The Falling of Momo: Armband Setup and Calibration

Step 1. Wearing the Armband

Positioning the armband on your forearm is an important step in the calibration process, and ensures consistent control throughout gameplay. Slide the armband up your preferred forearm, almost to your elbow as shown below. The band should be snug enough to avoid inadvertent movement/slippage during gameplay, but not so tight as to cause discomfort; adjust the fit of the band using the 8 provided clips. For optimal performance, Thalmic Labs suggests wearing the armband with the **logo positioned along your inner forearm and micro-usb charging port pointing toward your hand, away from your body** (the orientation shown below).

Note the following when wearing the armband:

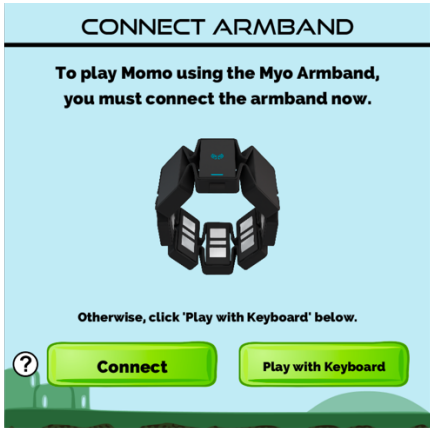
a) *Allow sufficient time (~5 mins) for the temperature of the armband's sensors to equalize with your skin temperature. The readings captured by the sensors are significantly affected by temperature.*

b) *Do not shift the armband (either up/down along the forearm, or rotating around the forearm) throughout the duration of gameplay as this will adversely affect your calibration. If the armband is shifted, a re-calibration should be performed.*

Step 2. Connecting the Armband

Before using the armband to play The Falling of Momo, the armband must be connected. Armband connection is established when the game is first launched by following these steps:

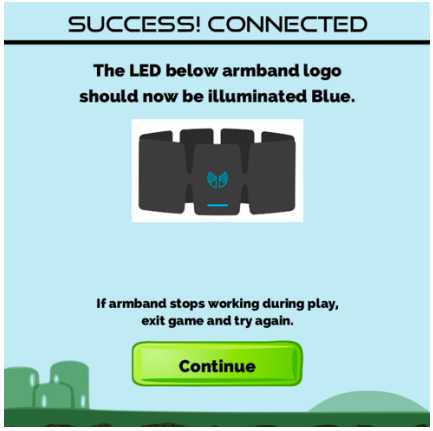
1. When the game is first launched, you will be presented with the armband connection screen.



2. Please ensure the following, then click the "Connect" button.
    a. The bluetooth USB stick (a small blue usb key, provided with the myo armband) is plugged into one of your computer's usb ports.
    b. The armband is charged and in *discovery mode* (i.e., the blue logo on the armband is slowly flashing on and off – if the logo is not illuminated, wake the armband by gently stretching the band or shaking your forearm).

3. Upon successful connection, both the logo and LED (rectangular light beneath the logo) should be illuminated in blue.

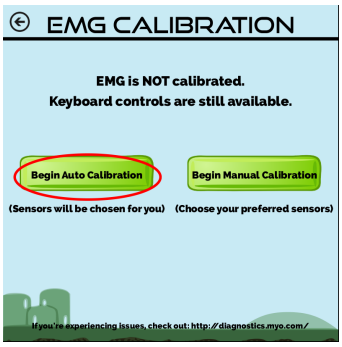
4. You should now be presented with the Success screen. Click "Continue" begin playing The Falling of Momo.



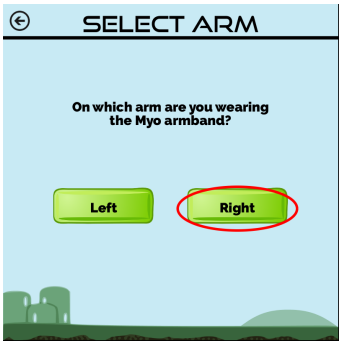
Step 3. Automatic Calibration

Automatic calibration is the quickest and easiest way to get started playing The Falling of Momo. Follow these steps unless you experience difficulties achieving a usable calibration:

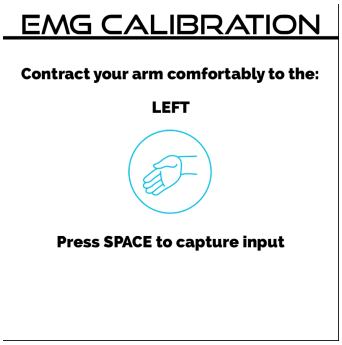
1. Click the "Calibrate" button from the Main Menu (can also be accessed from the Pause Menu).



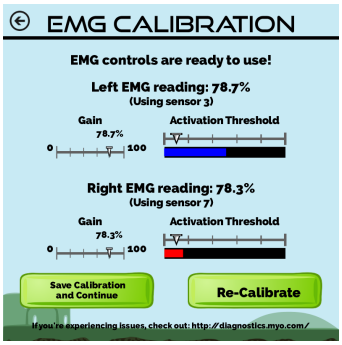
2. Click the "Begin Auto Calibration" button.



3. Select whether you are wearing the armband on the left or right forearm.



4. Match each of the following on-screen hand movements by steadily holding your hand/forearm in the appropriate position. *Contract naturally, with a normal level of exertion; do not over-exert your muscles during the calibration phase.* During movements, focus on contracting only the current forearm muscle, keeping the opposing forearm muscle quiet. Press the SPACEBAR to capture readings.

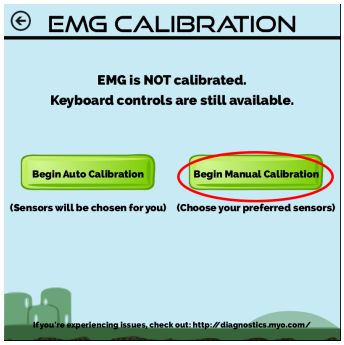


5. Upon success, you will be presented with the Calibration Settings Menu. Validate your calibration by closely watching the 2 bars independently rise as you slowly move your hand/forearm from full flexion, through relaxation, to full extension. If you experience difficulties achieving a successful calibration, try manually assigning sensors by following the **Manual Calibration** steps below.

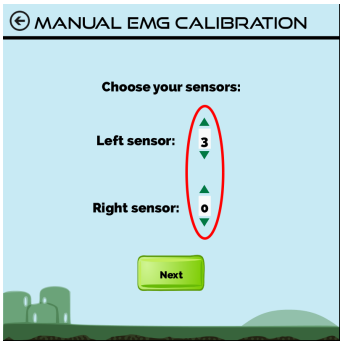
Step 4. Manual Calibration

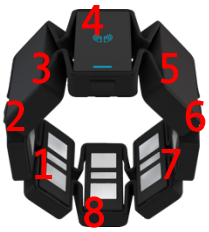
If you experience difficulty achieving a usable calibration with the **Automatic Calibration** steps, try manually assigning sensors to each of the flexion/extension muscle sites. Follow these steps to perform manual calibration:

1. Click the "Calibrate" button from the Main Menu (can also be accessed from the Pause Menu).

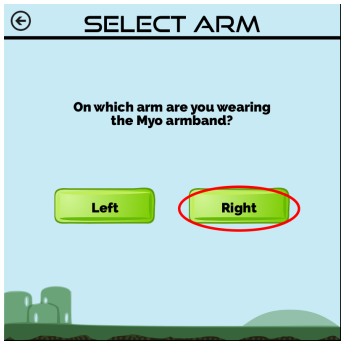


2. Click the "Begin Manual Calibration" button.

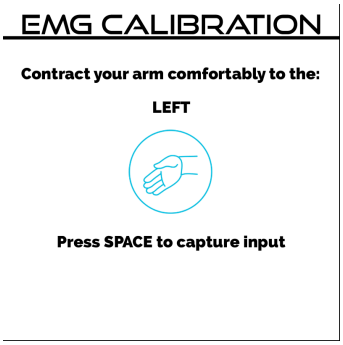




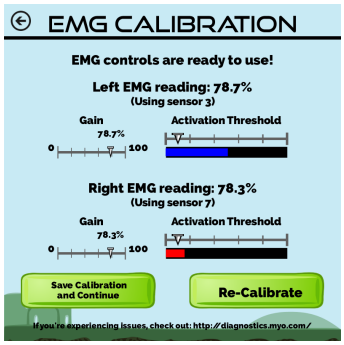
3. Select the appropriate sensor ID (numbered 1 through 8 above) for the left and right movements.



4. Select whether you are wearing the armband on the left or right forearm.



5. Match each of the following on-screen hand movements by steadily holding your hand/forearm in the appropriate position. *Contract naturally, with a normal level of exertion; do not over-exert your muscles during the calibration phase.* During movements, focus on contracting only the current forearm muscle, keeping the opposing forearm muscle quiet. Press SPACEBAR to capture readings.



6. Upon success, you will be presented with the Calibration Settings Menu. Validate your calibration by closely watching the 2 bars independently rise as you slowly move your hand/forearm from full flexion, through relaxation, to full extension. If you still experience difficulties, try **Adjusting Calibration Settings** as outlined below.

Step 5. Adjusting Calibration Settings

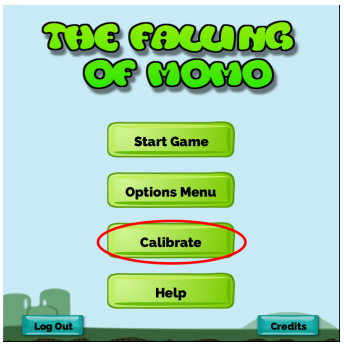
After completing initial calibration, several settings can be adjusted to improve in-game controls and compensate for common muscle control issues experienced by new prosthesis users. *If adjusting these settings does not fully fix control issues (e.g., the left (blue) and right (red) EMG bars both go up simultaneously whenever the patient flexes their muscles), recalibrate the armband by following "Steps 3: Automatic Calibration" or "Step 4: Manual Calibration", taking special care to ensure that the sensors selected align with the patient's muscle sites.*

Step 5-a. Sensor Gain

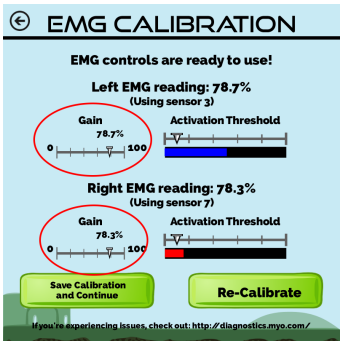
To compensate for players with varying levels of muscle strength, adjust sensor gain. Selecting a higher gain corresponds to a greater amplification of the raw muscle signal (i.e., higher "sensitivity"), which can be useful for players with weaker muscle strength. Adjust gain when:

a. you have trouble filling the EMG bar with a natural, normal muscle contraction (i.e., gain is *too low*)
b. the EMG bar fills very quickly, even from minimal muscle contraction (i.e., gain is *too high*)
c. the EMG bar remains significantly full, even when your muscles are at rest.

To adjust the sensor gains, following these steps:



1. Click the "Calibrate" button from the Main Menu (can also be accessed from the Pause Menu).



2. Using one muscle at a time, perform a natural, normal strength muscle contraction and adjust gain as follows:

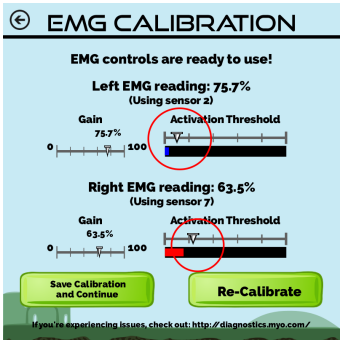
- if the EMG bar does not reach its maximum, adjust the slider up (i.e., toward 100%)
- if the EMG bar fills quickly, even with small contractions, adjust the slider down (i.e., toward 0%)

Step 5-b. Activation Threshold

Some players have trouble sustaining muscle quietness, which can result in jittery movement when the player attempts to keep Momo still. Adusting the *activation threshold* setting can be used to help players in this situation. Any muscle activity below the *activation threshold* will be ignored during game play and result in no movement.

To adjust the activation threshold, following these steps:

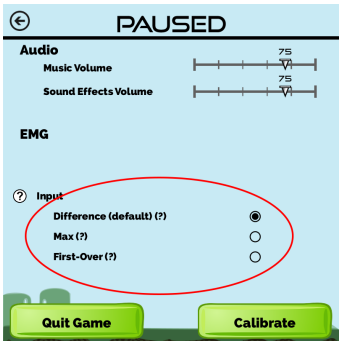
1. Click the "Calibrate" button from the Main Menu (can also be accessed from the Pause Menu).



2. Adjust each activation threshold sliders such that it is slightly higher than the corresponding EMG bar while the player is at rest. This ensures that any unintentional muscle activity will not result in “jitter” during game play.

Step 5-c. Control Policy

Several *control policies* have been implemented in The Falling of Momo. These *control policies* are used in real upper-limb prostheses to help individuals who experience difficulties achieving isolated or sustained contractions. The control policy can be selected from the in-game Pause Menu (by pressing either SPACEBAR or ESC during game play).



Select one of the 3 control policies listed under **Input**:

a) *Difference*: Only the difference between the left and right sensor readings contributes to in-game movement. To move quickly, the player must be able to reliably perform isolated contractions.

b) *Max*: Momo moves (proportionally) per strength of the larger of the left and right sensor readings; the smaller of the two readings is ignored. This policy is appropriate for individuals who have trouble performing isolated contractions.

c) *First-Over*: Momo moves (proportionally) in the direction of the first sensor reading to exceed the *minimum activation threshold* and continues to move in this direction until the sensor drops below the threshold. Throughout this duration of time, the opposing sensor reading is ignored. This policy is appropriate for individuals who have trouble sustaining strong, isolated contractions, but can control which muscle contracts first.

Troubleshooting

If you experience difficulties setting up or playing The Falling of Momo please don't hesitate to reach out to us, as we'll be happy to help:

Scott Bateman	1 (506) 447-3336	scottb@unb.ca
Aaron Tabor	1 (506) 262-0170	aaron.tabor@unb.ca

The following tips may help resolve several common issues that arise:

The blue lights on the armband will not turn, even when I stretch the band and shake my arm.

- The batteries in the armband may be dead. Even when not in use, the armband may stay awake and drain battery power. Charge the armband using the provided charging cable and wall-plug.

Before I start the game, the armband vibrates when I move my muscles.

- This is normal. The armband has built in software that recognizes different muscle patterns and vibrates when it recognizes them. Once the Momo game starts, armband vibration is disabled.

The indicator light is solid blue, even when I am not playing the game.

- This indicates that the armband is actively connected to another device (e.g., an old connection from previous game play, or accidentally connected to a nearby phone/tablet). Plug the armband into its charger for a few seconds to reset it.

The armband will not connect to the game, even when it is in discovery mode (i.e., blue flashing logo).

- Ensure that the blue usb-dongle is inserted fully into one of the laptop's usb ports.
- Reboot the computer.

The armband disconnect during game play, and no longer allows me to control Momo.

- This occasionally happens, especially when there are other active bluetooth devices (phones/tablets) nearby. Restart the game by exiting normally and following steps #1 and #2 of this guide.
- If the issue persists, try disabling bluetooth settings on other nearby devices or moving to another room.