Experiment HM-14: Menstrual Cramp Simulation

Lab written by iWorx interns 2024:

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This lab is meant to elicit Muscle cramps as such it is meant to be uncomfortable!!

Equipment Required

PC or Mac Computer

IXTA, USB cable, Power supply for TA

PPG-320 pulse plethysmograph

HV stimulator lead wires for IXTA

Disposable electrodes

Pulse Sensor Setup

1. Locate the PPG-320 pulse sensor and plug it into the PT port on the front of the TA.
2. Place the plethysmograph on the volar surface (where the fingerprints are located) of the distal segment of the subject's middle finger or thumb, and wrap the Velcro strap around the end of the finger of the non-dominant hand to attach the unit firmly in place.

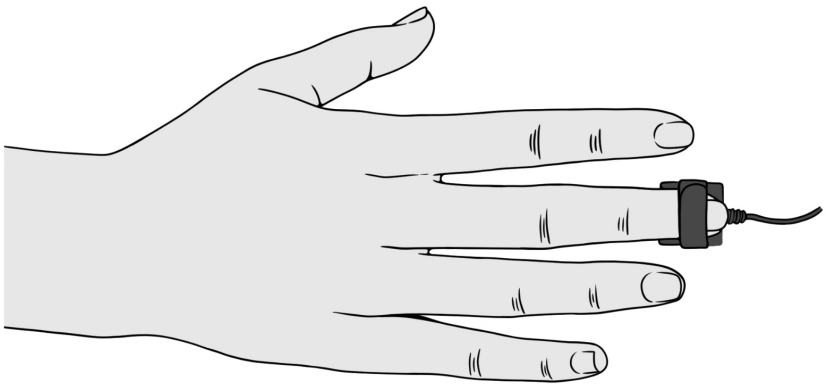

Figure HM-14-S1: Placement of the PPG pulse sensor on the finger.

Figure HM-14-S2: The PPG-320 pulse plethysmograph plugged into the PT port.

Simulator Electrode Placement

1. Snap the round stimulating electrodes onto the black and red stimulator cables.
2. Place the electrodes approximately 5 cm below the belly-button on either side on the midline.
3. Place the black electrode 2 cm to the right of the midline and the red electrode 2cm to the left of the midline.

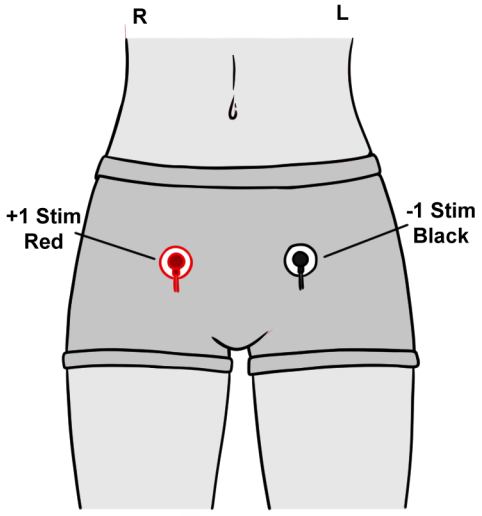

Figure HM-14-S3: Placement of the electrodes for eliciting muscle cramps.

IXTA Stimulator Setup

1. Place the IXTA on the bench near the subject.

Warning: Before connecting the IXTA stimulating electrodes to the subject, check the Stimulator Control Panel to make sure the amplitude value is set to zero (0).

Note: Disconnect the subject from the IXTA prior to powering off the device.

Figure HM-14-S4: The IXTA stimulating electrodes.

2. Instruct the subject to remove all jewelry before beginning the experiment.
3. Connect the color-coded stimulator lead wires to the High Voltage Current Stimulator. Make sure you push the safety connector of each lead wire into the appropriate socket as far as possible.

IXTA Isolated Stimulator

The IXTA has a high voltage stimulus isolator designed to deliver constant current to the nerve or muscle being studied. 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 IXTA to adjust the voltage to deliver the required current is known as voltage compliance. The upper limit of this compliance by the IXTA 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 IXTA 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 IXTA will not cause injury or tissue damage.

The current is selected using the Stimulator Control Panel. The HV Stimulator can deliver a maximum output of twenty milliamperes.

The duration, frequency, and number of stimulus pulses generated by the stimulator are also controlled by making changes to the values in the Stimulator Control Panel. The initial values of the pulses generated by the IXTA are programmed by the same settings file that configured the recording software. For example, if a pulse from the IXTA is programmed for a duration of 1 millisecond and a frequency of 1 Hz, the stimulator will generate a stimulus pulse with the same duration and frequency.