

## Equipment Information

This information sheet provides information about the equipment that will be used in the study *Seeing with the Skin* conducted by the OIST Embodied Cognitive Science Unit. The equipment mentioned here includes physiological recording instruments as well as human-computer interaction interfaces. The use of this equipment is required to obtain a more detailed understanding of the processing done by human minds, brains, and bodies.

Please read this information carefully so you know what type of measurements to expect.

### EMG

Contraction of muscles produces electrical activity that can be detected by an electromyogram (EMG). In psychological studies in general, surface EMG is used, in which recording electrodes are placed on the skin over the target muscle group and the signals are amplified through additional apparatus.

Before the electrodes are placed, your skin will be cleaned with alcohol. The researcher will measure your area of interest (e.g. forearm, forehead) to determine the best placement for the electrodes and then apply some conductive gel to the skin. The electrodes will then be attached to your skin with a double-sided adhesive tape. The researcher will make sure the electrical properties of the setup are both safe for you and sensitive enough to capture the muscle activity. All steps in the EMG recording are noninvasive and there is neither pain nor risk to your body.

### ECG

The heart is an organ that pumps blood through the body through contractions. These contractions can be felt, heard through a stethoscope, and recorded with an electrocardiograph (ECG), which measures electrical currents produced by the heart and detectable on the body surface.

Electrodes can be placed on different parts of the body depending on the experiment. Typically, wrists or ankles are used but when the experiment requires you to use your hands, a placement on the torso is preferable to minimize the noise from your body movement on the recorded activity.

### Enactive Torch

Enactive Torch is a simple sensory substitution device. Devices of this type translate information that is normally available to one sensory modality (for example vision) into another sensory modality (for example touch or hearing). You can think of a blind person's cane as an example of an analog sensory substitution device which allows a person to "see" through the sensations conveyed by the cane to their hand. Enactive Torch realizes a similar mapping. It is equipped with a distance sensor that detects the distance to the first-encountered surface and a motor that produces vibration that is inversely proportional to the distance. That is, detection of a smaller distance produces vibration of higher intensity while detection of a larger distance produces a less intense vibration. The sensor also has a limit such that pointing the Torch at a large empty room will not produce any noticeable vibration.

Previous studies show that using Enactive Torch is intuitive and people can learn to use to distinguish a variety of objects and perform many tasks. There is no risk associated with this device.

## Torobo Robot Arm

Torobo is a simple robot arm that consists of 7 segments connected with joints that can rotate in different directions. The arm is connected to a power supply, a device that processes commands issued to the arm, a PC which issues the commands and an emergency button.

The Arm has been developed for research purposes such as testing robot operation (e.g., in industrial settings), investigating different algorithms responsible for motion control and exploring collaboration between robots and humans. Being around the robot is generally safe but it is a powerful device that can generate significant forces. There is never a perfect guarantee that nothing will go wrong during its operation. However, we take the following measures to minimize any risks involved:

- before carrying out any study, robot operation is tested extensively
- during the experiment, the researcher remains in the same room and supervises robot operation
- emergency button can be pressed at any time, which will immediately cut off power supply from the robot and stop its operation

Before the experiment you will have the chance to examine the arm and confirm your willingness to interact with it. You can anyway always decide to stop the experiment without needing to provide any reason to do so.

