

Experiment HN-10: Play Games – Hypothesis Testing

Background

One of the best ways to learn a concept and commit it to memory is to have fun doing it. Play-based learning is one of the big ideas now about how to get children to learn best. But, what about adults? Can we benefit from having some fun and learn something at the same time?

The short answer to this is...YES! There are lots of ways to learn concepts and play games at the same time. Think of board games like Monopoly, Risk, Scrabble, and even Pictionary. These games teach skills as simple as adding and subtracting to much more complex ideas like strategies and planning. Communication skills, word play, and complex problem solving are additional skills that can be gleaned from playing these games.

Where do physiology concepts come in? Take the arcade game “Whack-a-Mole”, this game is all about speed and accuracy. You can measure reaction times, skin conductance (are you stressed?), pulse, temperature and more, and get an understanding of how the body reacts while trying to hit a silly mole on the head. EMG activity can be measured, as well as other parameters, while trying to pass a metal ring over a metal bar – watch out, don’t hit the sides, or you’ll get buzzed (Operation, anyone?).

The lab activity shown here is based on “Whack-a-Mole” and set to measure reaction time, accuracy and pulse. Add any other channels to measure other physiological concepts. Directions for adding other channels can be found right in the Set Up information.

So, break out the games, have some fun, laugh and learn!

NOTE: To use the Metal-Ring game, just plug in the iWire-B3G and use the Edit → Preferences to add the EMG channels and other parameters. You can purchase the game from iWorx.

Equipment Required

PC or Mac Computer

IXTA, USB cable, IXTA power supply

RPD-400 4-Button Event marker

PT-104 Pulse sensor

*Optional

* iWire-B3G – for EMG, ECG or EOG

* RM-204 – respiration monitor and respiration rate

* any additional sensors based on hypothesis

Start the Software

1. Click on LabScribe
2. Click Settings → Human Nerve → Play Games
3. Once the settings file has been loaded, click the **Experiment** button on the toolbar to open any of the following documents:
 - Appendix
 - Background
 - Labs
 - Setup (opens automatically)

Event Marker Setup

1. Locate the RPD-400 event marker ([Figure HN-1-S1](#)), in the iWorx kit.
2. Plug the connector cable into the RPD-400 event marker and the other end of the connector cable into the Digital Inputs port on the back of the IXTA ([Figure HN-1-S2](#)).
3. Locate the PT-104 pulse sensor, plug it into channel A-5 on the front of the IX-TA.
4. Attach to the pulse sensor to a pulse point that will not experience movement artifacts:
 - The fleshy surface of the big toe, or
 - To the carotid artery in the neck (attach with surgical tape)

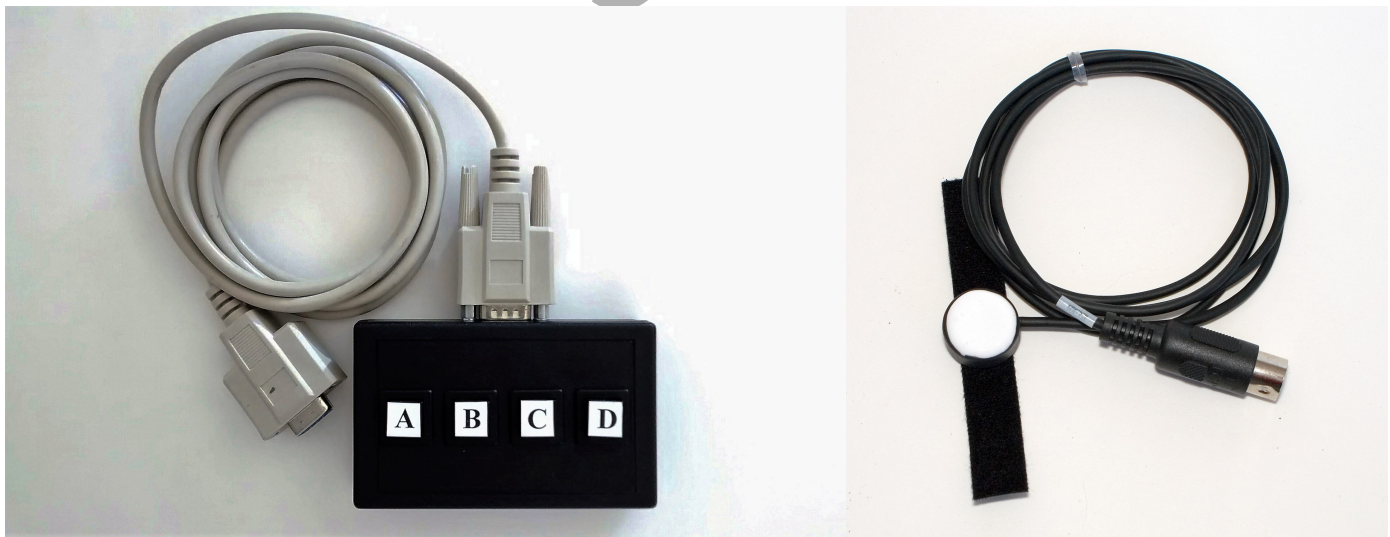


Figure HN-10-S1: The RPD-400 event marker and the PT-104 Pulse sensor.



Figure HN-10-S2: The IX-TA with the RPD-400 event marker. The pulse sensor gets plugged into the front of the IX-TA to channel A-5.

*Adding Optional Sensors and Games

1. To add a new game:
 - Plug the phono connector on the Metal Hook and Ring game into the EM1 port on the back of the IX-TA.
 - In the software – go to Edit → Preferences (LabScribe → Preferences on a Mac)
 - Put a check in Channel EM-1
 - Change the name of the Channel to MetalGame
 - Click OK



Figure HN-10-S3: Metal Hook and Ring Game – can be ordered from iWorx.

2. To add the iWire-B3G
 - NOTE – the iWire-B3G needs to be plugged into the TA before powering it on.
 - Plug the iWire-B3G into the iWire1 port
 - In the software – go to Edit → Preferences (LabScribe → Preferences on a Mac)
 - Put a check in Channel i1 2
 - Change the name of the channel based on what you are measuring
 - Click OK
 - Attach the red, black, and green leads
 - To measure EMG – put the leads on the muscle to be measured - look at Human Muscle-Antagonistic Muscles for set up
 - To measure EOG – take a look at the Human Muscle-EOG lab for set up
 - To measure ECG – place the red lead on the left wrist, black on the right wrist, and green on the right ankle.
3. To add the RM-204
 - Plug the RM-204 into channel A-6
 - In the software – go to Edit → Preferences (LabScribe → Preferences on a Mac)
 - Put a check in Channel A-6
 - Change the name of the Channel to Respiration
 - Click – Add Function → Periodic → Rate to add the Breathing Rate channel
 - Click OK
 - Change the name of the new channel to Breathing Rate; click V2-V1 on the right margin and change to Mean, to get an average heart rate.

Sample Exercise: Reaction Time, Accuracy and Heart Rate

Aim: To measure the reaction time, accuracy and heart rate of a subject while playing “Whack-A-Mole”.

Approximate Time: 20 minutes

Procedure

1. Read all instructions carefully before beginning to record.
2. Information for the subject:
 - Instruct the subject to sit in a chair and face the computer screen.
 - Watch the computer screen and quickly press the correct letter on the event marker that corresponds to the image and position of the Mole ([Figure HN-1-L1](#)).
3. Directions for the other student(s):
 - Make sure to click the “Whack-A-Mole” sequence and click Run Sequence when the subject is ready.
 - In this exercise, the subject will perform twenty trials.

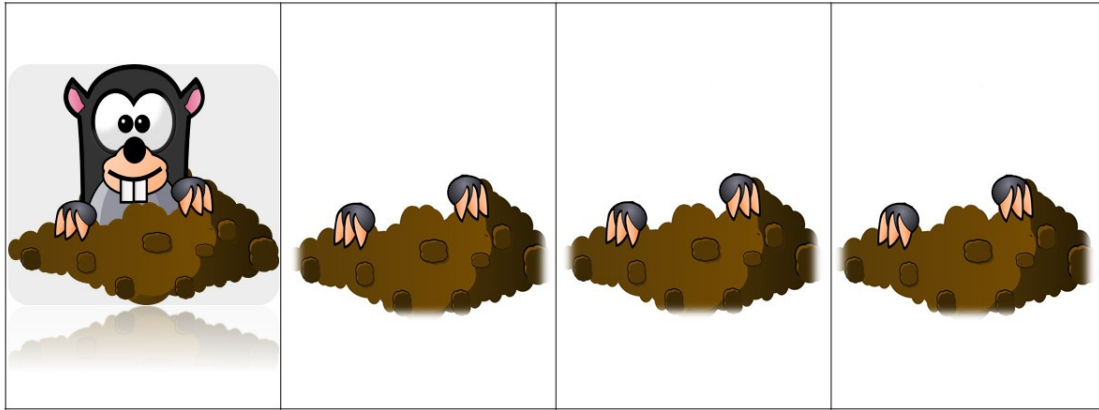


Figure HN-1-L1: Sample image – subject will click button “A” on the event marker corresponding to the mole being in the first box.

Warning: In this exercise, it is important to press the corresponding button on the event marker as soon as the Mole image shows up. Another image will pop up at any time! A blank white image will be shown between Mole images.

4. When the subject is ready, click on the Record button and the Run Sequence.
5. Remind the subject to press the correct button on the event marker as soon as he or she sees the mole image show up on the computer screen ([Figure HN-1-L2](#)).
6. After the twenty (20) mole images, the recording should be stopped. Do not click stop until you are sure the last image has been shown. The last image will remain on the screen and not change to a white screen.
7. Click Stop to halt recording.
8. Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.

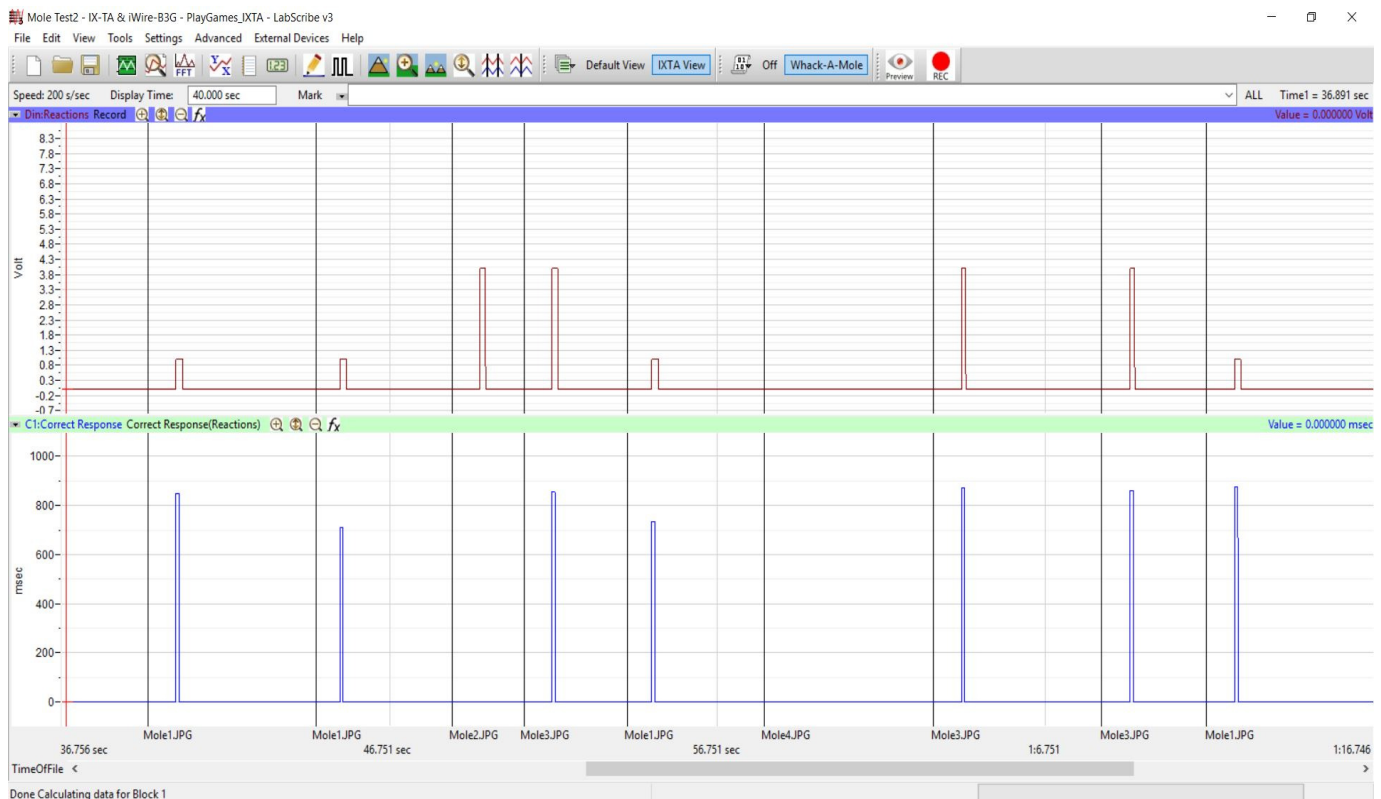


Figure HN-10-L2: The subject's reaction signal is shown in the top graph, each reaction is followed by an automatic calculation of the subject's accuracy and response time as shown in the bottom graph.

When recording pulse and heart rate – the pulse signal will be in the 3rd graph and the Mean heart rate will be in the bottom-most graph.

Data Analysis

1. Scroll to the beginning of the data recorded to display some of the trials on the Main window.
2. Use the Display Time icons to adjust the Display Time of the Main window to show approximately 10 responses. Double or halve the display time to show the 10 responses.

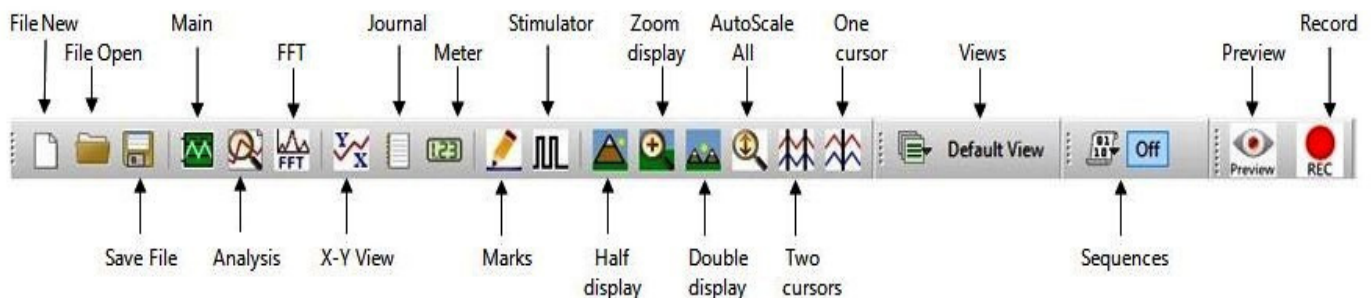


Figure HN-10-L3: The LabScribe toolbar.

3. Data can be collected from the Main window.

- The mathematical functions, Value (Correct Response) and Mean (Heart Rate) should appear on screen. Value and Mean are shown in the upper right edge of the two graphs.
- Click Single Cursor mode to measure reaction time.
- Use the mouse to click on and drag the cursor to the peak of the blue Correct Response.
 - If there is no response there will be nothing in the correct response line – this allow you to calculate accuracy (black arrow).
 - If there is a correct response, there will be a blue bar (shown by the green arrow).
- Once the cursor is placed in the correct positions for determining the reaction time, record the value, shown by the red arrow, on a separate data table.
- Once the reaction time in the first trial is measured and recorded, repeat Steps 6 and 7 on the data from the second trial. Continue for all 20 trials. You will need to scroll through the recording to measure the second set of 10 trials.
- After the reaction times have been measured for all the trails, double the display time to show all 20 trials on screen. Click the Double Cursor icon ([Figure HN-10-L3](#)).
- Place the cursors on either edge of the recording to measure the Mean Heart Rate as shown on the Heart Rate graph (not shown in the image below).

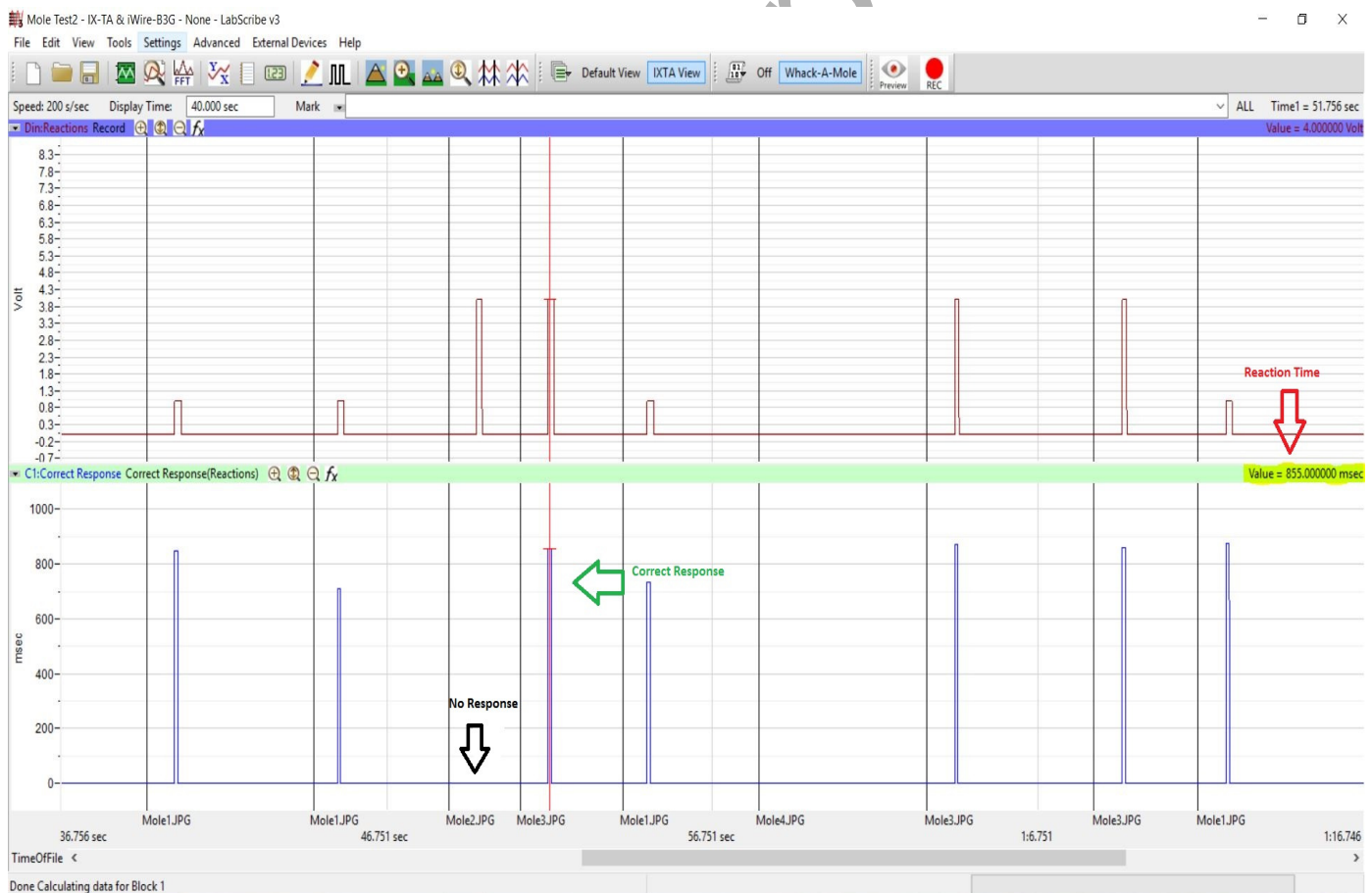


Figure HN-10-L4: The subject's reaction signal is shown in the top graph, each reaction is followed by an automatic calculation of the subject's accuracy and response time as shown in the bottom graph.

Measurement of the subject's reaction time (Value) in this trial = 855 msec.

Note – any reaction that is incorrect will not have a signal in the Correct Response graph, thus enabling calculation of accuracy.

Hypothesis Testing

Create your own experiment and come up with other ideas to measure responses, heart rate, temperature, EMG, ECG, EOG, etc...while playing games.

iWorx Sample Lab