

## HN-5: Visual Reflexes and Color Stimulation

### Exercise 1: Reaction Time and Single Color Visual Cues

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

#### Procedure

1. Instruct the subject to:
  - Sit in a chair and hold the BCL-100 bicolor light source in one hand.
  - Hold the EM-100 event marker in the other hand in a manner that enables the subject to press the button on the event marker as quickly as possible.
  - Watch the bicolor light source and quickly press and release the button on the event marker when the green colored signal generated by the BCL-100 first appears.
2. Open the Sequence menu ([Figure HN-5-L1](#)). Select GreenLED, which is the proper pre-programmed sequence of light cues that should be used in this exercise. When GreenLED is selected, the name on the Sequence menu is replaced with the words, GreenLED. This sequence will run automatically when the Record button is clicked.

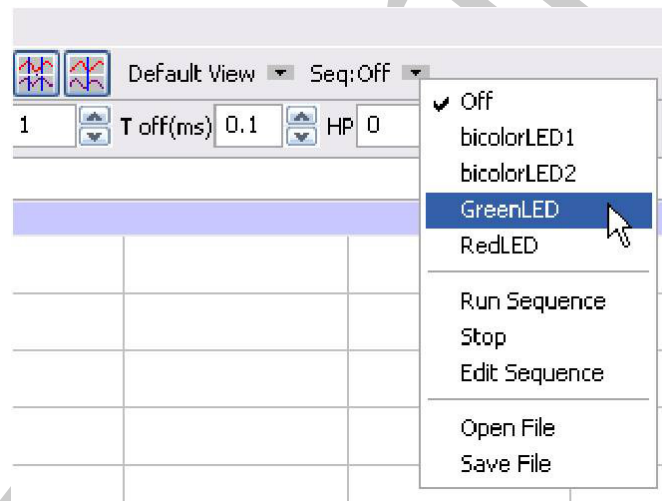


Figure HN-5-L1: The Sequence menu containing the preprogramming light sequences used in this experiment.

3. Type <Subject's Name> Green Cues in the Mark box that is to the right of the Mark button.
4. Click on the Record button and press the Enter key on the keyboard to mark the recording. Instruct the subject that the exercise has begun, that a visual cue from the bicolor light source could appear at any time, and that he or she should respond to the visual cue as quickly as possible.
5. Deliver twenty green colored visual cues to the subject. The cues will be between two and five seconds apart.

6. After the twentieth cue, click Stop to halt recording.
7. Select Save As in the File menu, type a name for the file. Choose a destination on the computer in which to save the file, like your lab group folder). Designate the file type as \*.iwxdata. 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 ([Figure HN-5-L3](#))
2. Use the Display Time icons to adjust the Display Time of the Main window to show both the visual cue and the response signal of the first trial on the Main window. This trial can also be selected by: ([Figure HN-5-L2](#))
  - Placing one cursor before the beginning of the visual cue and the second cursor after the response signal made by the subject; and
  - Clicking the Zoom between Cursors button on the LabScribe toolbar to expand the complete reaction trial to the width of the Main window.

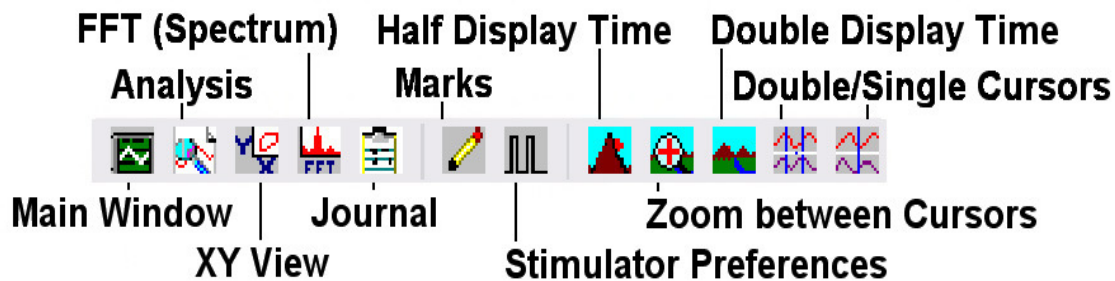


Figure HN-5-L2: The LabScribe toolbar.

3. Click on the Analysis window icon in the toolbar ([Figure HN-5-L2](#)) or select Analysis from the Windows menu to transfer the data displayed in the Main window to the Analysis window ([Figure HN-5-L4](#)).
4. Look at the Function Table that is above the display of the Response channel displayed in the Analysis window. The mathematical function,  $T_2 - T_1$ , should appear in this table. The value for  $T_2 - T_1$  is seen in the table across the top margin of the Response channel.
5. Use the mouse to click on and drag a cursor to the onset of the signal used as the visual cue. 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.

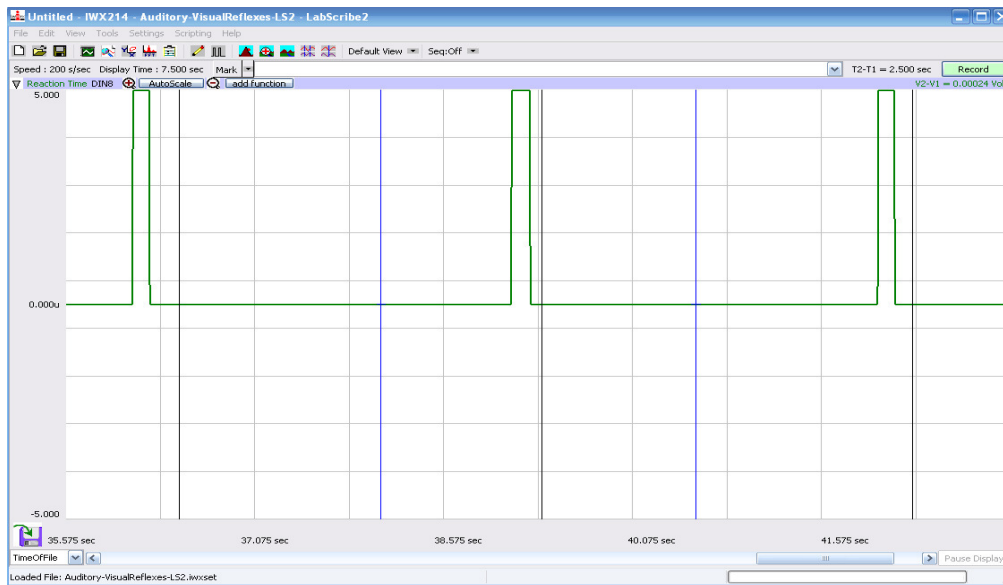


Figure HN-5-L3: The signals for the visual cue and the subject's response to the cue shown on the Main window.

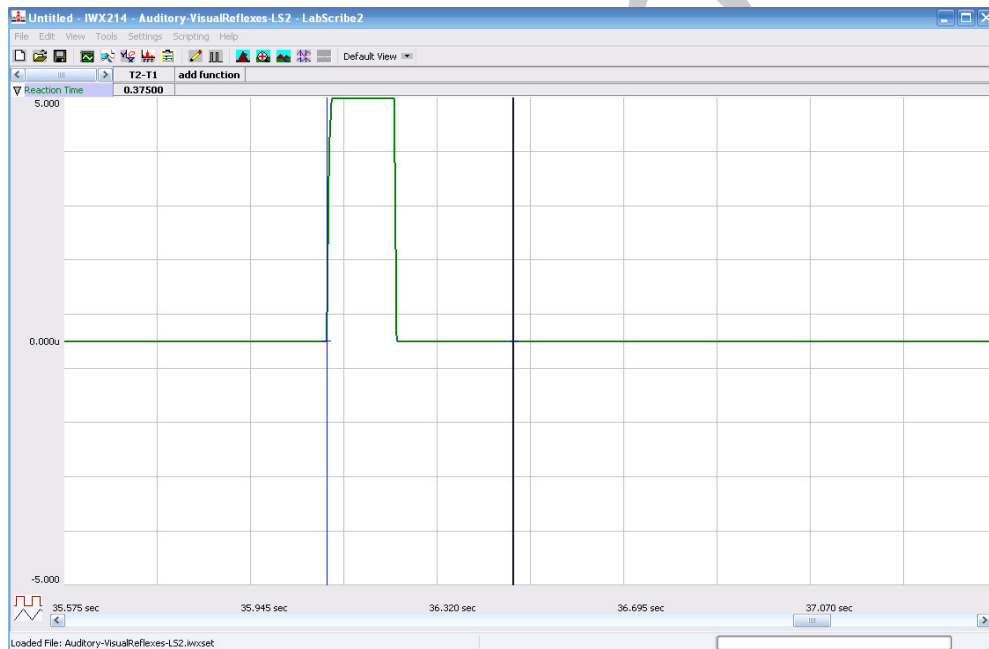


Figure HN-5-L4: The signals of the visual cue and the subject's response to cue shown on the Analysis window, The cursors are placed to measure the subject's reaction time. The subject's reaction time is 215 msec.

7. The functions in the channel pull-down menus of the Analysis window can also be used to enter the name and value for T2-T1 into the Journal. To use these functions:
  - Place the cursors at the locations used to measure the reaction time.

- Transfer the name of the T2-T1 function to the Journal using the Add Title to Journal function in the Response Channel pull-down menu.
  - Transfer the value for T2-T1 to the Journal using the Add Ch. Data to Journal function in the Response Channel pull-down menu.
8. Once the reaction time in the first trial is measured and recorded, use the scroll bar at the bottom of the Analysis window to move the data from the second trial onto the window. If needed, use the Display Time icons to adjust the width of the Analysis window to show both the visual cue and the subject's response on the same window.
  9. Repeat Steps 5 through 7 on the data from the second trial.
  10. Use the same techniques used in Steps 5 through 8 to measure the reaction times from the remaining trials.
  11. 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 HN-5-L1](#).

## **Exercise 2: Reaction Time and Repetition of Red Visual Cues**

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

### ***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 cues in each of three sets of cues.
2. Open the Sequence menu ([Figure HN-5-L1](#)). Select RedLED, which is the proper pre-programmed sequence of light cues that should be used in this exercise. When RedLED is selected, the name on the Sequence menu is replaced with the words, RedLED. This sequence will run automatically when the Record button is clicked.
3. Type <Subject's Name> Red Cues-Set 1 in the Mark box that is to the right of the Mark button.
4. Click on the Record button and press the Enter key on the keyboard to mark the recording. Instruct the subject that the exercise has begun, that a visual cue from the bicolor light source could appear at any time, and that he or she should respond to the visual cue as quickly as possible.
5. Deliver twenty red colored visual cues to the subject. The cues will be between two and five seconds apart.
6. After the twentieth cue, click Stop to halt recording.
7. Let the subject rest for 1 minute.
8. Repeat steps 2-7. Type <Subject's Name> Red Cues-Set 2 or Red Cues-Set 3 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 cues 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 HN-5-L1](#).

### **Questions**

1. How does the subject's mean reaction time for the green visual cues in Exercise 1 compare to the mean reaction time for the red visual cues 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 cues compare to those of other subjects?

### **Exercise 3: Reaction Time and Specific Color Visual Cues**

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

#### **Procedure**

1. Instruct the subjects to prepare themselves as they did in Exercise 1 and 2. In this exercise, the subjects will be responding only to red colored light cues in three sets that are combinations of twenty red or green colored cues.
2. Open the Sequence menu ([Figure HN-5-L1](#)). Select bicolorLED1, which is the proper pre-programmed sequence of light cues that should be used in this exercise. When bicolorLED1 is selected, the name on the Sequence menu is replaced with the words, bicolorLED1. This sequence will run automatically when the Record button is clicked.
3. Type <Subject's Name> Red Cues Only-Set 1 in the Mark box that is to the right of the Mark button.
4. Click on the Record button and press the Enter key on the keyboard to mark the recording. Instruct the subject that the exercise has begun, that a visual cue from the bicolor light source could appear at any time, and that he or she should respond as quickly as possible to only the red colored cues.
5. Deliver twenty visual cues to the subject. The cues will be between two and five seconds apart.
6. After the twentieth cue, click Stop to halt recording.
7. Let the subject rest for 1 minute.
8. Repeat steps 2-7. Type <Subject's Name> Red Cues Only-Set 2 or Red Cues Only-Set 3 for these sets of trials.
9. 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 cues. Measure only the reaction times for the trials where the subject responded correctly to the red colored visual cue. Do not measure the reaction times of trials where the subject responded incorrectly.
  - For example, a set of trials contains ten red cues to which the subject is supposed to respond. If the subject only responds correctly to eight of the ten red cues, only the reaction times for the eight correct responses are measured.
2. Calculate the mean reaction time for correct responses to the red cues in each set of trials. Enter the mean reaction times for the correct responses in each set of trials in [Table HN-5-L2](#).
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 cues) compare to his or her mean reaction time in Set 1 of Exercise 2 (responding to all cues)?
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 cue in sets that contain cues of different colors?
4. Did you detect any differences in reaction times between the trials using red cues and the trials using green cues?
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 Cues

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

### Procedure

1. Instruct the subjects to prepare themselves as they did in Exercise 1, 2, and 3. In this exercise, the subjects will be responding only to green colored light cues in three sets that are combinations of twenty red or green colored cues.
2. Open the Sequence menu ([Figure HN-5-L1](#)). Select bicolorLED2, which is the proper pre-programmed sequence of light cues that should be used in this exercise. When bicolorLED2 is selected, the name on the Sequence menu is replaced with the words, bicolorLED2. This sequence will run automatically when the Record button is clicked

3. Type <Subject's Name> Green Cues Only in the Mark box that is to the right of the Mark button.
4. Click on the Record button and press the Enter key on the keyboard to mark the recording. Instruct the subject that the exercise has begun, that a visual cue from the bicolor light source could appear at any time, and that he or she should respond as quickly as possible to only the green colored cues.
5. Deliver twenty visual cues to the subject. The cues will be between two and five seconds apart.
6. After the twentieth cue, 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 cues. Measure only the reaction times for the trials where the subject responded correctly to the green visual cue. 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 cues in the set of trials. Enter the mean reaction times for the correct responses for the set in [Table HN-5-L2](#).
3. Calculate the percentage of correct responses. Enter this value in [Figure HN-5-L2](#).
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 cue did your subject respond most quickly, the red cues from Set 1 in Exercise 3 or green cues in Exercise 4?
2. Is there any difference in mean reaction times between the red cues in Set 3 of Exercise 3 and green cues 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 cue as the other members of the class?

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

Cue	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 Cue				
Red Color Cue Set 1				
Red Color Cue Set 2				
Red Color Cue Set 3				
Averages of the 3 Sets of Red Color Cues				

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

Cue	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 Cue Only Set 1				
Response to Red Cue Only Set 2				
Response to Red Cue Only Set 3				
Averages of the 3 Red Cue Only Sets				
Response to Green Color Cue Only				