Mobile Interactive Cognitive Kit

User Guide
Version 3.1

The MICK app is for research and informational purposes only and is not approved for any clinical use or purpose. The user of this application assumes all risks associated with its use, including risks associated with maintaining and storing personal and confidential information on a mobile device.

MICK includes clinical tools that remain in research and development. When completed, it is intended for use by healthcare professionals. MICK is not a replacement for experienced clinical judgment. These tools do not give medical or professional advice; physicians and other healthcare professionals who use these tools should exercise their clinical judgment as to the information it provides. MICK is not intended to represent the only or best method or procedure for the situation discussed. Rather, it describes an approach that may be helpful or of interest to medical practitioners.

Non-medical professionals who use MICK do so at their own risk. Individuals with any type of medical condition are specifically cautioned to seek professional medical advice before beginning any sort of health treatment. Such consumers should always seek the advice of their physician or other qualified health provider with any questions they may have regarding a medical condition. Never disregard professional medical advice or delay in seeking it because of some MICK results. All medical information, from this or any other source, needs carefully to be reviewed with a trusted health-care provider before being acted upon in any way.

Because the app is investigational, no guarantees are expressed or implied as to the accuracy, timeliness, currency, completeness, or suitability for any purpose of the MICK tools. Neither the creators of MICK nor NYU Grossman School or NYU Langone Health makes any warranty regarding MICK whatsoever. Any user of MICK assumes full responsibility for any actions taken from their use. The creators of MICK, NYU Grossman School of Medicine, and NYU Langone Health cannot and will not be held legally, financially, or medically responsible for decisions made following any use of MICK and for any damage or injury (including death) to the user, other persons, or property arising therefrom.

Copyright 2020, 2023 Model Compilers LLC and NYU Langone Health

Unless otherwise noted, MICK and all information presented is owned by NYU Langone Health and is copyrighted by NYU Langone Health. All Rights Reserved. Use of MICK and other materials on this site is personal to users and readers. Use of MICK or other materials for commercial purposes, other than those approved by MICK's creators and NYU Langone Health, is not permitted.

Contents

1	Introducing MICK	1
	How a MICK test works	2
2	Starting MICK for the First Time	3
3	Creating a Participant	7
	Searching for a Participant	10
4	Running a Baseline	13
5	Running a Regular Test	23
6	Reviewing a Test	27
7	Groups	29
	Create a Group	29
	Assign Participants to the Group	32
	Filtering the Subject List by Groups	34
8	Other Features	37
	About Page	37
	Test Card Gallery	38
9	Exporting and Importing Data	39
	Install a File Share Service	39
	Export a CSV Data Set	40
	Export All Data as a Zip file	44
	Import a CSV Data Set	44
	Exporting by email	46
A	The MICK Test Cards	47
	MULES	47
	SUN	49

B	Installing MICK	51
	Installation	51
	Upgrading to Newer Versions	56
	Uninstalling MICK	59
C	Migrating from Version 2	63
	Terminology Differences	63
	Export from Version 2	64
	Import into Version 3	65
D	Advanced Settings	67
	Accessing the Advanced Settings Page	67
	Turn Audio Recording On/Off	69
E	MICK Data Schema	71

1

Introducing MICK

MICK is a tool for assessing vision-based aspects of neurological function.

The Mobile Integrated Cognitive Kit (MICK) is a tablet app that provides digitized versions of two rapid neurological screening tests - the Mobile Universal Lexicon Evaluation System (MULES) and the Staggered Uneven Number (SUN) test. MULES involves rapid picture naming while SUN involves rapid number naming. These rapid automatized naming (RAN) tests engage complex neural pathways related to eye movements, visual processing, language, and cognition.

Research has shown worse performance on RAN tests like MULES and SUN in conditions like concussion, mild cognitive impairment, Parkinson's disease, and multiple sclerosis. The paper validates that MICK app testing has excellent agreement with paper-based versions of MULES and SUN.

Key features of the MICK app:

- Digitized delivery of validated MULES and SUN tests
- Optimized tablet interface with built-in timers and voice recording
- Scores recorded for test time and errors
- Test administration guidance and scripts
- Data output for analytics

The app aims to increase accessibility, remote administration, and scalability of reliable neurological assessments using standardized RAN

tests. MICK is currently free and designed to be user-friendly for clinical and research use.

How a MICK test works

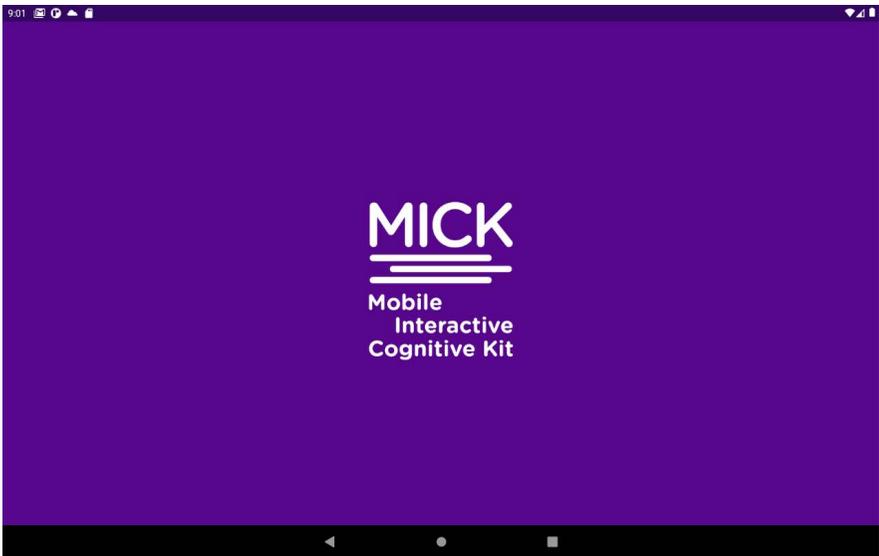
MICK consists of two tests: the picture-naming MULES and the number-naming SUN test. In each test, the participant is expected to name the items (pictures or numbers). The app times how long it takes the participant to complete naming the items.

Following a suspected head injury or similar event, administer the MICK test to determine if the subject's time to name the items are worse than their baseline times.

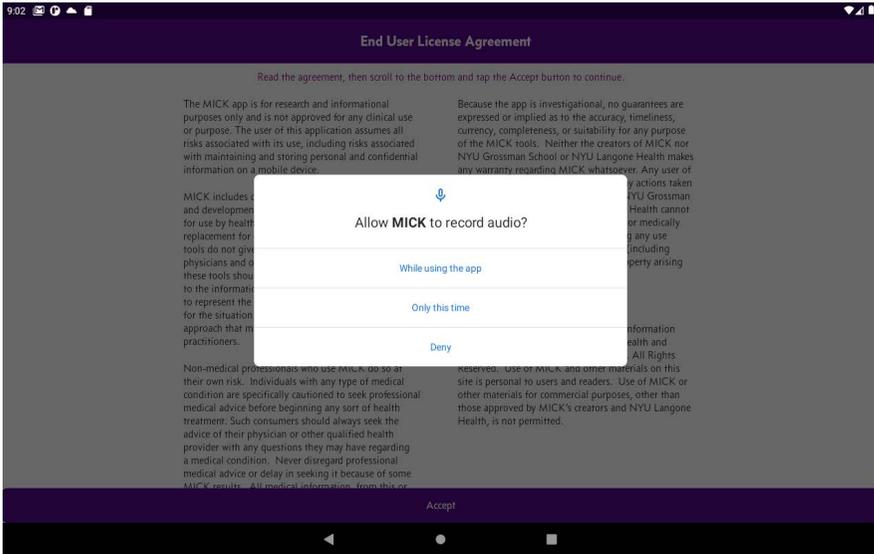
2

Starting MICK for the First Time

When you start MICK you will see the splash screen.



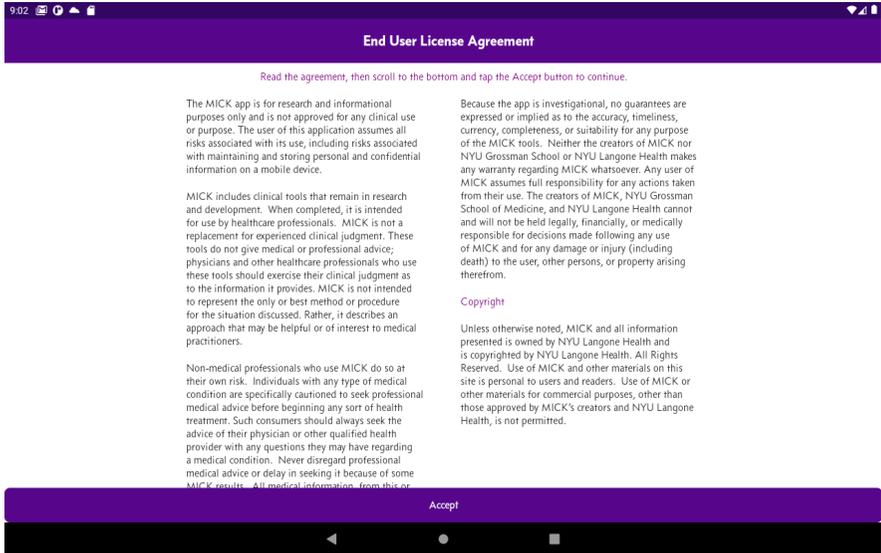
The first time you start MICK you will be asked to allow MICK to record audio. Audio recordings are made during tests so that you can review the test to identify errors or other issues.



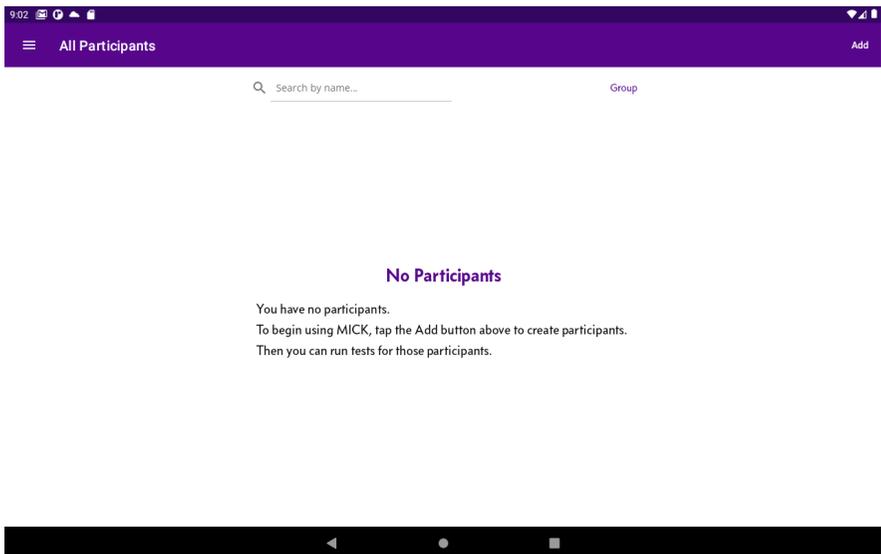
Tap “While using the app” or equivalent. (The prompt may be different on different Android and iOS versions.)

Note that if you do not allow recordings MICK will prompt you on startup, but will allow you to run tests without making recordings.

Next accept the license agreement.



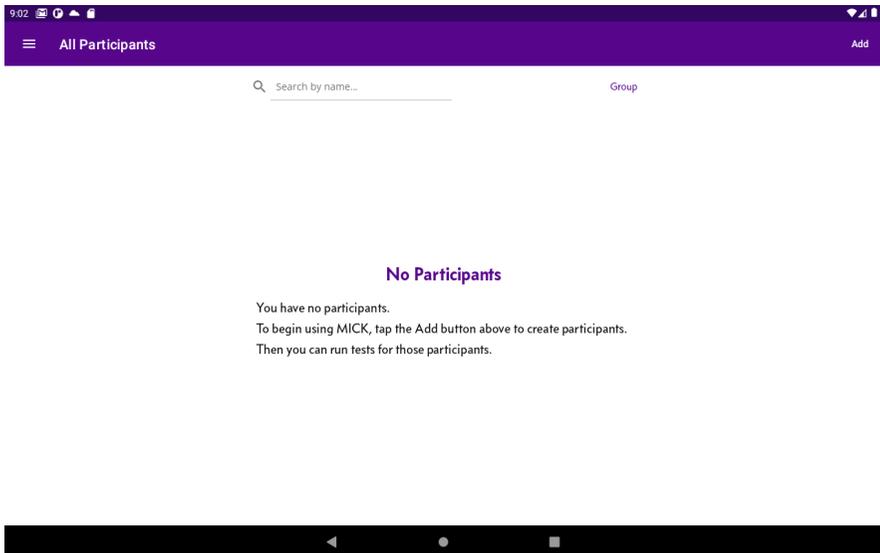
After completing these startup activities, you'll see an empty Participants page.



3

Creating a Participant

The MICK app always opens to the Participants page. When you first start MICK the Participants page is empty.



Tap Add to start adding a new Participant.

This brings up the New Participant page. Enter the information about the new Participant.

The screenshot shows a mobile application interface for creating a new participant. The header is purple and contains the text "New Subject" in the center, with "Cancel" on the left and "Save" on the right. Below the header are four input fields:

- Participant Code:** A text field containing the value "2023-07-26-09-02-54".
- Name:** A text field containing the value "Ronna Hayes".
- Group:** An empty text field.
- Date of Birth:** An empty text field.

A keyboard is visible at the bottom of the screen, with the word "Hayes" entered in the search bar. The keyboard is a standard QWERTY layout with a blue checkmark button on the right.

Only a unique Participant Code is required—all other values are optional.

Complete entering the participant information and tap Save.

The screenshot shows a mobile application interface for creating a new subject. The title bar is purple and contains 'Cancel', 'New Subject', and 'Save'. The form fields are as follows:

- Participant Code: 2023-07-26-09-06-07
- Name: Hayes, Ronna
- Group: (empty)
- Date of Birth: 5/18/1994
- Gender: Female
- Native Language(s): English
- Notes: (empty text area)

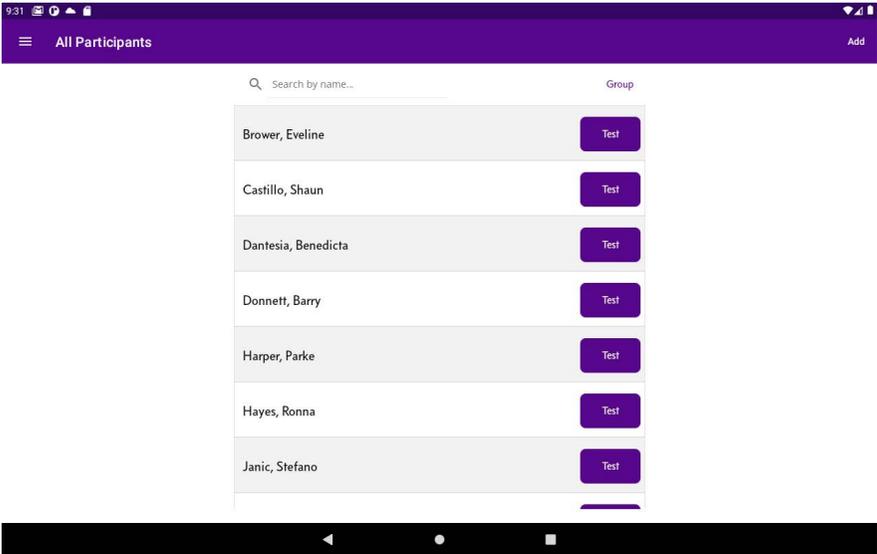
The participant is added to the list.

The screenshot shows the 'All Participants' screen in the mobile application. The title bar is purple and contains a menu icon, 'All Participants', and an 'Add' button. Below the title bar is a search bar with the text 'Search by name...'. A participant entry is displayed in a light gray box:

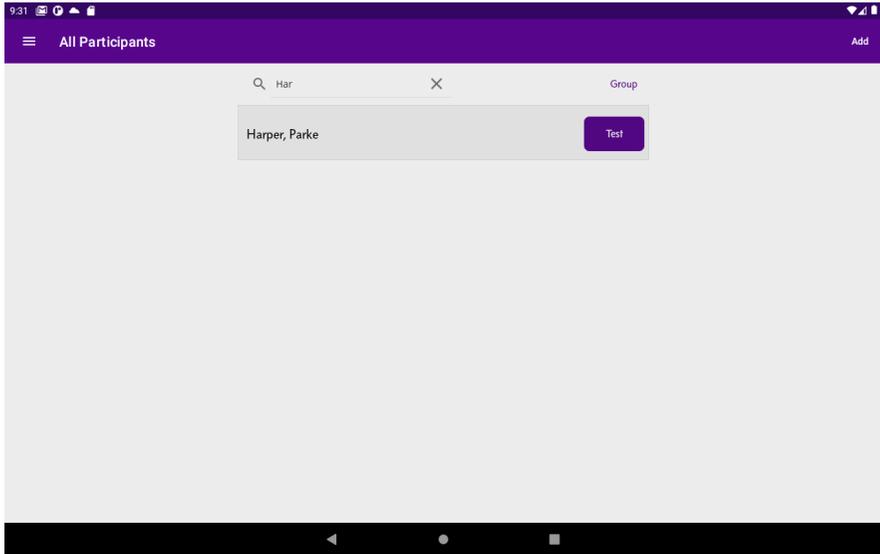
- Name: Hayes, Ronna
- Action: Test (button)

Searching for a Participant

The search box at the top of the Participant list is useful when you need to find a particular Participant from a long list.



Tap the search box and begin typing some or all of the first or last name. Only those whose names contain the text in the search box will be listed.

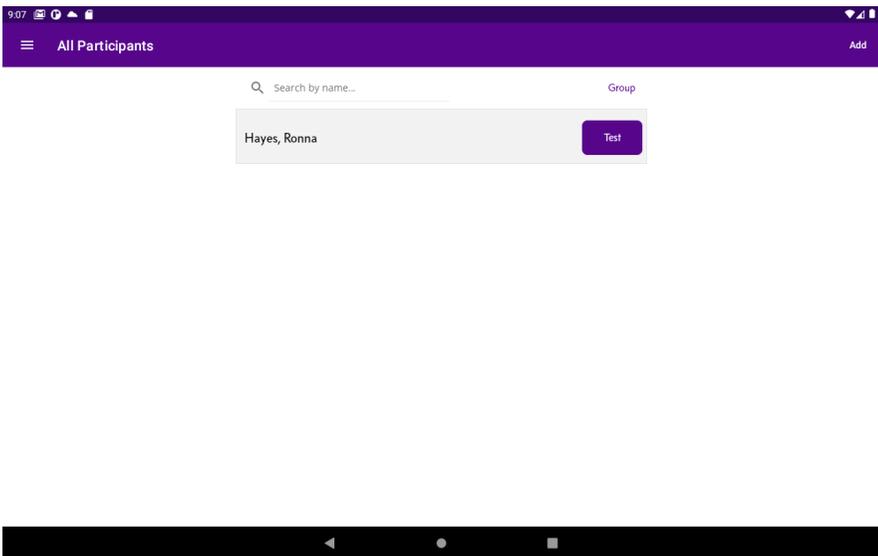


Tap the X next to the search box to clear it and to restore a complete list of Subjects.

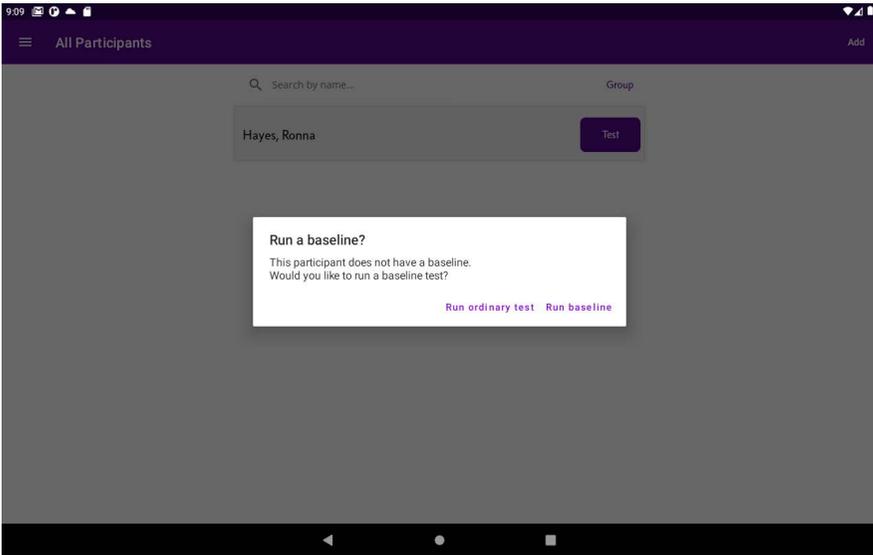
4

Running a Baseline

After you add a Participant you should run a baseline assessment in order to determine that individual's nominal healthy times to read the MULES and SUN cards. Tap the Test button next to the Participant.

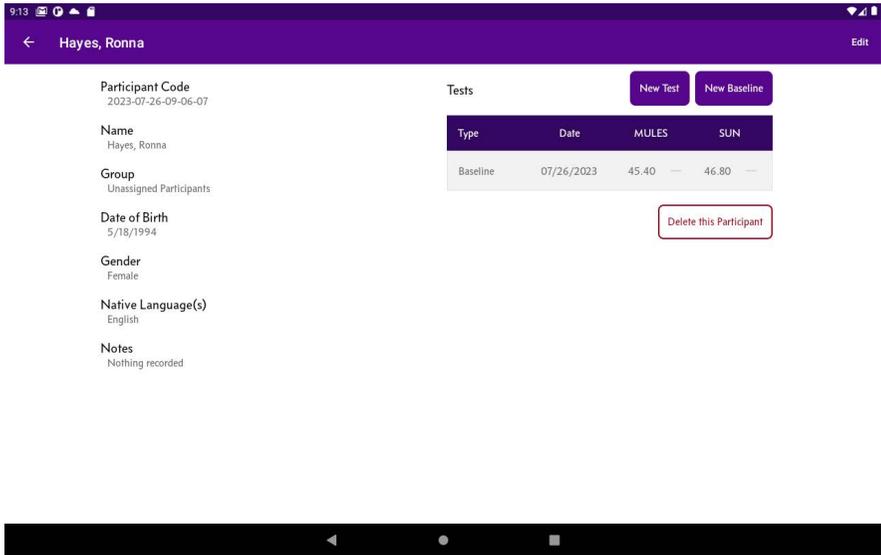


If you have never run any test for that participant you'll be prompted if you want to run a baseline or a regular assessment.



Tap "Run baseline."

Alternatively you can tap the participant line and then select “New baseline” from the participant detail page.



A baseline assessment consists of two runs of MULES (picture naming) followed by two runs of SUN (number naming). The shortest MULES time and the shortest SUN time are used as the baseline.

Each test begins with an instruction page such as this one for the first MULES trial.



MULES Trial 1

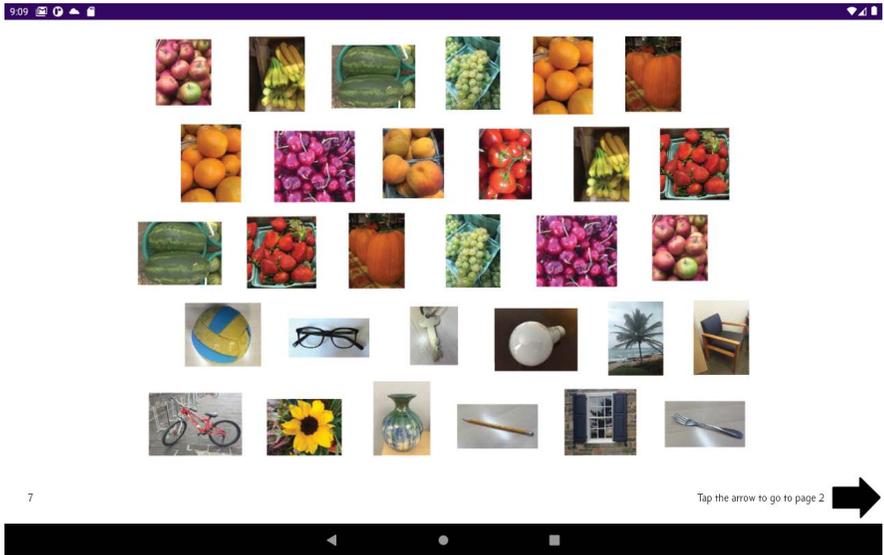
Name each of the pictures. Go from left to right starting on the first line.
Tap the arrow to go to the second page.
Continue naming the pictures.
Then tap the arrow to complete the test.

Tap the arrow to start



Tap the arrow on the right side to advance from page to page.

Make sure the participant knows what to do and tap the arrow to begin the test.

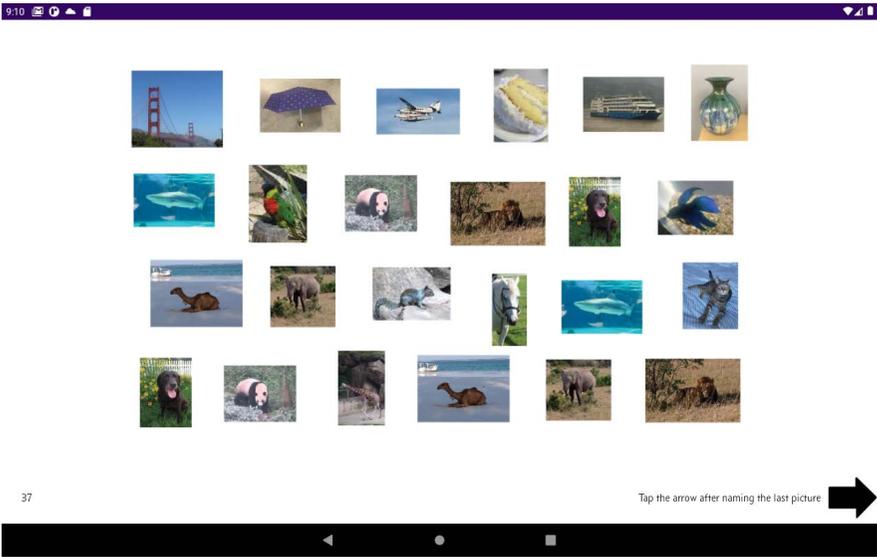


The MULES test is divided across two pages.

Have the participant name the pictures from left to right and top to bottom.

Upon reaching the end of the page, tap the arrow to continue to page 2.

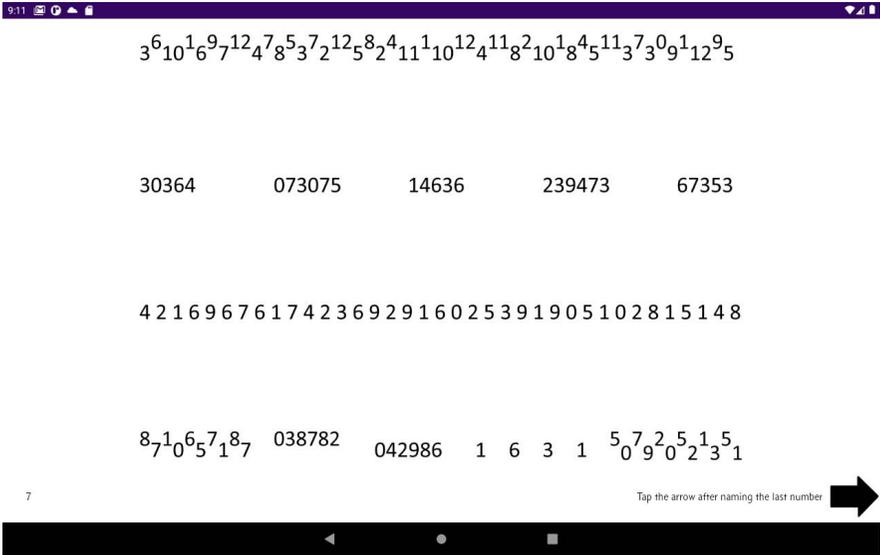
A small discreet timer in the lower left corner counts the test time in seconds.



Tap the arrow after the subject names the last item.

Continue with the second MULES run.

The SUN test is on a single page.



Have the participant name the numbers from left to right and top to bottom.

Upon reaching the end of the page, tap the arrow to end the test.

Tap the arrow one more time to complete the test.



Test Complete

Tap the arrow to continue.
Return the tablet to the tester.

Tap the arrow to complete the test



The baseline result is summarized on the test summary page.



← Hayes, Ronna | Baseline 7/26/2023 9:09:07 PM

Subject
Hayes, Ronna

Run Type
Baseline

Run Date/Time
7/26/2023 9:09:07 PM

Test Results

MULES

Trial 1

Trial 2

time errors

45.40

45.80

0

0

SUN

time errors

49.60

46.80

0

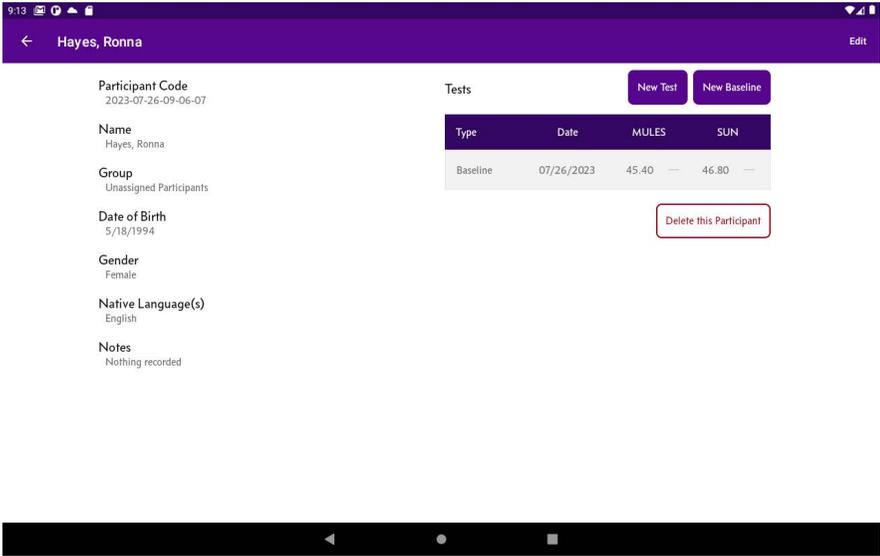
0

Tap the box to view the details of the run

Delete this Test

Note that the best (shortest) times are highlighted with a thick line.

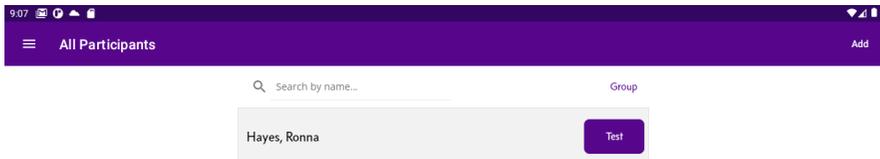
Go back to the participant detail page (tap the arrow in the upper left corner).



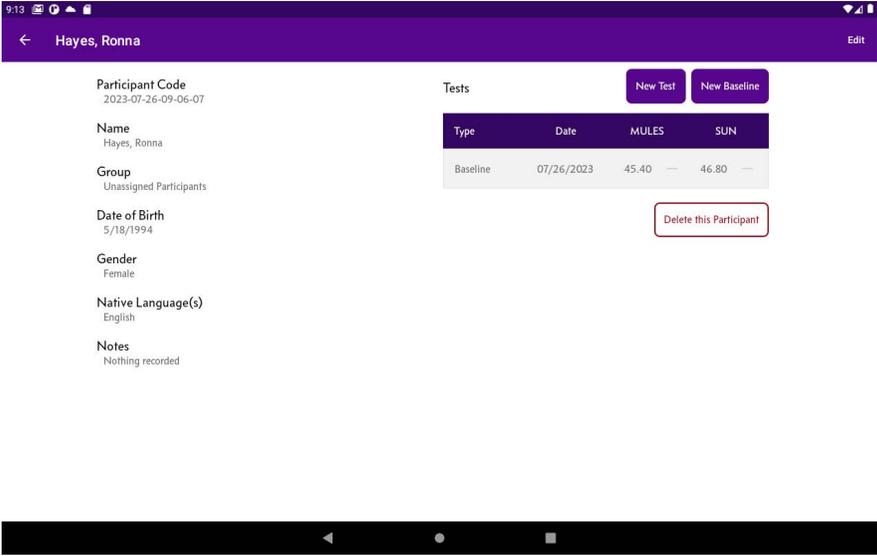
5

Running a Regular Test

To run a regular test for a subject (e.g. following an injury or for other clinical purposes), tap the Test button next to the Subject name.

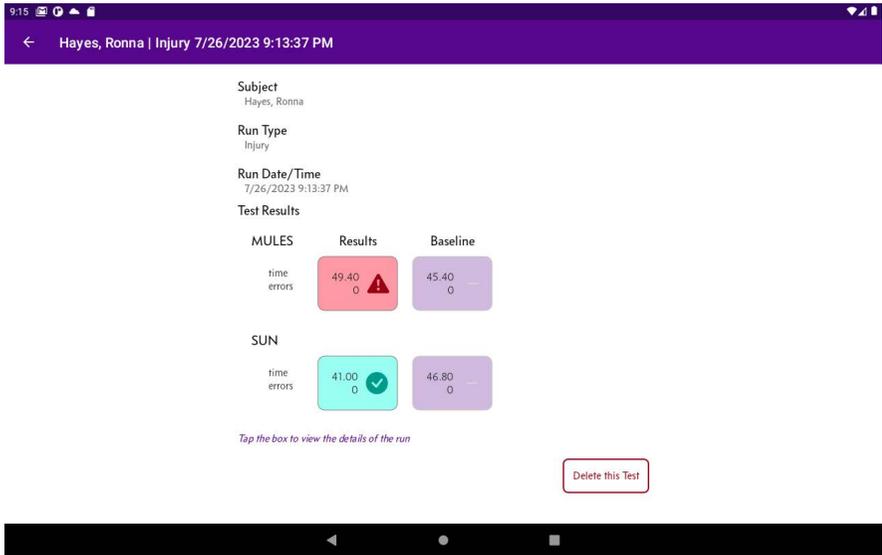


Alternatively tap the New Test button on the Subject detail page.

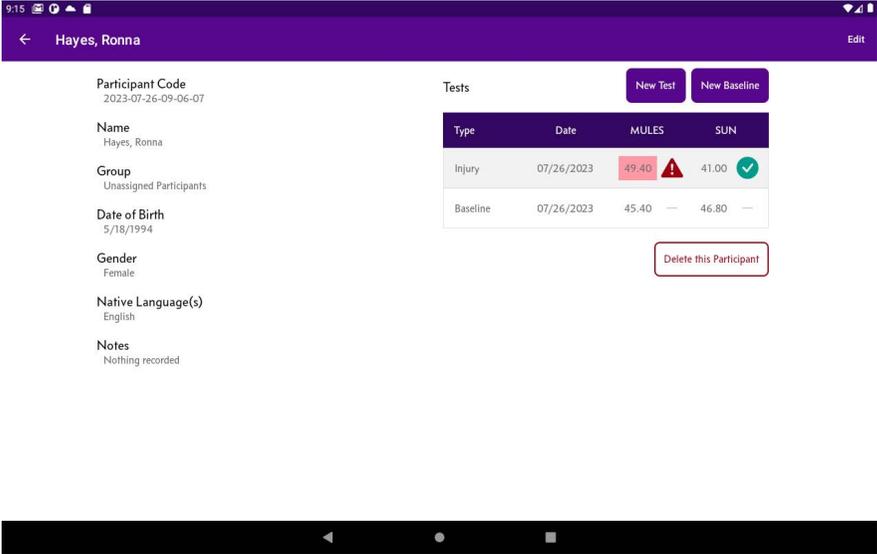


A regular test consists of one run each of MULES and SUN.

After running the test, MICK displays the times for the test, comparing them to the baseline.



Note that times longer than the baseline time are marked in red; times shorter than baseline are marked in green. These same indications appear on the test list on the Subject detail page.

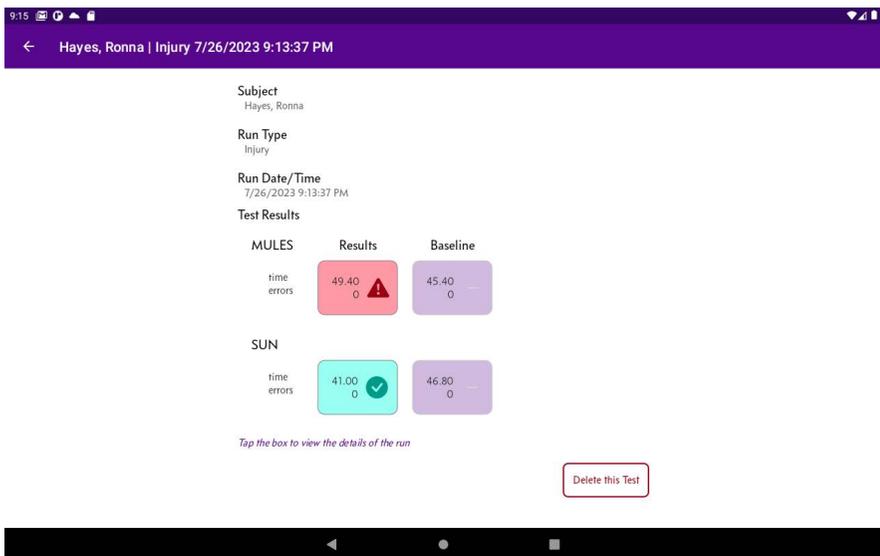


6

Reviewing a Test

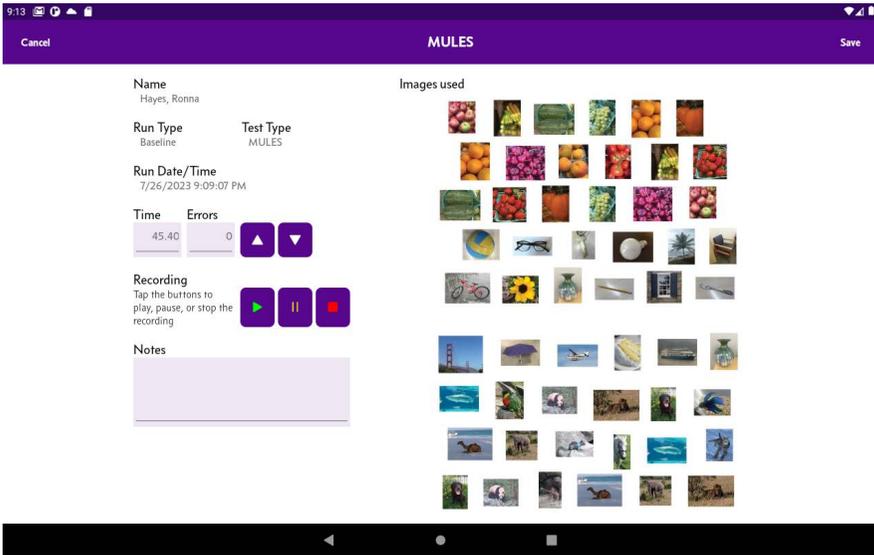
MICK records audio as the Subject is naming the pictures and numbers. You can play this recording in order to review the test to identify errors or other issues.

Tap any of the result boxes on the test summary page.



Note that you can review any kind of test—baseline, injury, or clinical.

The review page provides a place to edit the times and error counts, to play the recording, and to make notes.



If a recording is present, press the Play, Pause, and Stop buttons to review the recording.

The Time and Errors boxes are editable.

Tap the Up and Down arrow buttons to increment / decrement the error count while playing the recording.

“Images Used” shows the exact test cards as they appeared for that test.

Tap the Save button to save changes or Cancel to return without saving.

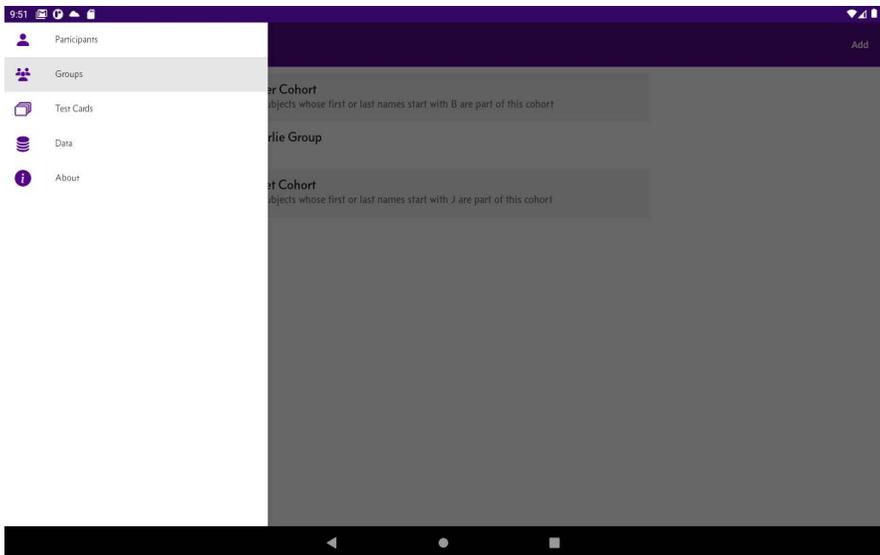
7

Groups

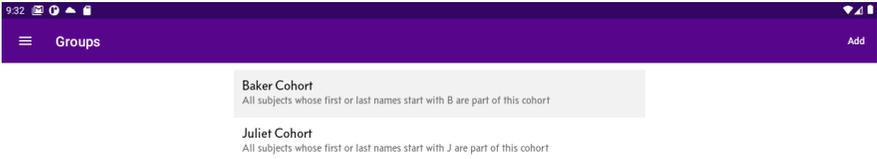
The groups feature lets you organize your Subjects by sports team, research cohort, and so forth.

Create a Group

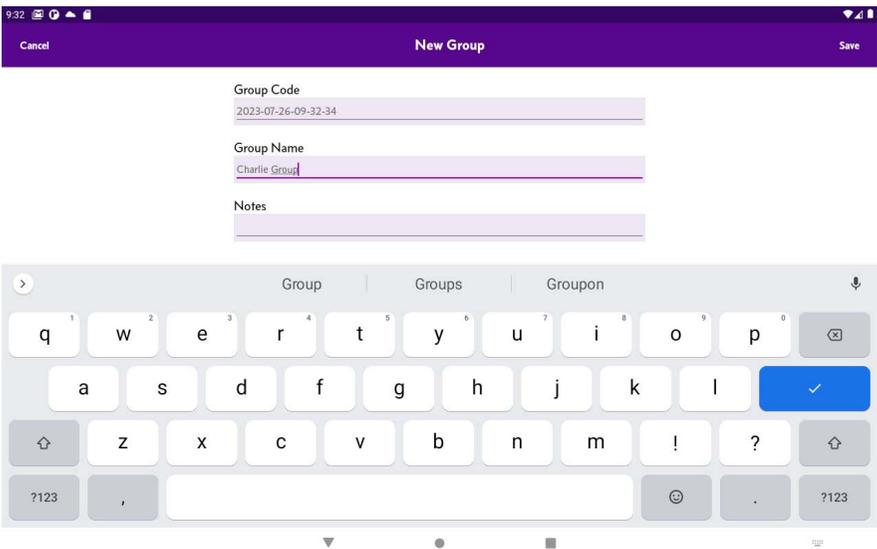
To create a group, tap the menu button in the upper left corner and select Groups.



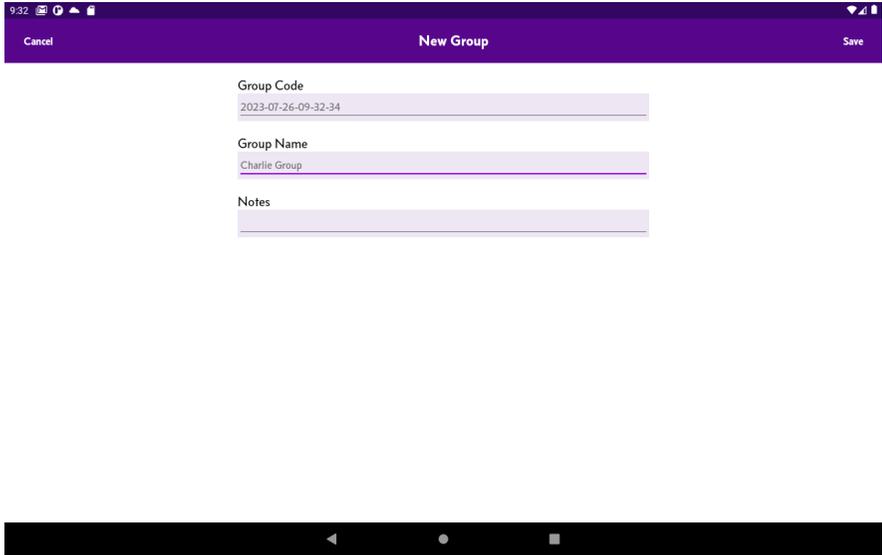
Add a group by tapping the Add button.



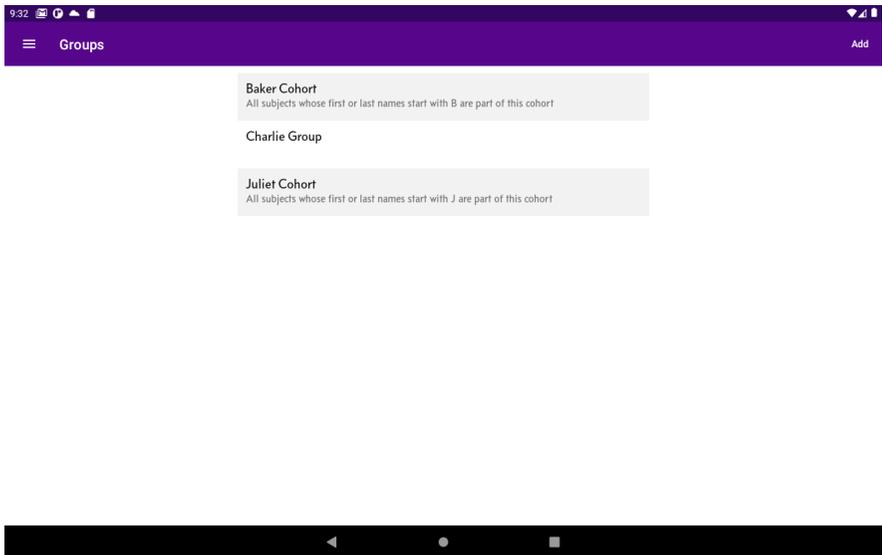
This brings up a page for entering the name and a description of the group.



Tap Save to create the new group.

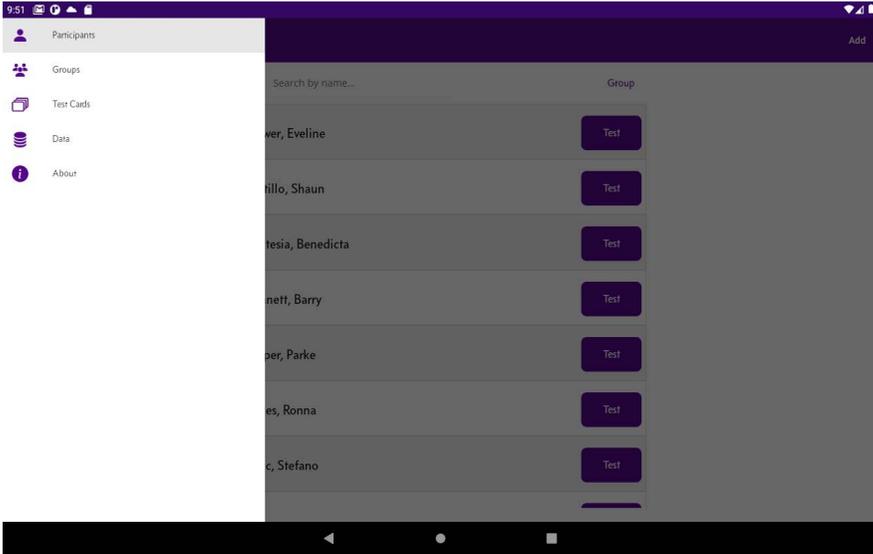


The new group is created and ready to be assigned Participants.

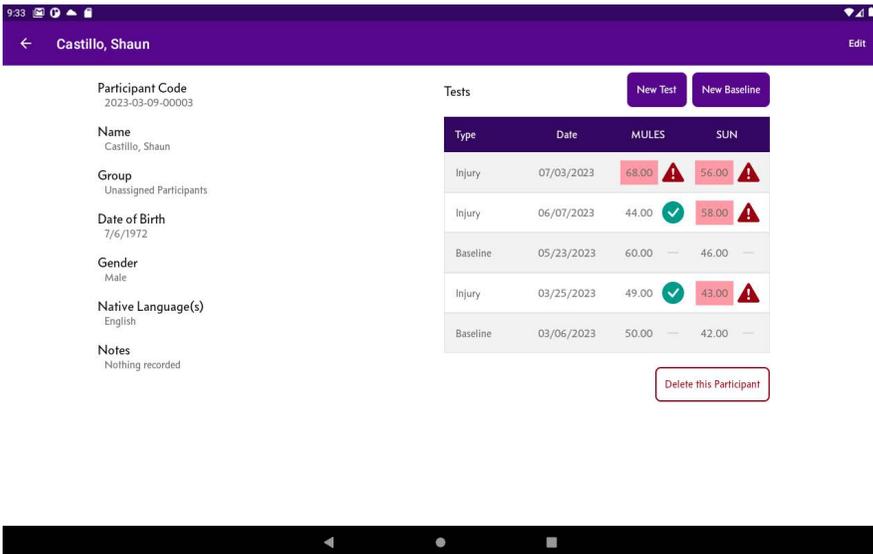


Assign Participants to the Group

Go to the Participant list by tapping Participants on the main menu.

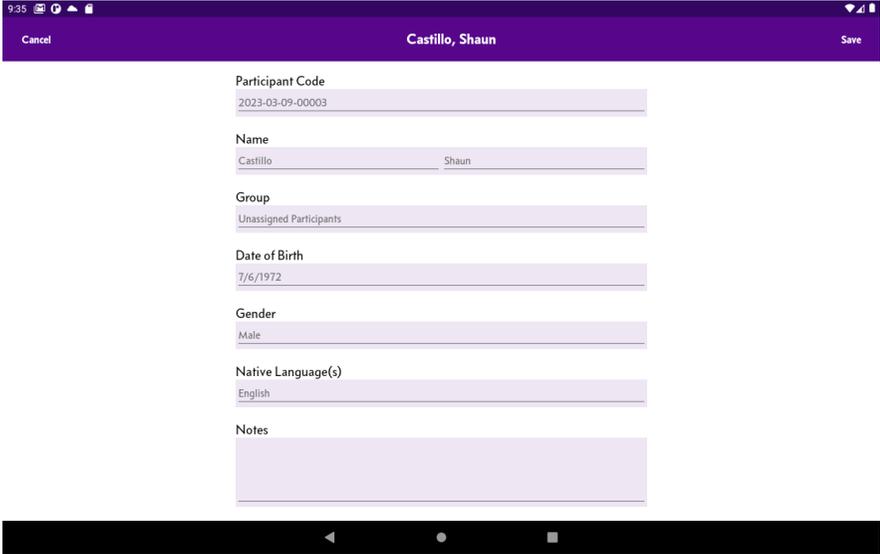


Tap a Participant to open the detail page.

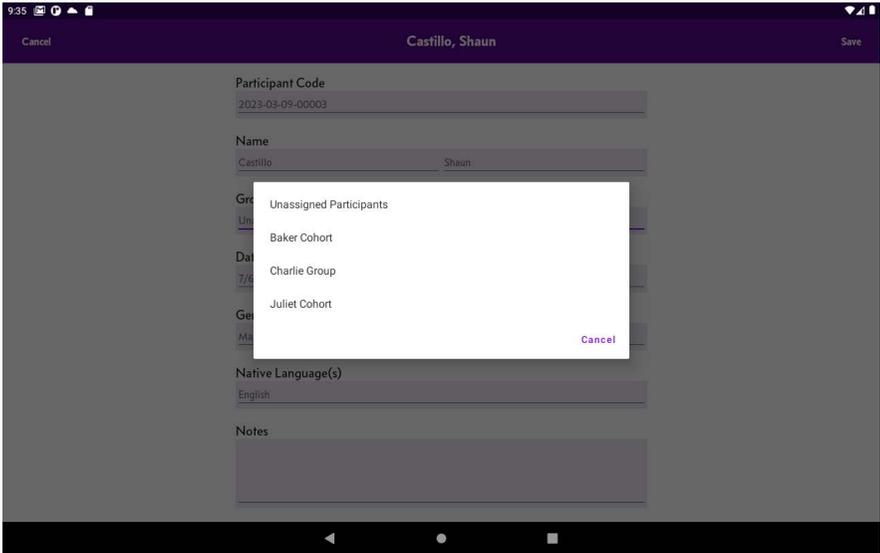


Tap Edit.

On the Edit page, tap Group to select a group.



Choose a group.



The Participant is now assigned to the Group.

A screenshot of a mobile application interface showing a form for editing participant details. The header bar is purple with the text 'Castillo, Shaun' in the center, and 'Cancel' on the left and 'Save' on the right. The form fields are as follows:

- Participant Code:** 2023-03-09-00003
- Name:** Castillo, Shaun
- Group:** Charlie Group
- Date of Birth:** 7/6/1972
- Gender:** Male
- Native Language(s):** English
- Notes:** (Empty text area)

Filtering the Subject List by Groups

On the Subject List page, tap the Group button.

A screenshot of a mobile application interface showing a list of participants. The header bar is purple with a hamburger menu icon on the left, the text 'All Participants' in the center, and an 'Add' button on the right. Below the header is a search bar with the text 'Search by name...'. To the right of the search bar is a 'Group' button. The list contains the following participants, each with a 'Test' button to its right:

Participant Name	Action
Brower, Eveline	Test
Castillo, Shaun	Test
Dantesia, Benedicta	Test
Donnett, Barry	Test
Harper, Parke	Test
Hayes, Ronna	Test
Janic, Stefano	Test

Choose a group.

The list now displays members of that Group.

To show Participants not assigned to any Group, choose Unassigned Participants.

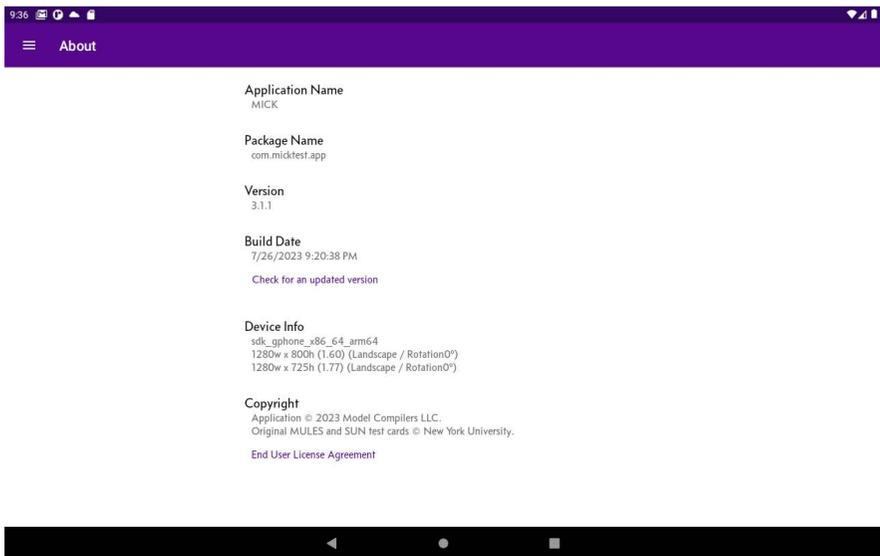
To return to a list of all participants, choose All Participants.

8

Other Features

About Page

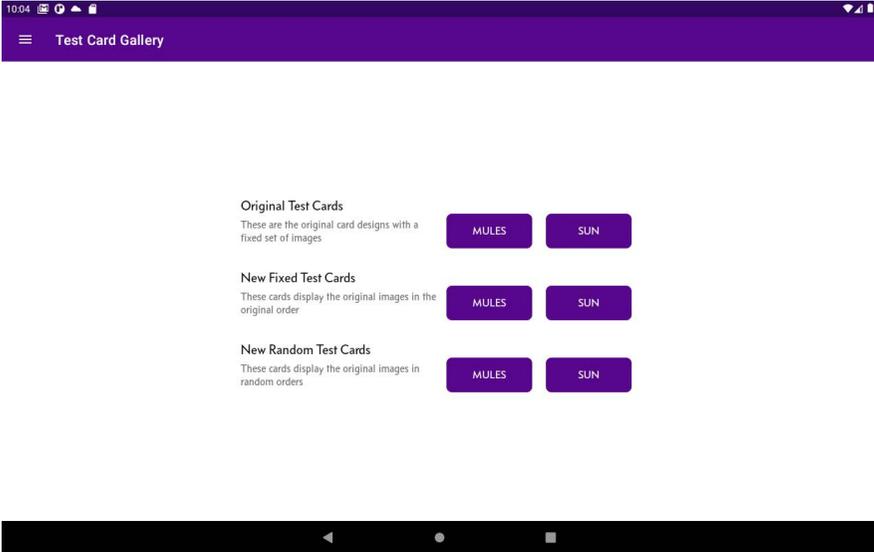
The About page shows information about the current installed version and device.



Tap “Check for an updated version” to see if there is a newer version available.

Test Card Gallery

The Test Card Gallery provides a way to view the MULES and SUN cards without running a test.



Note that the “New Fixed” and “New Random” test cards are for demonstration purposes only and are not used for actual tests.

9

Exporting and Importing Data

Although MICK does not maintain a live internet connection, it is possible to export data from one device and to import data into another. This can be useful for tabulating research data or sharing baselines for use by sports teams.

Install a File Share Service

To share data between devices, we recommend that you install one of several file sharing services on your device:

- Google Drive
- Dropbox
- Microsoft OneDrive

All of these will require that you sign in with your file share credentials before performing an import or export. Once you have completed your import/export operations you may sign out from the file share service.

(If you plan to give your MICK device to others but do not want them to have access to the share services we recommend that you sign out before giving the device to others to use.)

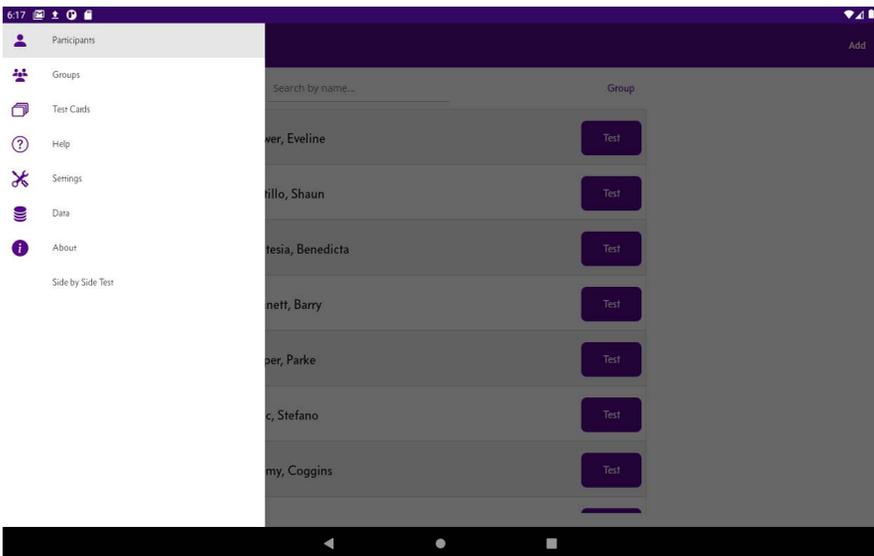
For all of the examples below we will use Google Drive, but the procedures should be the same for other share services.

Export a CSV Data Set

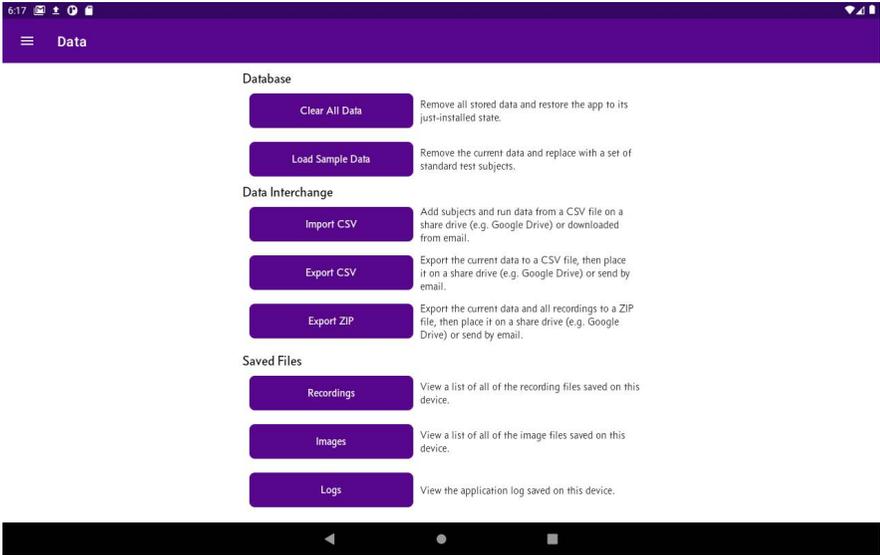
A CSV (comma separated values) file contains the participant and test information in a format that can be exchanged with spreadsheets (e.g. Microsoft Excel, Google Sheets) and other table-oriented data management applications.

The actual data schema is described in Appendix E.

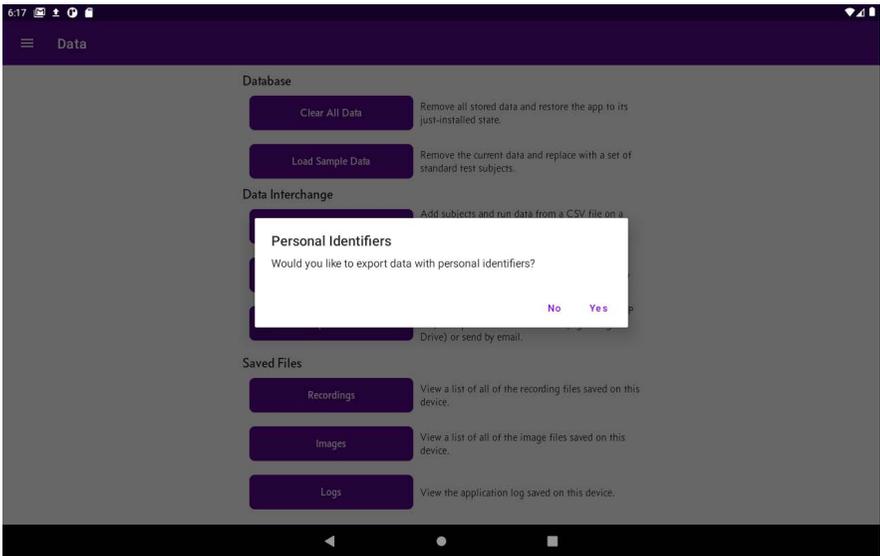
Tap the menu button and select Data.



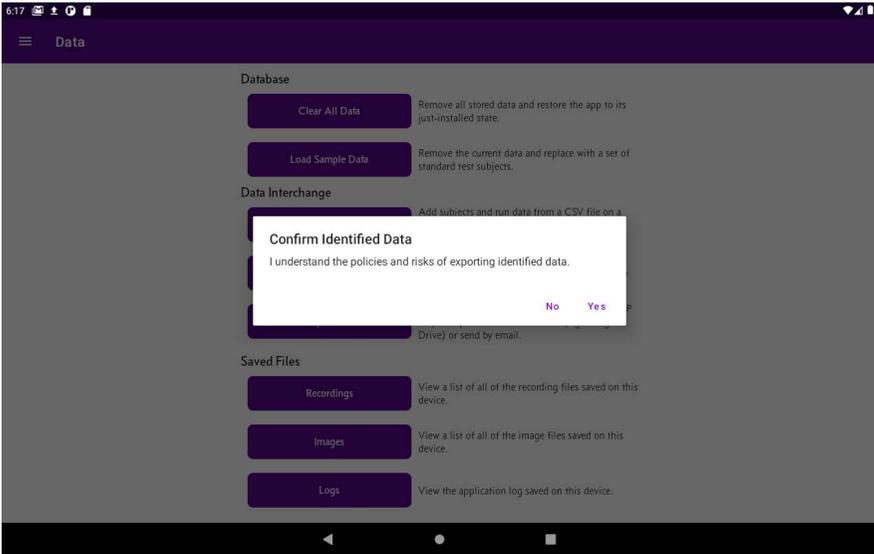
Tap the Export CSV button.



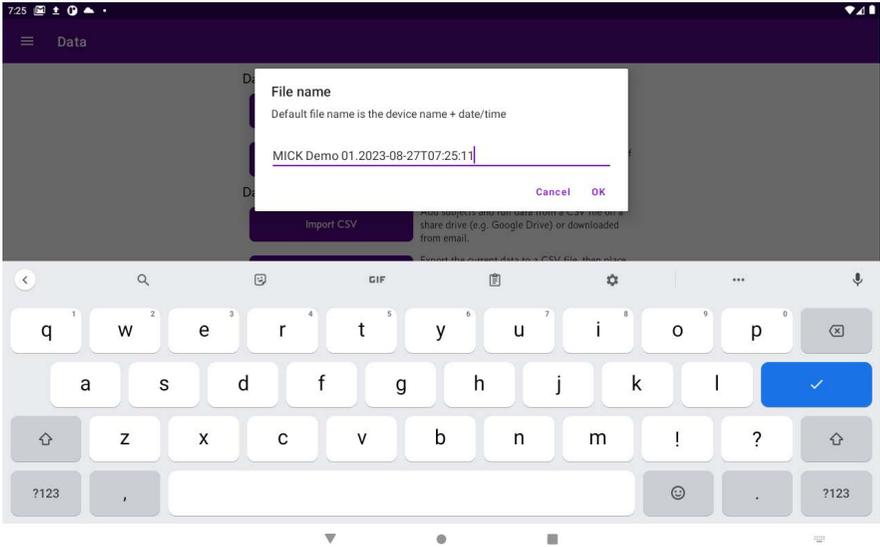
State whether you want to include personal identifiers (e.g. participant names).



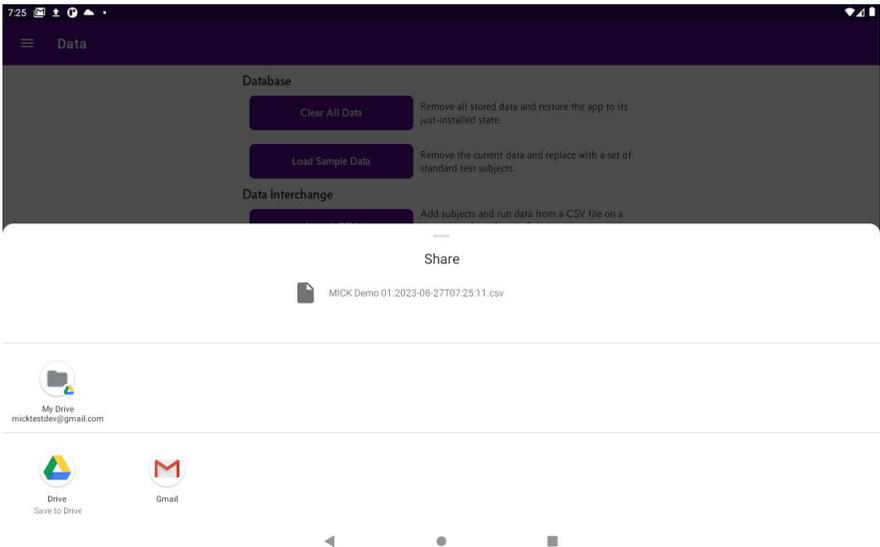
If you select “Yes” (you want to include personal identifiers) then confirm that you understand the implications, including your institutional rules.



By default, the name of the file is the name of the device plus the date and time of the export. Adjust the name as you prefer and tap OK.



Select the export destination. In this example, tap “My Drive.”



The file has now been exported and should be present in your share.

Export All Data as a Zip file

To transfer all data, including the recordings and images of the test cards, export the data as a Zip archive file. (The Zip format compresses the data making the transfer faster.)

At present there is no facility for other compression formats (rar, 7z) or for password-protecting the Zip archive file.

The procedure is identical to exporting a CSV file, except:

- on the Data page, tap Export Zip
- the name of the exported file will have the “.zip” extension.
- you will need to unzip the file in order to use it.

The unzipped directory will contain one subdirectory for each participant.

- the audio files have the “.wav” extension
- the image files have the “.jpg” extension

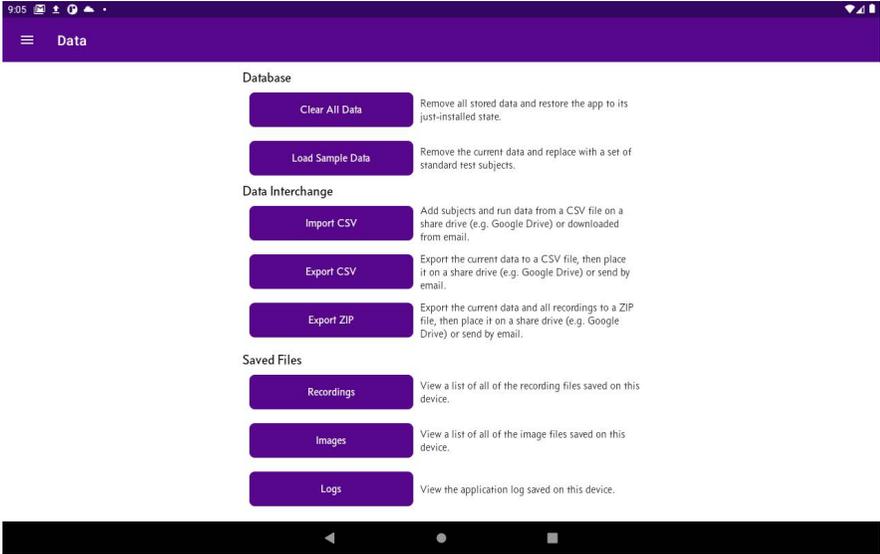
The participant times will be in the “times.csv” file.

Import a CSV Data Set

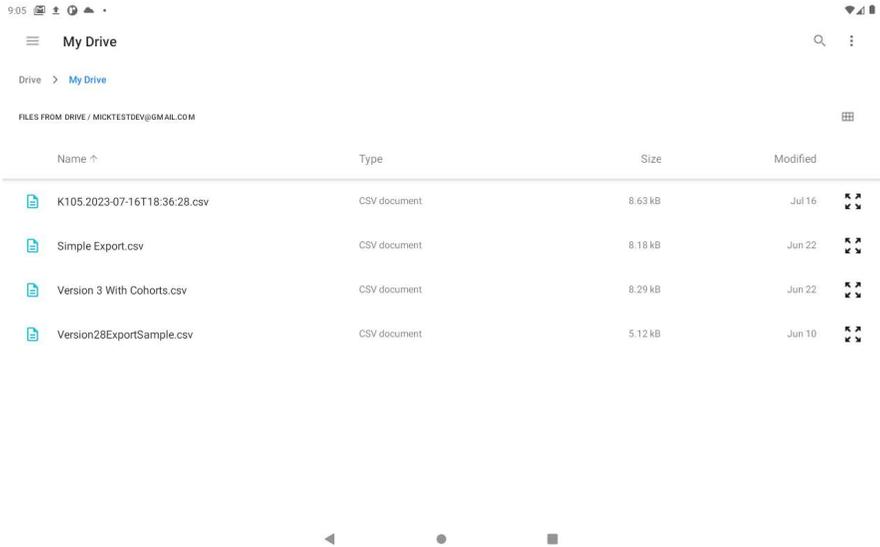
You can load subjects and times from a CSV file formatted according to the schema described in Appendix E. This can be particularly useful if you want to distribute a set of baselines to many devices (e.g. all coaches and trainers for a sports team).

To import, place the CSV file(s) into your share folder on your computer. These should then be available for import on your devices.

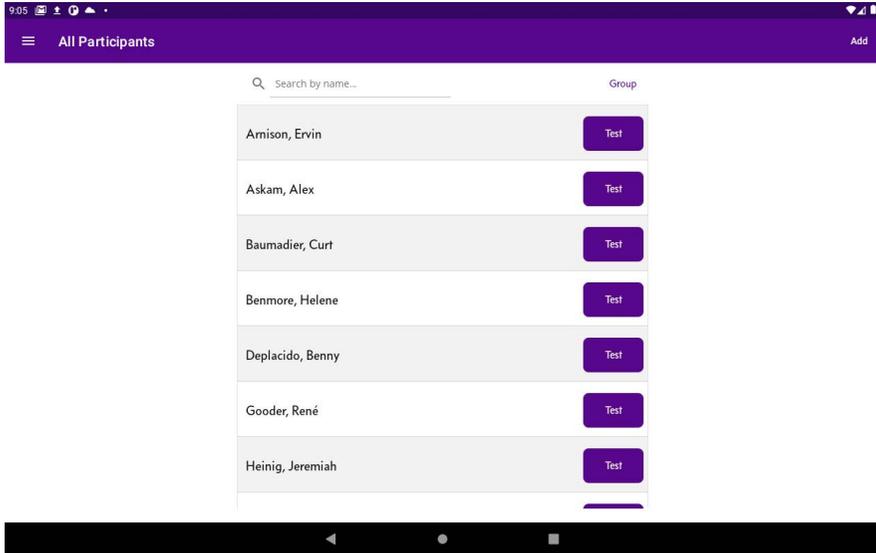
On the Data page, tap Import CSV.



Navigate to the share folder. Tap the CSV file you want to import.



When the import completes, you will be taken to the Subjects page.



Check to be sure that all of the imported subjects are present.

Exporting by email

You may notice that Gmail appeared as one of the export options. MICK can export to an email message if an email client is available and configured on the device. Note, however, that email transfer may be insecure and is not recommended if your files contain personal information.

A

The MICK Test Cards

The MICK test consists of the MULES and SUN tests.

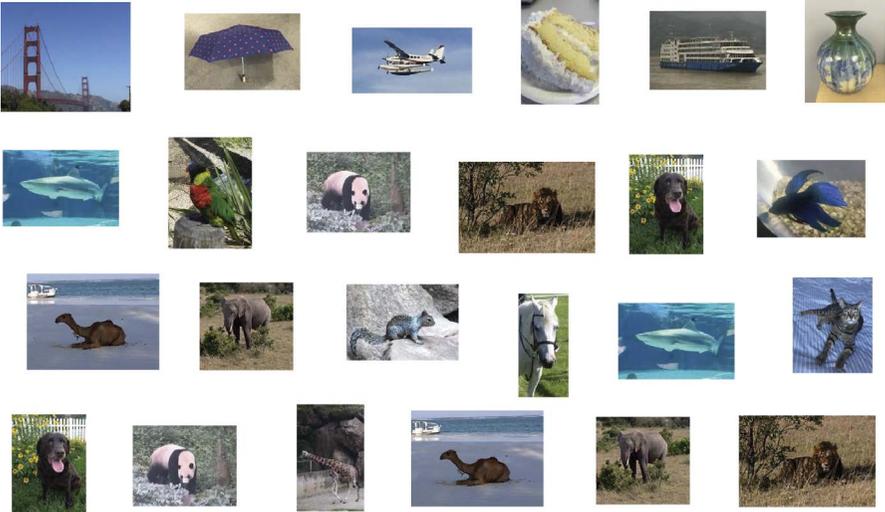
MULES

The MULES (Mobile Universal Lexicon Evaluation System) test consists of two cards.

Card 1 has five lines of images:



Card 2 has four lines of images:



SUN

The SUN (Staggered Uneven Number) Test has four lines of numbers:

3⁶10¹6⁹7¹²4⁷8⁵3⁷2¹²5⁸2⁴11¹10¹²4¹¹8²10¹8⁴5¹¹3⁷3⁰9¹12⁹5

30364

073075

14636

239473

67353

4 2 1 6 9 6 7 6 1 7 4 2 3 6 9 2 9 1 6 0 2 5 3 9 1 9 0 5 1 0 2 8 1 5 1 4 8

8¹7⁰6⁵7¹8⁷

038782

042986

1 6 3 1

5⁷0⁹2⁰5¹5¹

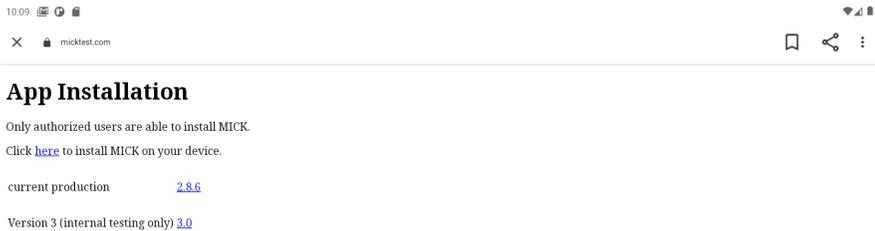
B

Installing MICK

In order to install MICK on an Android tablet you must have a Google account that is registered with the MICK team. The Google account does not have to be a Gmail account—you can (and should) get a Google account for the email address that you normally use for communication with colleagues in the organization(s) for which you will be using MICK.

Installation

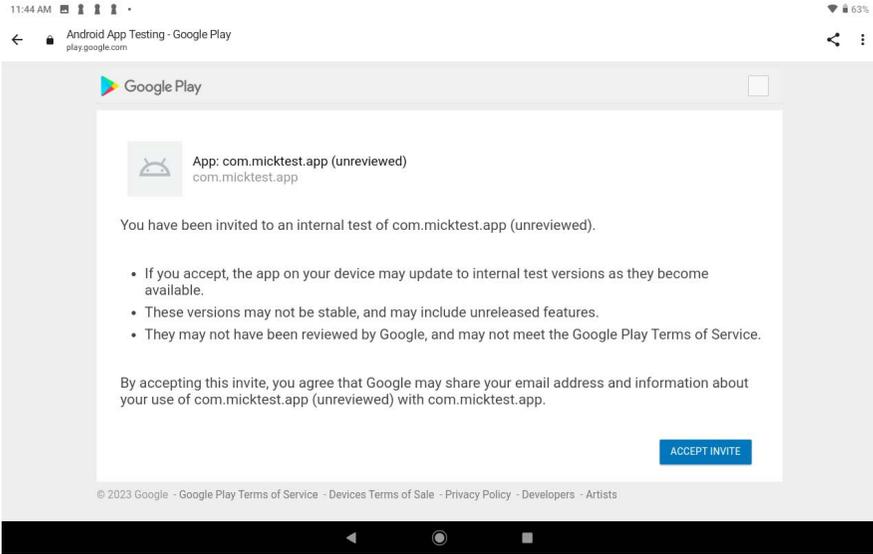
Navigate to <http://micktest.com/apps>.



Note that this site is not linked from the main micktest.com site.

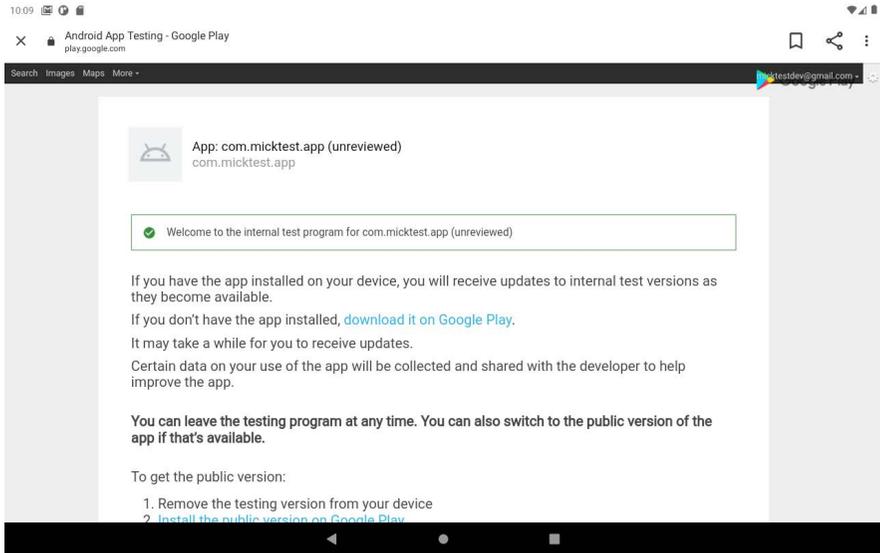
Tap the link for the version you wish to install.

The first time you install MICK through your Google account you will be prompted to accept the invitation to join MICK.



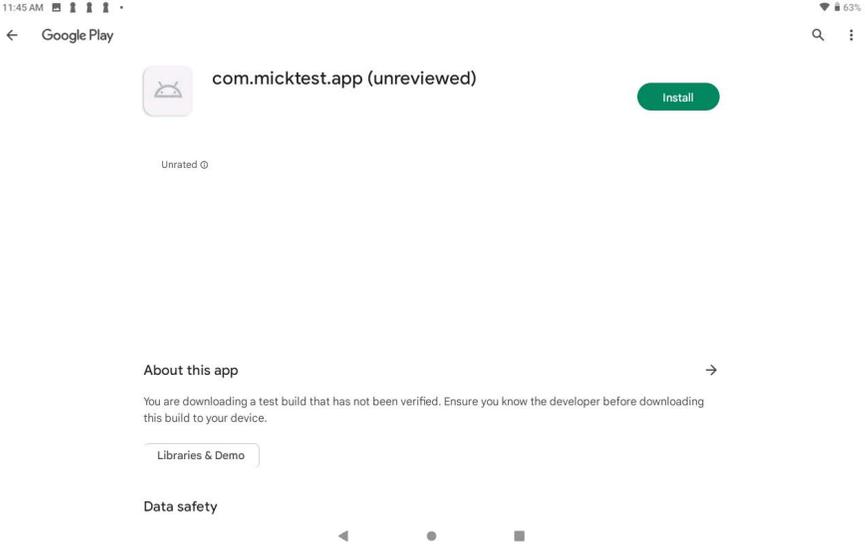
Tap “Accept Invite.”

Next you will be prompted to download MICK.

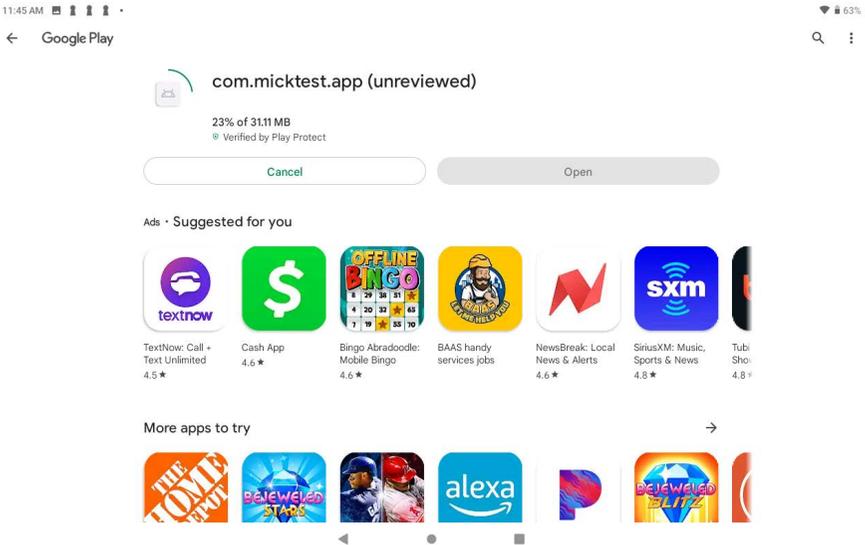


Tap “download it on Google Play.” Do not tap “Install the public version...” At present there is no public version.

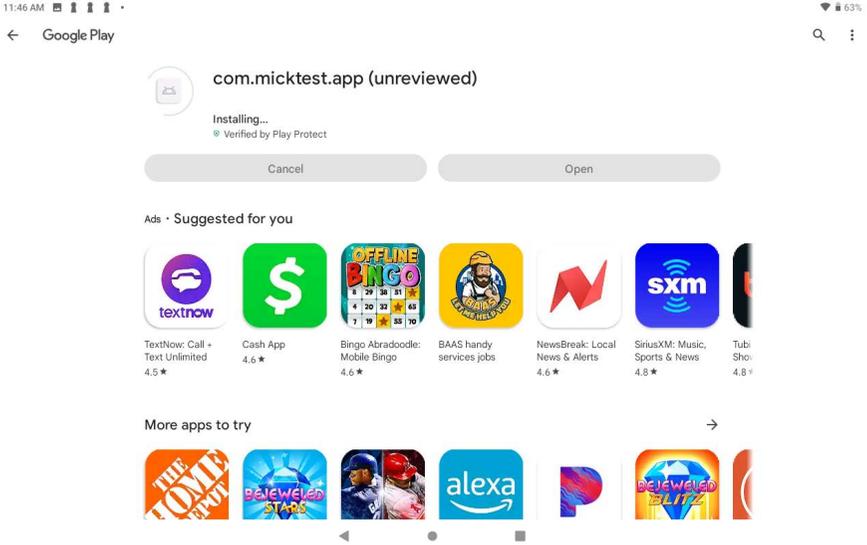
On the app page tap Install.



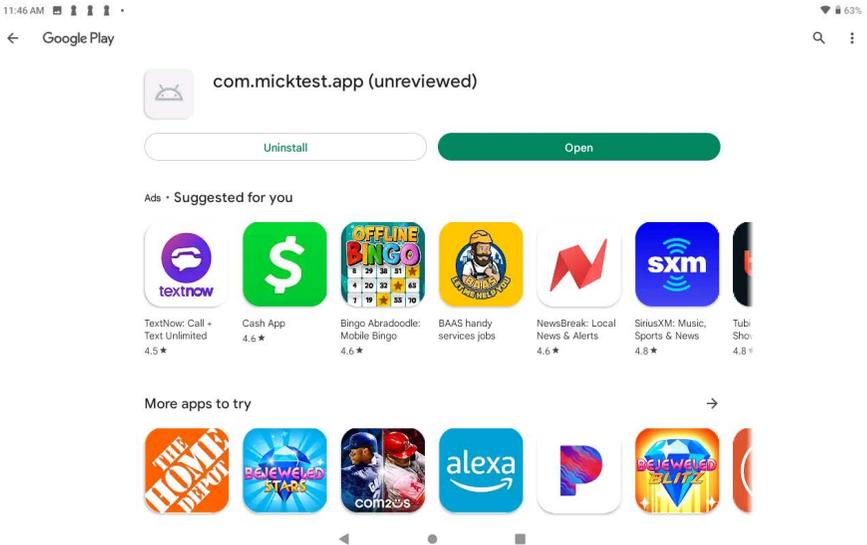
Ignore the other ads while MICK is downloading...



...and installing.



Once MICK is installed, tap Open to start MICK.



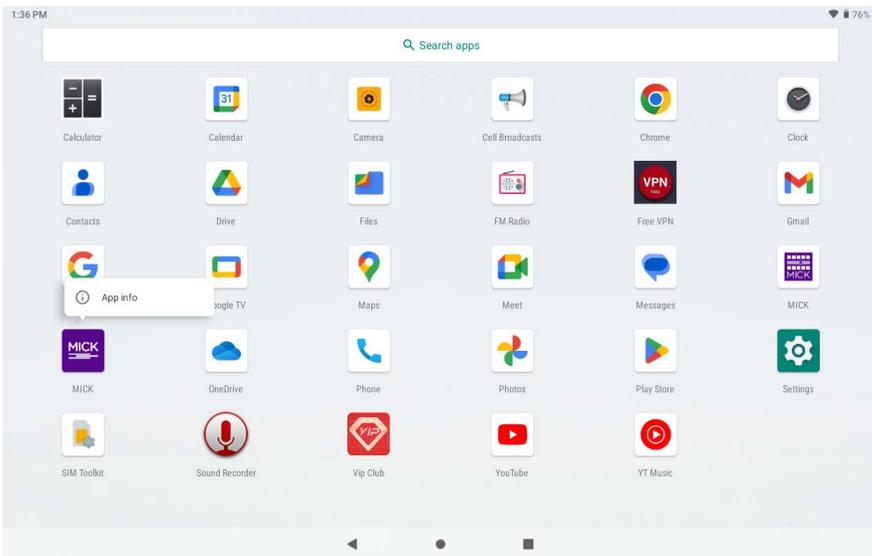
Upgrading to Newer Versions

Newer versions of MICK are released periodically with upgraded functionality and bug fixes. These upgrades are not installed automatically (for clinical and research compatibility). Instead you will need to explicitly upgrade to new versions.

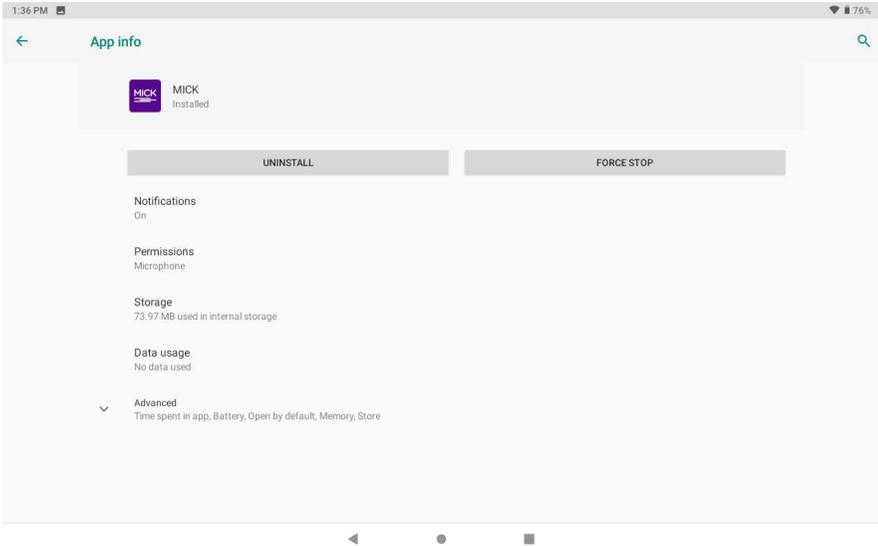
There are two approaches to installation:

- Install the new version from the web (as in the Installation section above)
- Do a direct upgrade

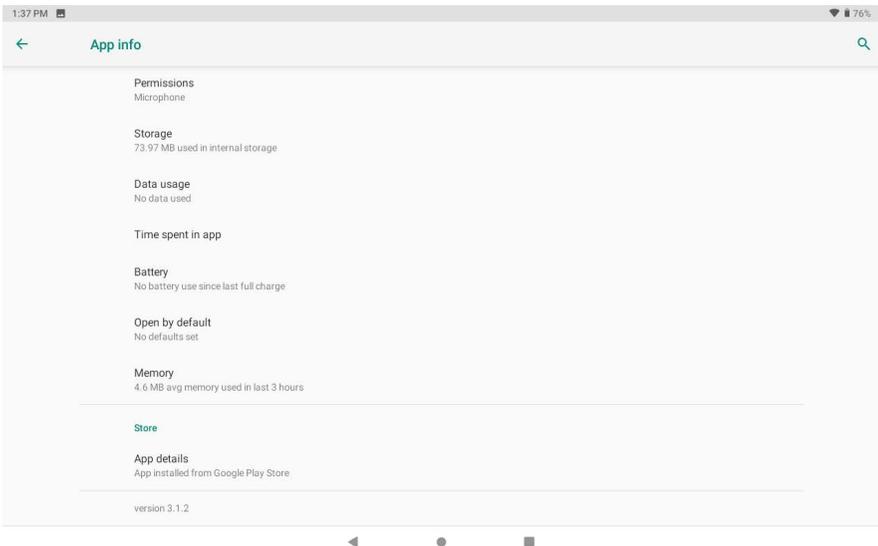
To do a direct upgrade, tap and hold the MICK icon until the App Info icon appears.



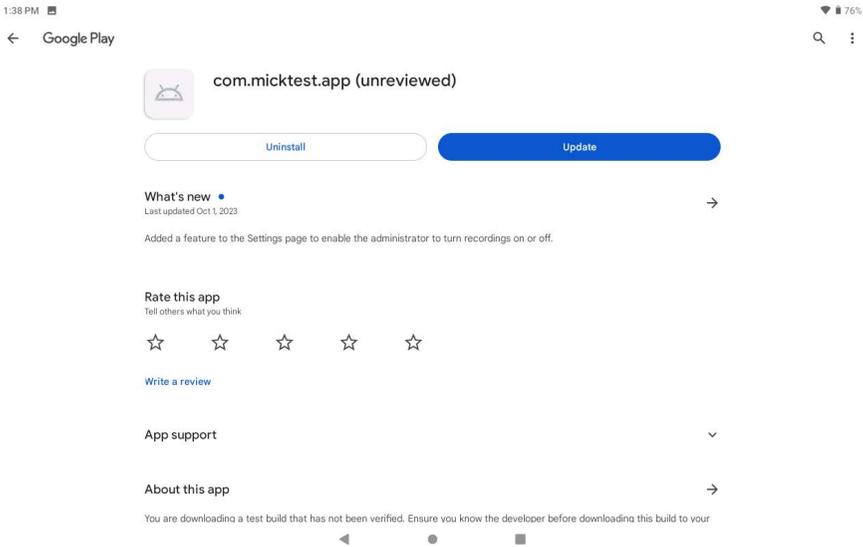
Tap to expand the the Advanced item.



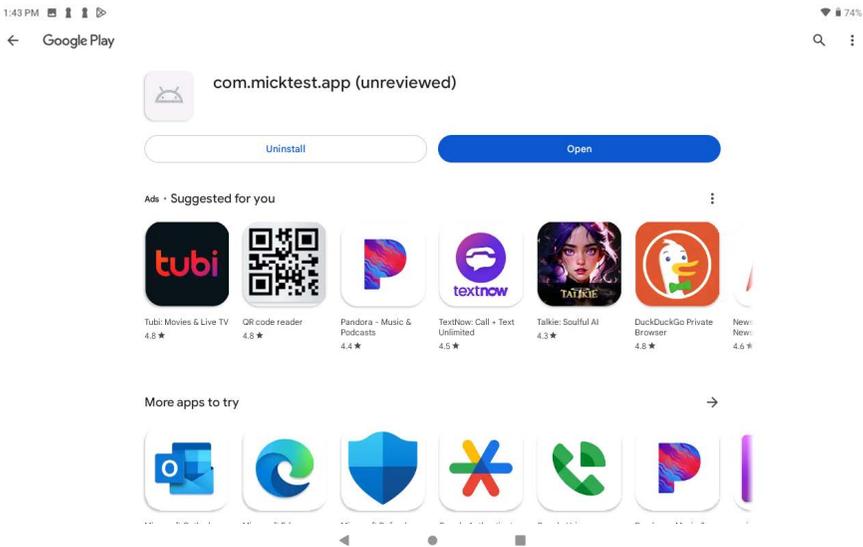
Scroll down to the App Details section.



Tap App Details. This opens the App Store page. If an update is available, the Update button is present.



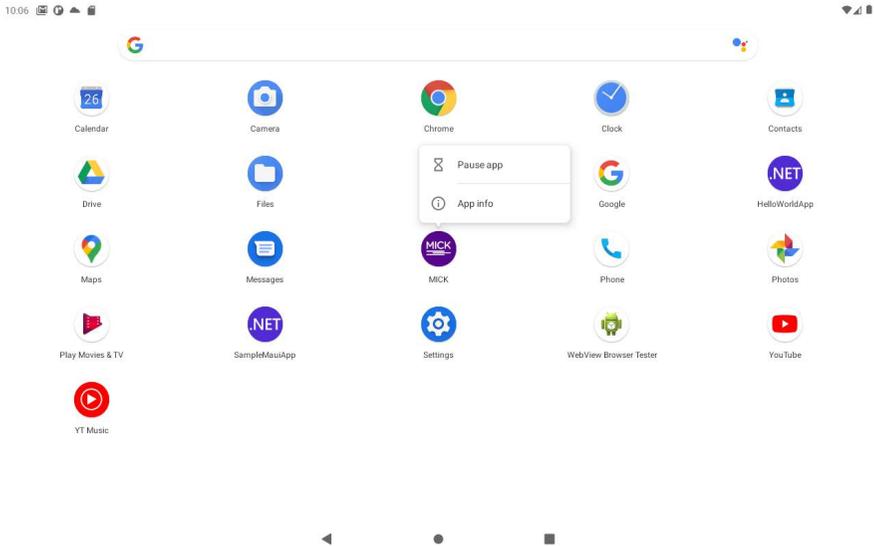
Tap the Update button. This will install the newer version. Then tap the Open button to open the new version.



Uninstalling MICK

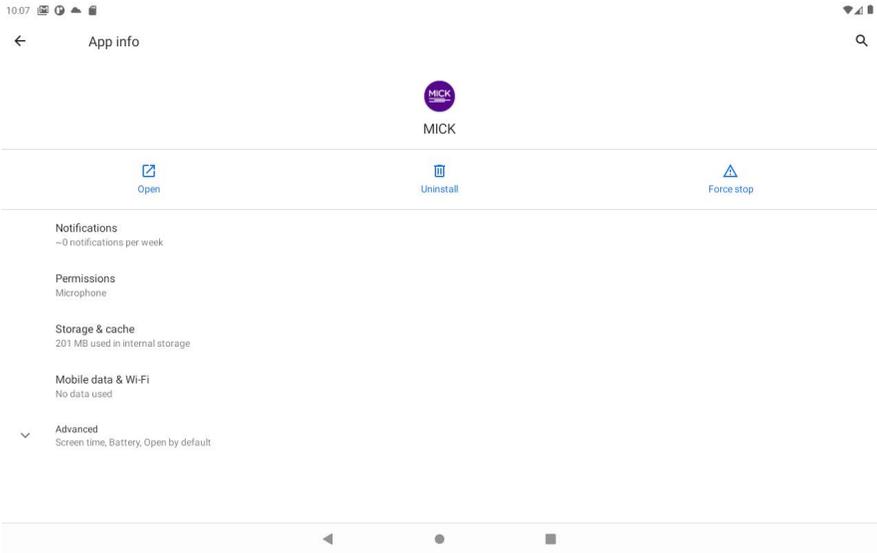
Should you need to completely uninstall MICK, we recommend you first back up the data. See “Exporting and Importing Data” on page 39.

From the desktop, press and hold the MICK icon until App Info appears.



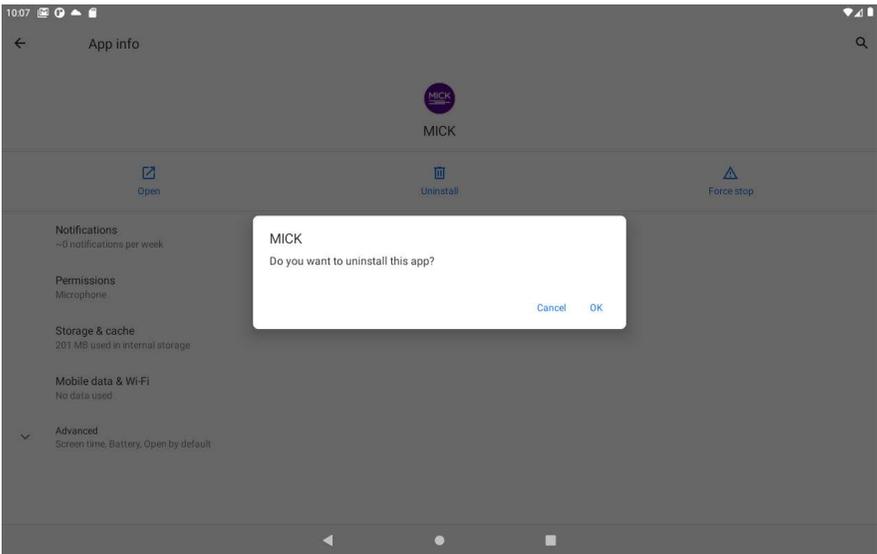
Tap App Info.

This opens the App Info page.



Tap Uninstall.

Confirm that you want to uninstall MICK.



Once uninstalled you can re-install MICK by following the instructions in “Installing MICK” on page 51.



Migrating from Version 2

MICK Version 3 is a completely new app. This allows you to run both Version 2 and Version 3 on the same device.

These two versions have separate databases.

Follow these instructions to migrate the participants and times from Version 2 to Version 3.

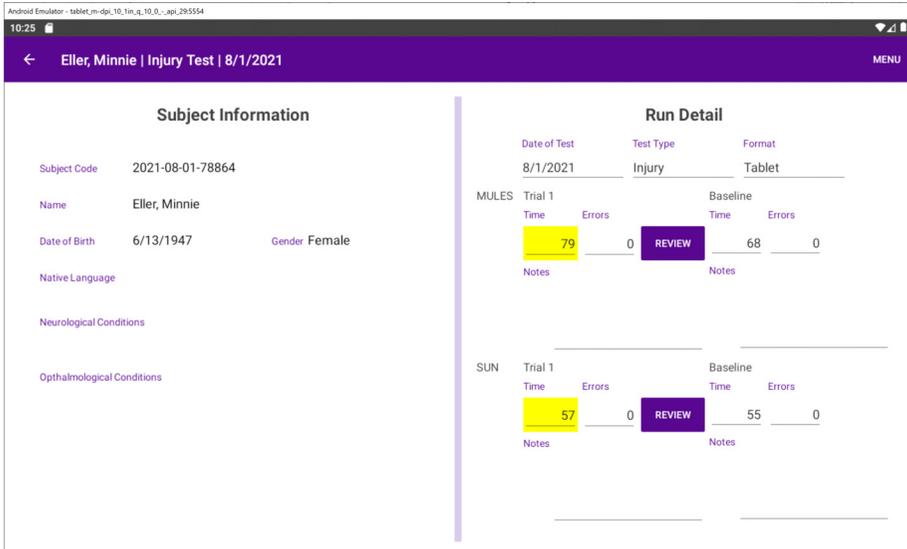
Terminology Differences

Some labels have changed between Version 2 and Version 3:

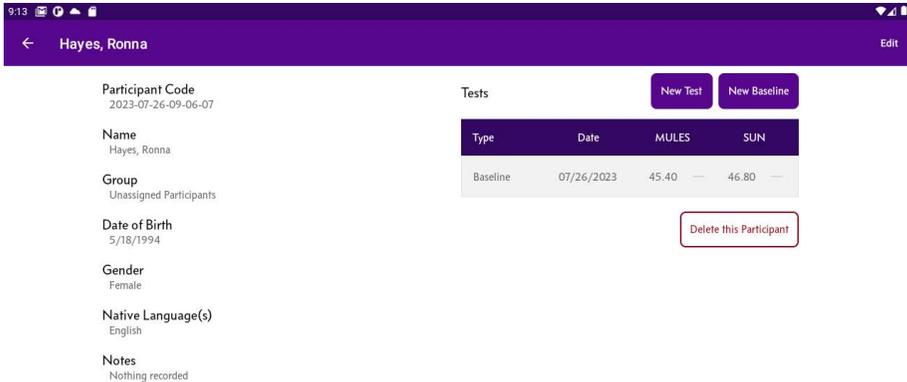
Version 2	Version 3
Subject	Participant
Cohort	Group
Run	Test
Neurological Conditions Ophthalmological Conditions	Notes (this data will not be migrated)

These changes are easiest to see if you compare the two screens:

Version 2:



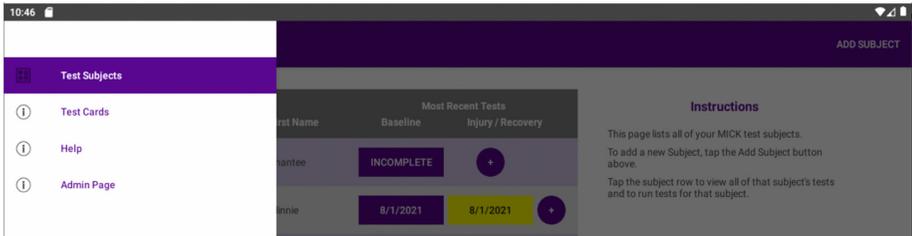
Version 3:



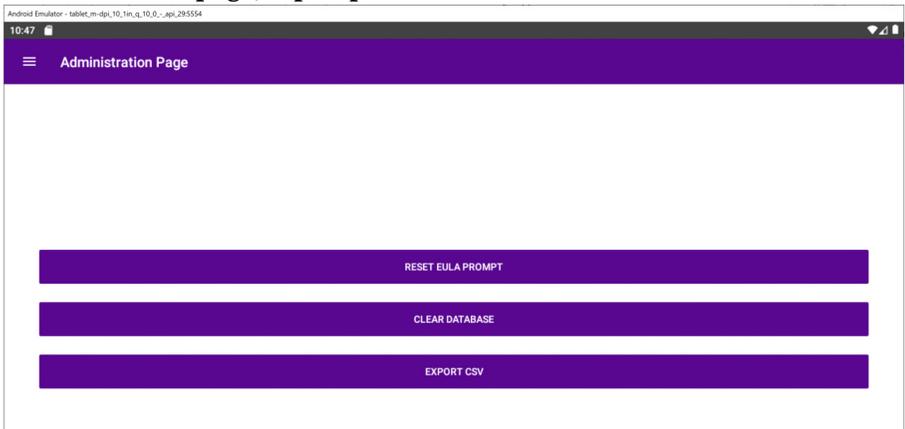
Export from Version 2

The migration is easiest if you use a file share service (e.g. Google Drive). See Chapter 9.

Open MICK Version 2. Tap the menu in the upper left corner then select Admin Page.



On the Admin page, tap Export CSV.



Select your file share service instead of an email message.

Import into Version 3

Follow the instructions in Chapter 9, “Import into Version 3” on page 65 to import the exported CSV file.

Note that you will only be importing participant names and times. The audio files will not be migrated.

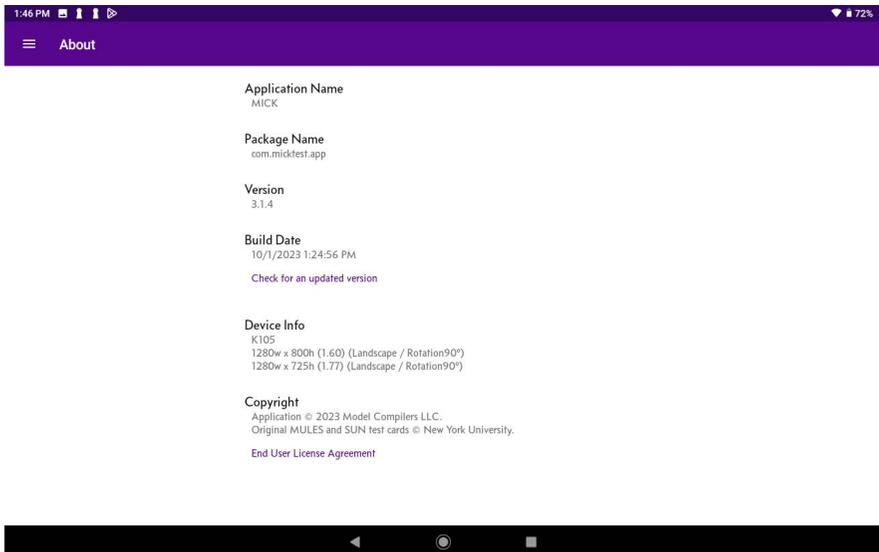
D

Advanced Settings

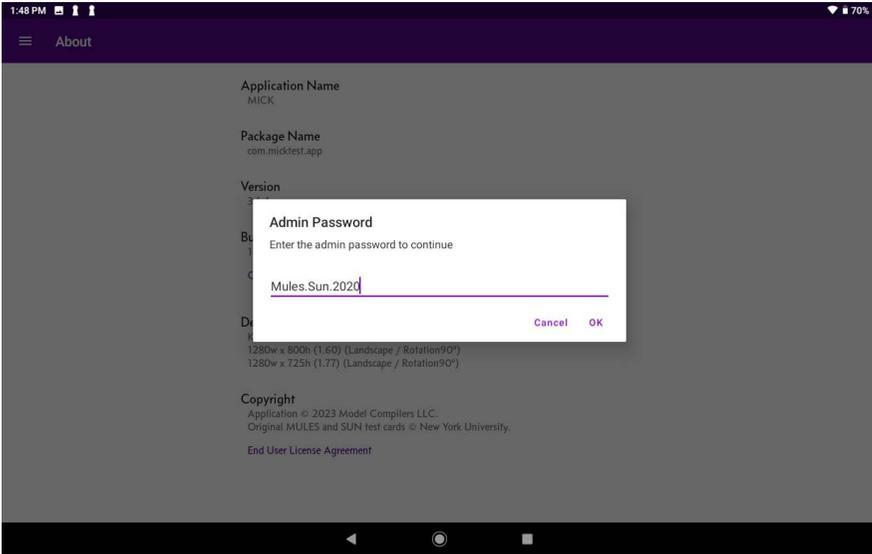
The following advanced features are for special configurations and research purposes only. Ordinary users should not need to access these features.

Accessing the Advanced Settings Page

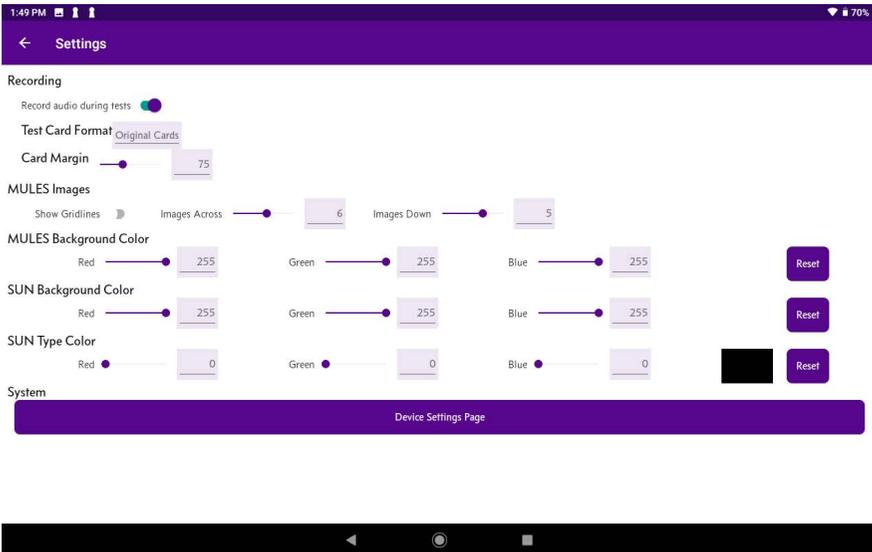
The Advanced Settings page is hidden. To get to it, first open the About page from the main menu. Double-tap the Version number.



You will be prompted for a password. Enter the password.

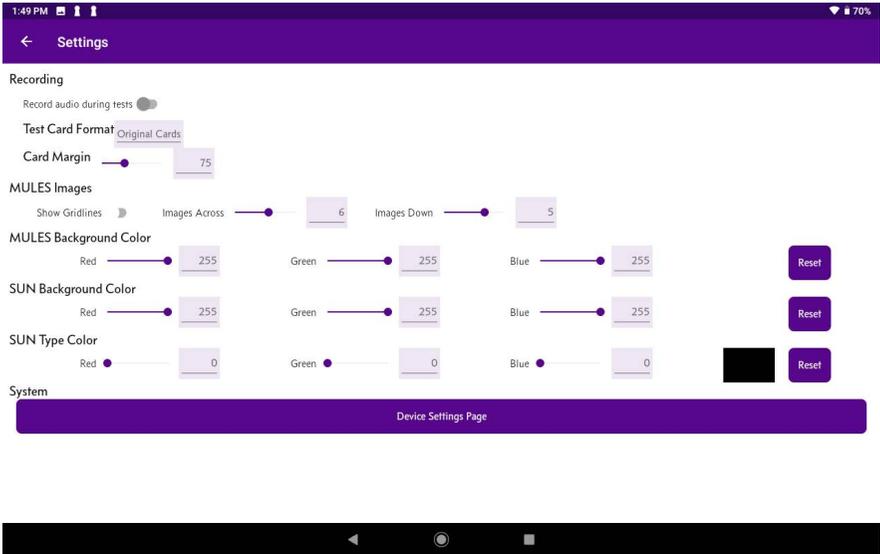


This will open the Settings page.

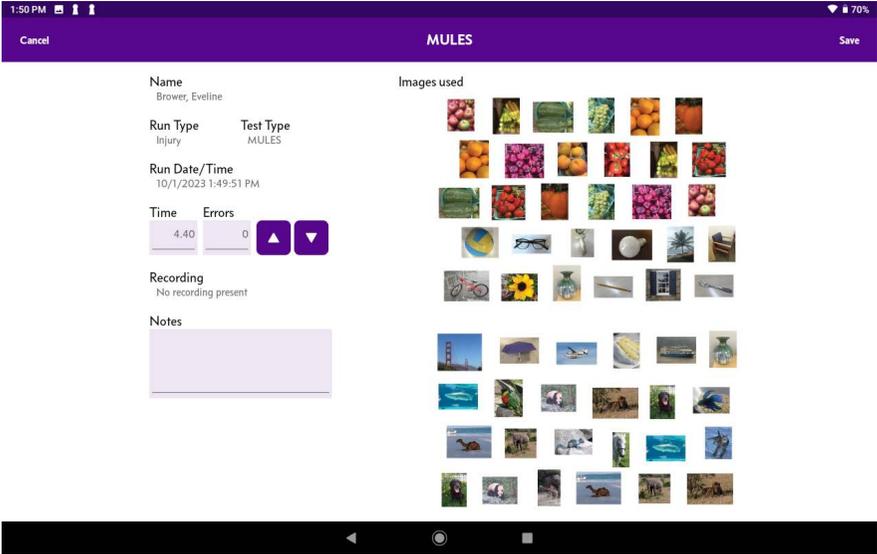


Turn Audio Recording On/Off

By default, an audio recording is made for each test. To disable audio recording, tap the to turn it off. (Left is off, right is on)



Verify that no recordings are made when running a test.





MICK Data Schema

The CSV import/export format described in Chapter 9 enables data to be exchanged between MICK devices and between MICK and other applications. This table describes the data schema.

The data will be exported in the column order described below. On import, the first row must contain the column names described in the schema but may occur in any order.

Note that some column names are different from the display names of the fields. These original column names are retained for compatibility.

When a Subject has no Runs (tests) all of the columns past the Subject Notes will be blank. Similarly if a Subject has multiple Runs, the Subject information will be duplicated for each Run row.

Field Name	Format	Description
Version	string	The application version that exported the data
MachineID DeviceID	string	The name / ID of the device
LastUpdate	number	Future use for synchronizing updates across devices
CohortID etc... GroupID	GUID	A unique identifier of the cohort (group)
CohortName	string	The name of the cohort (group)

SubjectID	GUID	A unique identifier of the subject (participant)
SubjectCode	string	A user-provided code for the subject
LastName	string	Last name of the subject
FirstName	string	First name of the subject
DOB	date	Subject date of birth
Gender	string	Gender as entered
NativeLanguage	string	Native language as entered
RunID	GUID	A unique identifier of the Run
BaselineRunID	GUID	For injury (regular) runs, this is the identifier of the baseline run
TestDate	date	Date/time of the run
TestType	string	MULES or SUN
TestFormat	string	always Tablet
MULES1Time	decimal	time in seconds
MULES1Errors	integer	error count
MULES2Time	decimal	time in seconds
MULES2Errors	integer	error count
SUN1Time	decimal	time in seconds
SUN1Errors	integer	error count
SUN2Time	decimal	time in seconds
SUN2Errors	integer	error count
RunLastUpdate		Future use for synchronizing updates across devices