

HN-5: Visual Reflexes and Color Stimulation

Equipment Required

PC or Mac Computer

IXTA, USB cable, IXTA power supply

EM-220 Event marker

BCL-100 Bicolor Light Source

EM-220 Event Marker and BCL-100 Bicolor Light Source Setup

1. Locate the EM-220 event marker and the BCL-100 bicolor light source.
2. Plug the connector of the EM-220 into the EM1 Channel input on the back of the IXTA.
3. Attach the BNC connector of the BCL-100 bicolor light source to the “Stimulator 1” connector on the stimulator outputs.



Figure HN-5-S4: The EM-220 and the BCL-100 connected to the IXTA.

HN-5: Visual Reflexes and Color Stimulation

Exercise 1: Reaction Time and Single Color Visual Signals

Aim: To measure the reaction time of a subject to a visual signal.

Approximate Time: 15 minutes

Procedure

1. Instruct the subject to:
 - Sit in a chair and hold the BCL-100 bicolor light source in one hand.
 - Hold the event marker in the other hand in a manner that enables the subject to click the button on the event marker as quickly as possible.
 - Watch the bicolor light source and quickly click and release the button on the event marker when the green colored signal generated by the BCL-100 first appears.
2. Select GreenLED from the Macros. This will run automatically when the Record button is clicked. If it does not – click the name of the macro and click Run.

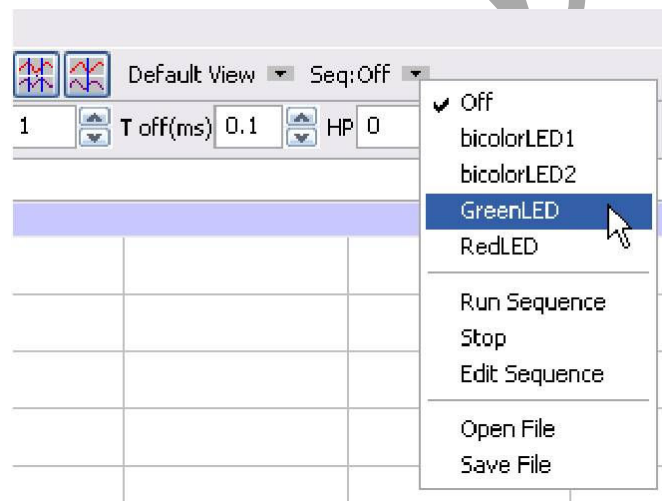


Figure HN-5-L1: The Macro menu containing the pre-programmed light sequences used in this experiment.

3. Type **Green** in the Mark box.
4. Click on the Record button and click the mark button to mark the recording.
5. The software will deliver twenty colored visual signals to the subject. The signals will be between two and five seconds apart.
6. After the twentieth signal, click Stop to halt recording.
7. Select Save As in the File menu, type a name for the file. Click on the Save button to save the data file.

Data Analysis

1. Display the beginning of the data recorded for Exercise 1 on the Main window.
2. Use the Display Time icons to adjust the Display Time of the Main window to show both the visual signal and the response signal of the first trial on the Main window.

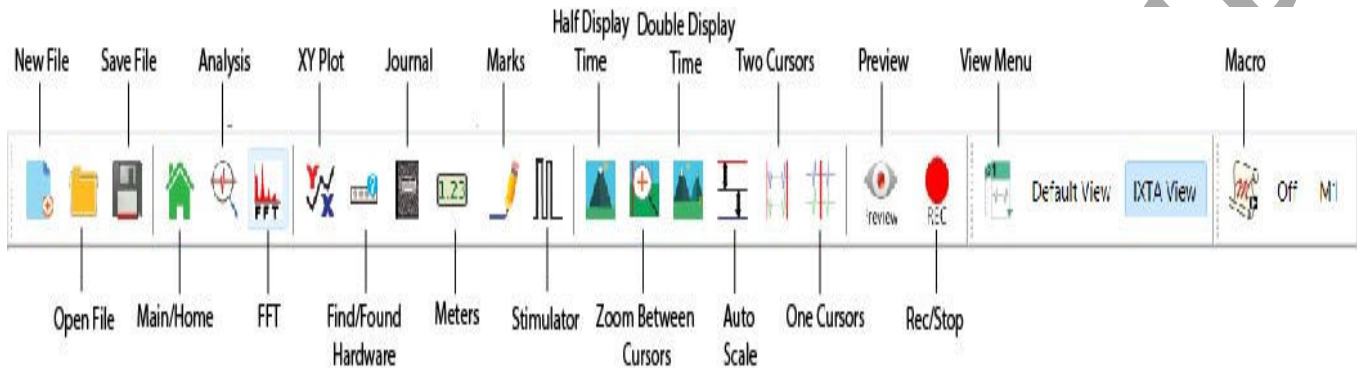


Figure HN-5-L2: The LabScribe toolbar.

3. Data can be collected from the Main window or the Analysis window. If you choose to use the Analysis window, click on the Analysis window icon in the toolbar.
4. The mathematical functions, $T_2 - T_1$ should appear on screen. The value $T_2 - T_1$ is shown in the upper right of the window.
5. Use the mouse to click on and drag a cursor to the onset of the signal used as the visual signal. Drag the other cursor to the onset of the signal used as the response.
6. Once the cursors are placed in the correct positions for determining the reaction time, record the value for $T_2 - T_1$ in the Journal. The value can be recorded in the on-line notebook of LabScribe by typing its name and value directly into the Journal. You may also record any data on separate data tables.
7. The functions in the channel pull-down menus of the Analysis window can also be used to enter the name and value for $T_2 - T_1$ into the Journal. To use these functions:
 - Place the cursors at the locations used to measure the reaction time.
 - Transfer the name of the $T_2 - T_1$ function to the Journal using the Add Title to Journal function in the Response Channel pull-down menu.
 - Transfer the value for $T_2 - T_1$ to the Journal using the Add Ch. Data to Journal function in the Response Channel pull-down menu.

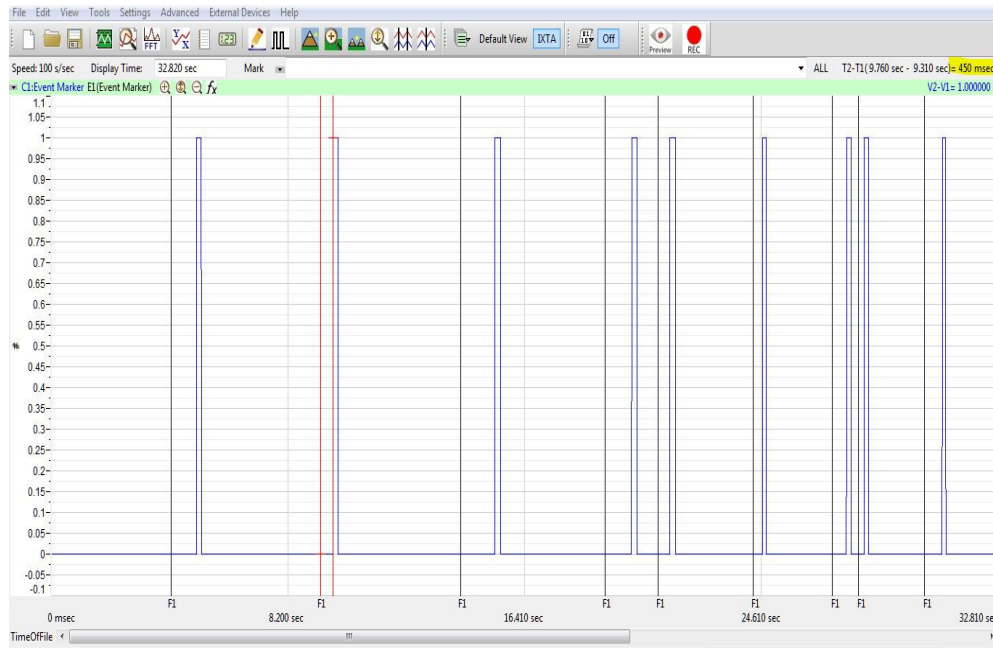


Figure HN-5-L4: The signals of the visual signal and the subject's response to signal. The cursors are placed to measure the subject's reaction time. The subject's reaction time is 450 msec.

8. Repeat Steps 5 through 7 on the data from the second trial.
9. Use the same techniques used in Step 8 to measure the reaction times from the remaining trials.
10. Once the reaction times in all twenty trials have been measured and recorded, open the Journal and use the values to determine the mean reaction time of the subject. Discard the longest and shortest times from the data set, and determine the average of the eighteen remaining reaction times. Record the mean reaction time for this exercise in Table 1.

Exercise 2: Reaction Time and Repetition of Red Visual Signals

Aim: To measure the reaction time of a subject to a visual signal after being habituated to the signal color.

Approximate Time: 30 minutes

Procedure

1. Instruct the subjects to prepare themselves as in Exercise 1. In this exercise, the subjects will be responding to twenty red colored light signals in each of three sets of signals.
2. Select RedLED from the macros menu.
3. Type **Red1** in the Mark box.
4. Click on the Record button and click the mark button to mark the recording.

5. The software will deliver twenty colored visual signals to the subject. The signals will be between two and five seconds apart.
6. After the last signal, click Stop to halt recording.
7. Let the subject rest for 1 minute.
8. Repeat steps 2-7. Type **Red2** or **Red3** for these sets.
9. Select Save in the File menu.

Data Analysis

1. Use the same techniques explained in Exercise 1 to measure and record the reaction times of the subject presented with red colored visual signals in Set 1.
2. Repeat the analysis on the data recorded in Sets 2 and 3.
3. Enter the mean reaction times for each set of trials in this exercise on Table 1.

Questions

1. How does the subject's mean reaction time for the green visual signals in Exercise 1 compare to the mean reaction time for the red visual signals in Set 1 of Exercise 2?
2. How do the mean reaction times for the three sets of trials in Exercise 2 compare to each other?
3. What could cause differences in reaction times for different sets of trials?
4. How do your subject's mean reaction times to green and red light signals compare to those of other subjects?

Exercise 3: Reaction Time and Specific Color Visual Signals

Aim: To measure the reaction time of a subject to a specific colored visual signal.

Approximate Time: 20 minutes

Procedure

1. Instruct the subjects to prepare themselves as they did in Exercises 1 and 2. In this exercise, the subjects will be responding only to **red** colored light signals in three sets that are combinations of twenty red and green colored signals.
2. Select bicolorLED1 from the macros menu.
3. Type **RedOnly1** in the Mark box that is to the right of the Mark button.
4. Click on the Record button and click the mark button to mark the recording. The subject should respond as quickly as possible **ONLY** to the **red** colored signals.
5. After the last signal, click Stop to halt recording.

6. Let the subject rest for 1 minute.
7. Repeat steps 2-7. Type **RedOnly2** or **RedOnly3** for these sets of trials.
8. Select Save in the File menu.

Data Analysis

1. Use the same technique explained in Exercise 1 to measure and record the reaction times of the subject presented with red colored visual signals. Measure only the reaction times for the trials where the subject responded correctly to the red colored visual signal. Do not measure the reaction times of trials where the subject responded incorrectly.
 - For example, a set of trials contains ten red signals to which the subject is supposed to respond. If the subject only responds correctly to eight of the ten red signals, only the reaction times for the eight correct responses are measured.
2. Calculate the mean reaction time for correct responses to the red signals in each set of trials. Enter the mean reaction times for the correct responses in each set of trials in Table 2.
3. For each set of trials, calculate the percentage of correct responses. Enter these values in the table.
4. For your subject, compare the mean reaction time from each set of trials in Exercise 2 to the mean reaction time from each set of trials in Exercise 3.

Questions

1. How does the subject's mean reaction time in Trial 1 of Exercise 3 (responding only to red signals) compare to his or her mean reaction time in Set 1 of Exercise 2 (responding to all signals)?
2. Compare Sets 2 in Exercises 2 and 3, as well as Sets 3 in Exercises 2 and 3. Do you see any temporal relationship?
3. What would cause a longer reaction time when asked to react to only one specific color signal in sets that contain signals of different colors?
4. Did you detect any differences in reaction times between the trials using red signals and the trials using green signals?
5. Do the mean reaction times of the sets in Exercise 3 differ?
6. How do your subject's percent correct scores compare to those of other subjects?
7. How do your subject's mean reaction times compare to the class average?

Exercise 4: Reaction Time and Specific Color Visual signals

Aim: To measure the reaction time of a subject to a specific colored visual signal.

Approximate Time: 20 minutes

Procedure

1. Instruct the subjects to prepare themselves as they did in Exercise 1, 2, and 3.
2. In this exercise, the subjects will be responding only to **green** colored light signals in three sets that are combinations of twenty red or green colored signals.
3. Select bicolorLED2 from the macros menu.
4. Type **GreenOnly** in the Mark box that is to the right of the Mark button.
5. Click on the Record button and click the mark button to mark the recording. The subject should respond as quickly as possible **ONLY** to the **green** colored signals.
6. After the last signal, click Stop to halt recording.
7. Select Save in the File menu.

Data Analysis

1. Use the same technique explained in Exercise 1 to measure and record the reaction times of the subject presented with green colored visual signals. Measure only the reaction times for the trials where the subject responded correctly to the green visual signal. Do not measure the reaction times of trials where the subject responded incorrectly.
2. Calculate the mean reaction time for correct responses to the green signals in the set of trials. Enter the mean reaction times for the correct responses for the set in Table 2.
3. Calculate the percentage of correct responses. Enter this value in Table 2.
4. For your subject, compare the mean reaction time from each set of trials in Exercise 3 to the mean reaction time from Exercise 4.

Questions

1. To which colored visual signal did your subject respond most quickly, the red signals from Set 1 in Exercise 3 or green signals in Exercise 4?
2. Is there any difference in mean reaction times between the red signals in Set 3 of Exercise 3 and green signals of Exercise 4?
3. What could explain a subject responding more quickly to one color as compared to another?
4. Did your subject respond more quickly or more slowly to same colored signal as the other members of the class?

Table HN-5-L1: Mean Reaction Times for Different signals.

signal	Mean Reaction Time Your Subject (ms)	Mean Reaction Time All Subjects (ms)	Shortest Mean Reaction Time in Class (ms)	Longest Mean Reaction Time in Class (ms)
Green Color signal				
Red Color signal Set 1				
Red Color signal Set 2				
Red Color signal Set 3				
Averages of the 3 Sets of Red Color signals				

Table HN-5-L2: Mean Reaction Time and Latency

signal	Number of Correct Responses	Percent Correct Response (%)	Mean Reaction Time Correct Responses Your Subject (ms)	Mean Reaction Time Correct Responses All Subjects (ms)
Response to Red signal Only Set 1				
Response to Red signal Only Set 2				
Response to Red signal Only Set 3				
Averages of the 3 Red signal Only Sets				
Response to Green Color signal Only				