

Experiment HP-11: Multisensory Reaction Times

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Equipment Required

PC or Mac Computer

IWX/214, USB cable, IWX/214 power supply

SI-200 Stimulator, cables and power supply

Start the Software

1. Click on LabScribe
2. Click Settings → Human Psychophysiology → MultisensoryReactionTimes
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)

Experimental Considerations

Before you start collecting data, it is important to decide what type of information will be collected. Some factors to consider:

1. What information about your subject are you recording? These should be factors that will be pertinent to reaction time (age, height, weight, gender, etc...).
2. Once you decide what information to collect, use the Journal or Excel to design an a spreadsheet to enter your data. At a minimum, include a subject identifier, treatment condition (visual/auditory/somatosensory), and the reaction time.

Subject ID	Treatment Condition	Reaction Time	Other subject info....

3. The settings file is set up to run 10 presentations of stimuli per reaction time experiment. When designing your own experiments you may decide to run more or fewer stimulus presentations per experiment.

4. As a group, discuss and decide:

- Should the subject be allowed to have one or more practice trials?
- How do you ensure the best possible stimulus for the subject (i.e. minimizing extraneous cues)
- Should the stimulus cues be presented in a predictable fashion or with randomly spaced intervals? The settings file you are working with today will present stimuli at randomly spaced intervals, but you may decide to test predictable cues with the subjects for your experiments.

SI-200 Isolated Stimulator

The SI-200 is a high voltage stimulus isolator designed to deliver constant current to the nerve or muscle being studied. To maintain the current at the level set by the amplitude knob on the front of the unit, the SI-200 automatically generates the voltage required to deliver that current. In situations where the resistance (R) along the path of the current increases, the voltage (V) increases to maintain the current (I in $V = IR$, Ohm's Law). The ability of the SI-200 to adjust the voltage to deliver the required current is known as voltage compliance. The upper limit of this compliance by the SI-200 is set at 100 Volts.

Constant current devices differ from constant voltage devices when presented with an increase in resistance, like the dehydration of the conductive gel under the electrodes. As pointed out earlier, a constant current stimulator is voltage compliant. In constant voltage stimulators, the current delivered to the tissue decreases as the resistance increases because the power supply of the constant voltage device is not designed to deliver additional current.

Although the SI-200 can generate up to 100 Volts, the current delivered by the unit is limited to a maximum of 20 milliamperes, for a maximum duration of 10 milliseconds per pulse, and a maximum frequency of 50 pulses per second (Hz). At these levels, the maximum amount of power delivered by the SI-200 will not cause injury or tissue damage.

The only parameter of the stimulus that is controlled directly by the SI-200 is the current output. The current is selected by rotating the amplitude knob on the front of the SI-200. Starting from zero, each 360° turn of the knob adds two milliamperes of current to the output. The knob can be turned a total of ten complete rotations to deliver a maximum output of twenty milliamperes.

The duration, frequency, and number of stimulus pulses generated by the SI-200 are controlled by signals coming from the output of the IWX/214 that is connected to the SI-200. Through a cable connecting the outputs of the IWX/214 to the trigger input of the SI-200, pulses from the IWX/214 control the pattern of the stimuli released by the SI-200. The initial values of the pulses generated by the IWX/214 are programmed by the same settings file that configured the recording software. For example, if a pulse from the IWX/214 is programmed for a duration of 1 millisecond and a frequency of 1 Hz, the SI-200 will generate a stimulus pulse with the same duration and frequency.

If you examine the stimulator settings of the IWX/214, you will notice that the amplitude of the pulses generated by the IWX/214 is set to 5 Volts. This is the voltage of signal required to control the SI-200. Remember that the current output of the SI-200 is controlled by the knob on the front of the SI-200, and the voltage of the pulses are dependent upon the resistance of the stimulation circuit.

SI-200 Setup

1. Place the SI-200 ([Figure HP-11-S1](#)) on the bench near the subject and the IWX/214.

Warning: Before connecting the SI-200 output to the subject, rotate the amplitude control knob on the front of the SI-200, in a counterclockwise direction, until the values on the dial and in the counter window read zero.



Figure HP-11-S1: The front panel of the SI-200 with the two high voltage (H.V.) output sockets, the amplitude control knob with its indicator dial, and the power and high voltage status lights.

2. Obtain the power supply for the SI-200 ([Figure HP-11-S2](#)).
3. Insert the connector on the cable of the SI-200 power supply into the power socket on the rear of the SI-200 ([Figure HP-11-S3](#)).
4. Attach one end of a BNC-BNC cable to the Trigger input on the back of the SI-200.



Figure HP-11-S2: The SI-200 and IWX/214 power supply.

Warning: Make sure the power switch of the SI-200 is flipped to the Off (O) position.



Figure HP-11-S3: The rear panel of the SI-200 showing the BNC Trigger input on the right, and the power switch and socket on the left.

5. Connect the other end of the BNC-BNC cable to a BNC-double banana adapter ([Figure HP-11-S4](#)).



Figure HP-11-S4: BNC-BNC cable attached to a female BNC to Dual Banana adapter. The tab on the side of the adapter identifies the prong that is connected to the ground jack.

6. Insert the prongs of the Female BNC to Dual Banana Adapter into the positive (red) and ground (green) jacks of the IWX/214 stimulator. The prong that is inserted into the ground (green) jack can be identified by the tab molded onto the side of the adapter. The tab is embossed with the letters GND indicating ground.



Figure HP-11-S5: The Female BNC to Dual Banana Adapter and BNC-BNC cable connected to the stimulator output of an IWX/214.

7. Instruct the subject to remove all jewelry before beginning the experiment.
8. Make sure the SI-200 is turned off (O). All the indicator lights on the front of the SI-200 should be off.

Warning: Make sure the Amplitude knob on the front of the SI-200 is set to zero.

9. Connect the color-coded stimulator lead wires to the High Voltage Current Outputs of the SI-200. Make sure you push the safety connector of each lead wire into the appropriate socket on the SI-200 as far as possible ([Figure HP-11-S1](#)).

Positioning of the Stimulating Electrodes – Used in Exercise 4

1. Make sure the SI-200 is turned off and the amplitude on the SI-200 is set to zero. Instruct the subject to remove all jewelry from the hand and wrist being used in the experiment.
2. Use an alcohol swab to clean and scrub two areas on the back of the subject's hand. One area is in the center of the hand, and the second area is along the lateral edge of the hand between the base of the little finger and the wrist.
3. Obtain two disposable electrodes. Remove the plastic shield from one of the disposable electrodes. Attach the electrode to the center of the back of the hand. The electrode should be half way between the first knuckle of the middle finger and the wrist ([Figure HP-11-S6](#)). This electrode is the positive stimulating electrode.
4. Remove the plastic shield from the second disposable electrode. Attach this electrode about one centimeter above the lateral edge of the hand, half way between the first knuckle of the little finger and the wrist. This electrode is the negative stimulating electrode.

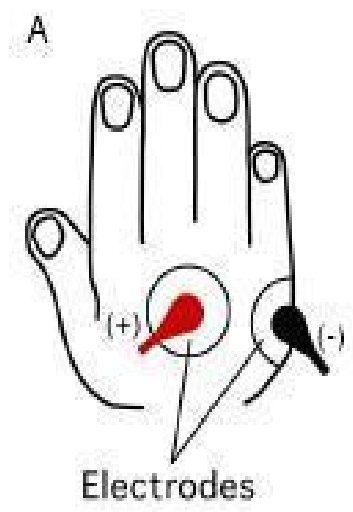


Figure HP-11-S6: A. Placement of the stimulating electrodes on the back of the right hand.

5. Connect the color-coded stimulator lead wires to the high voltage (H.V.) outputs of the SI-200. Make sure you push the safety connector of each lead wire into the appropriate socket on the SI-200 as far as possible.
6. Snap the ends of the H.V. Output lead wires onto the stimulating electrodes, so that:
 - the red (+) lead is snapped on the electrode in the center of the back of the hand,
 - the black (-) lead is snapped on the electrode at the lateral edge of the hand.
7. Click on the Stimulator button in the LabScribe toolbar to open the Stimulator control panel on the LabScribe Main window. Compare the values set for the IWX/214 stimulator to the values programmed on the Preferences Dialog window, which can be viewed by selecting Preferences from the Edit menu on the LabScribe Main window. Make any changes to the parameters that are necessary and click on the Apply button to complete the changes,

Warning: *Make sure the Amplitude knob on the front of the SI-200 is set to zero.*

8. Flip the power switch on the back of the SI-200 to turn on the unit. If the SI-200 is working properly, the red lights on the front of the device will glow to indicate the SI-200 is properly powered and the high voltage source is ready to deliver a stimulus.
9. Click on the Record button on the LabScribe Main window to activate the IWX/214 and SI-200 stimulator. There should be no response from the subject since the current output is zero. Continue to record.

Note: *As the current output of the SI-200 is increased in the next couple of steps, ask the subject to indicate when he or she first feels any tingling under the negative stimulating electrode. Minor movement of the subject's finger can usually be seen when the stimulus current is raised another milliamp or two.*

10. Slowly rotate the Amplitude knob clockwise 1 turn, which is equal to a current output of 2 milliamperes (mA). Remind the subject to indicate the first occurrence of tingling. You want the subject to feel a tingling sensation without any finger movement. The feeling should be a tingling without it being uncomfortable.
11. If tingling does not occur at 2 mA, rotate the Amplitude knob an additional 1/4 turn to increase the stimulus current by 0.5mA. Check for tingling. If necessary, increase the current output in increments of 0.5mA until the subject feels a strong tingling sensation without too much finger movement.
12. Find the lowest stimulus current that creates the most comfortable tingling sensation from the subject's finger.
13. Click Stop to turn off the stimulator.
14. Set the current at this level.