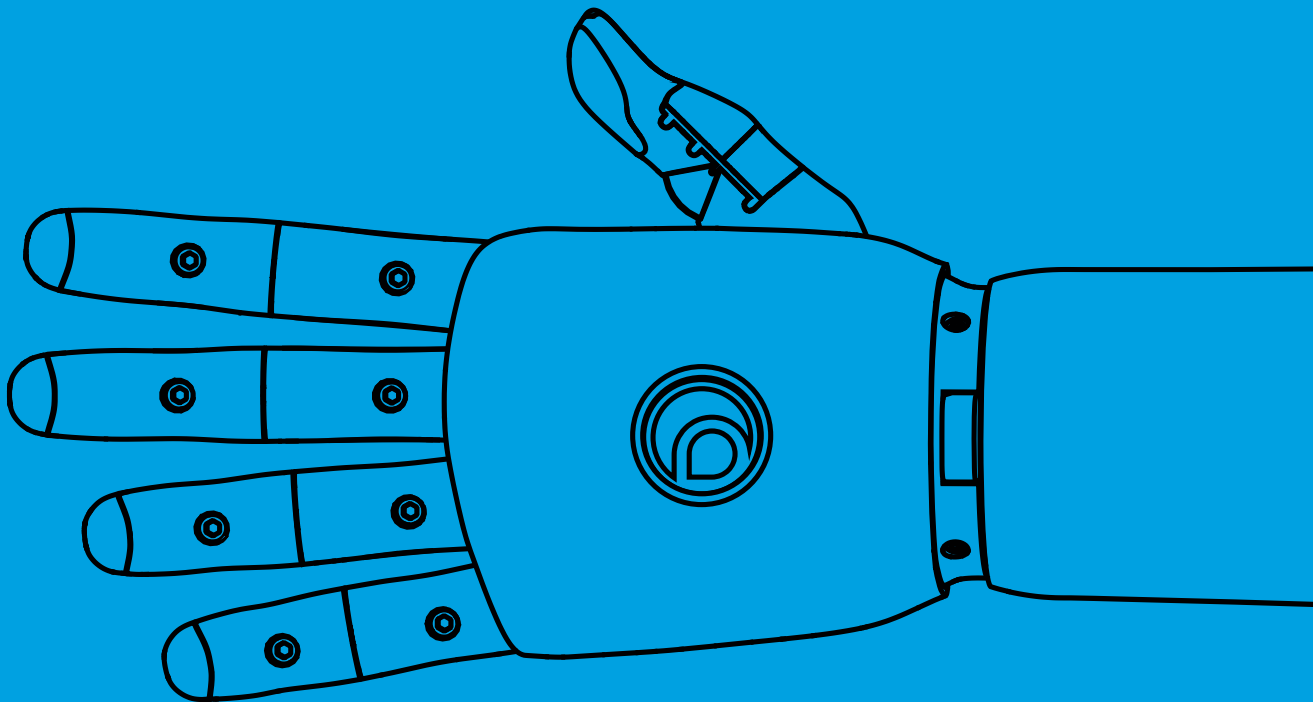




HERO ARM™

Occupational Therapy Training Guide



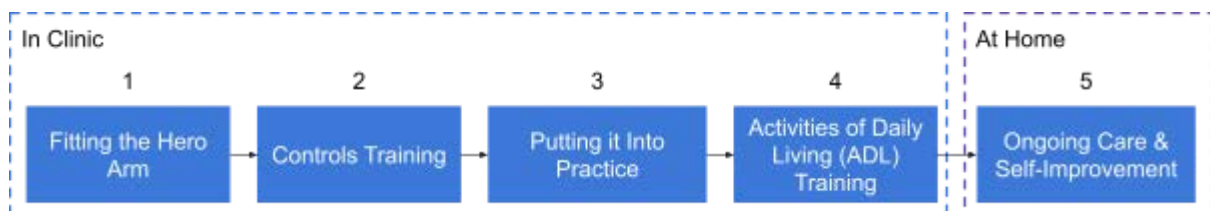
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1. Introduction

It is expected that by this point the clinician has followed the appropriate evaluation process for the patient including:

- ✓ Having a good understanding of the Hero Arm features and functions.
- ✓ Finding functional muscle sites for myo sensors.
- ✓ Discussing goals and outcomes with the patient.
- ✓ Setting the patient's expectations appropriately.
- ✓ Following the Open Bionics casting guidelines before ordering a Hero Arm.

1.1. Training Programme Overview



1.2. Tools/Equipment Needed

- Drumstick, pen or thin cylindrical object
- Tennis Ball
- Cones
- Shopping bag or "laptop bag"
- Whiteboard and marker
- Bottle of water
- Zip-up overcoat or jumper
- Fork
- Plastic Cup
- Games if training a child (see play section, p15)

2. Fitting the Hero Arm

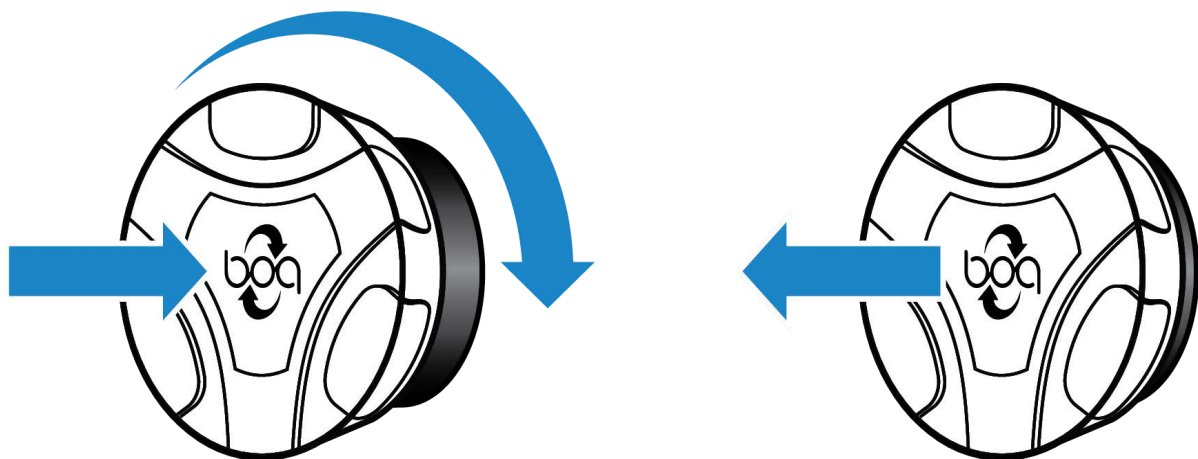
2.1. Donning/Doffing

([Video Link](#))

The Hero Arm comes equipped with a BOA™ system to help suspension of the arm around the user's limb. When the BOA™ is tightened, it will tighten the Hero Arm frames around the socket to ensure a tight fit. The BOA™ can then be released to doff the Hero Arm. For some Hero Arm users, they prefer to find a comfortable amount of tightness for the BOA™ and leave it in a fixed position. For others, they prefer to tighten and release the BOA™ each time they don and doff the arm.

It is important not to over tighten the BOA™ and it should not be used as the primary suspension method.

If the socket feels tight to get on, you may use mild lubricant such as a body lotion to improve donning. This can be done for the first week until the patient is used to this type of socket.



To tighten, push in then rotate clockwise

To loosen, pull outwards

Hero Arm users can adjust the tightness of the BOA™ throughout the day if they experience volume changes in their limb.

2.2. Wearing Schedule

Development of a wearing schedule is an extremely important aspect of the first visit. Initial wearing periods should be no longer than 15 to 30 minutes, with frequent examination of the skin for excess pressure or poor socket fit. This is particularly important for the patient with insensate areas and adherent scar tissue. If redness persists for more than 20 minutes after the prosthesis is removed, the patient should return to the prosthetist for review. If no skin problems are present, wearing periods

may be increased in 30-minute increments up to three times a day. By the end of a week, the patient should be wearing their prosthesis all day. [ref](#)

Example Wearing Schedule:

(Times when prosthesis should be worn highlighted in blue)

Day	Mon	Tue	Wed	Thu	Fri
08:00-09:00					
09:00-10:00					
10:00-11:00					
11:00-12:00					
12:00-13:00					
13:00-14:00					
14:00-15:00					
15:00-16:00					
16:00-17:00					
17:00-18:00					
18:00-19:00					
19:00-20:00					
20:00-21:00					

Patients that are new to myoelectric control systems may experience muscle fatigue, particularly during their first fitting, and frequent breaks may be necessary. For some Hero Arm users it may take weeks to overcome muscle fatigue and become comfortable using the Hero Arm for longer periods of time. This does not necessarily need to prevent them from wearing the Hero Arm and becoming accustomed to the size and weight of wearing the prosthesis.

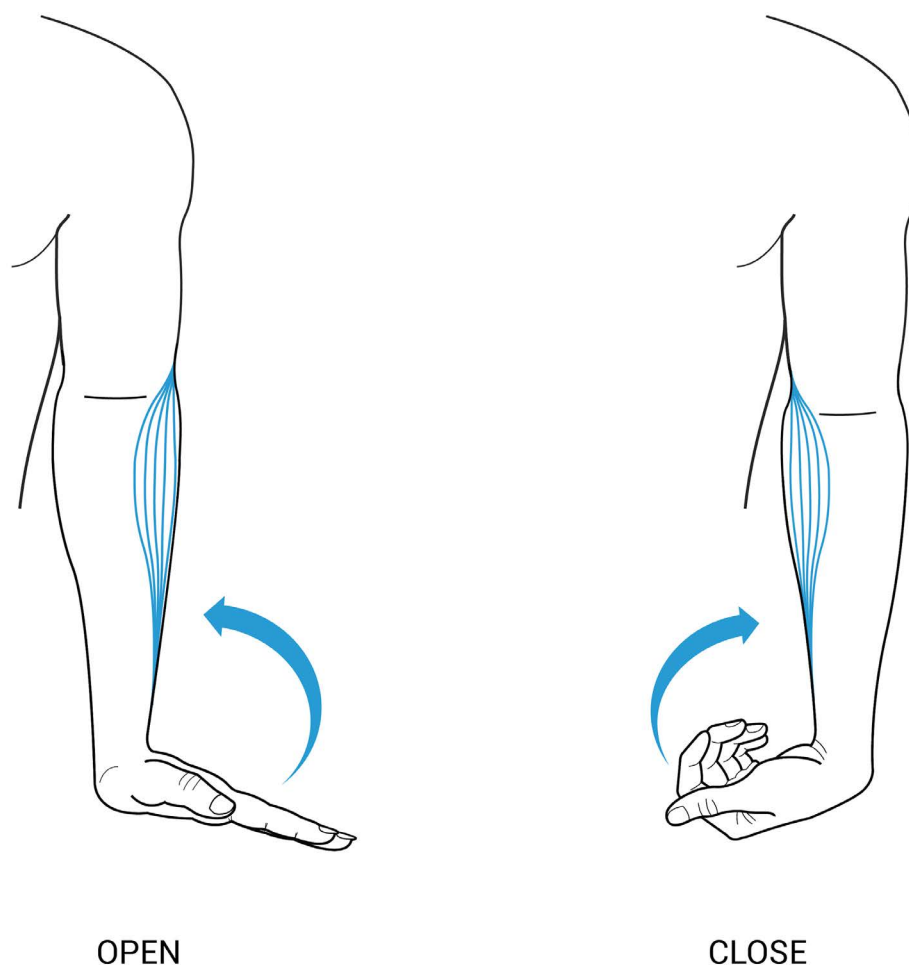
3. Controls Training

3.1. Open and Closing the Hero Hand

3.1.1. Basic Muscle Control

([Video Link](#))

The default configuration for a Hero Arm is a two-site myo control system, with one signal opening the fingers of the hand, and the other signal closing the fingers. During the initial patient evaluation, muscle sites will have been determined, and trainers should be careful to make sure patients are moving the muscles under the myoelectric sensors. The diagram below shows the typical movements that a patient should be thinking about doing to create strong muscle signals.



For the “open” motion, the wrist and fingers are both extended simultaneously to create a strong signal across the muscle groups on the outside of the forearm.

Notice the precise location of the fingers in the diagram for “close”. They are bent slightly, but not so much as to be clenching a fist. Clenching a fist may trigger both muscle sites simultaneously, which will prevent the hand from closing properly. The wrist is also moved, amplifying the signal from the muscle groups on the inside of the arm.

When practicing these movements, it's helpful for a patient to begin by holding both arms out in front of them and doing the motions together with both their unaffected and affected arms. For patients with a shorter forearm, the "translation" between the affected and unaffected arm may not be obvious and may take some time to get the hang of. Start by having the patient practice these motions without wearing their Hero Arm.

Once you're happy the patient is doing the correct movement to generate a signal over the myo sensors in their Hero Arm, have them put on the Hero Arm and try to move the fingers. At this stage, it is acceptable for the patient to support the weight of their Hero Arm with their unaffected arm or on a table surface, while they focus on generating the correct signals.

3.1.1.1 Single-site Operation

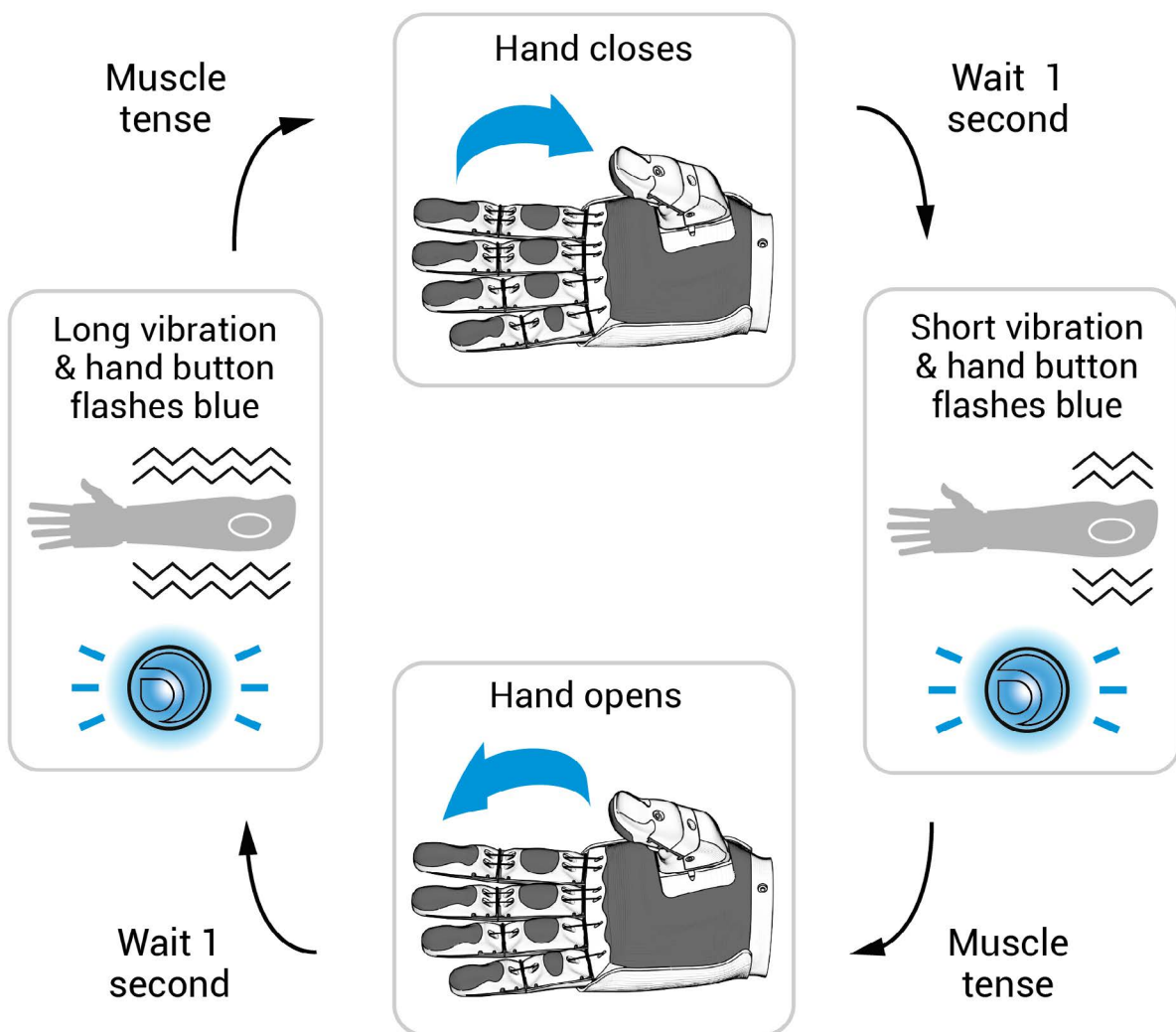
Occasionally some patients won't be able to separate their muscle signals or they can only reliably send either the "open" or "close" signal. These patients may have their Hero Arm set up to use Single-site Control.

In this case, when you tense the muscles under your single sensor, the Hero Arm swaps between opening, then closing the fingers. If you tense, the fingers will begin by closing. If you relax and wait for 1 second, the hand will swap to be ready to open on your next signal. It will indicate this by flashing blue and vibrating. Tensing now will cause the fingers to open. Relaxing again will cause the hand to swap back to be ready to close the fingers. By alternating backwards and forwards like this, you can pick up and put down objects. The length of the vibration you receive when the hand changes direction provides non-visual feedback about which direction it will go. Shorter pulses mean it has swapped to open next. Longer pulses mean it will close next.

(See diagram on next page for a visual guide.)

To alternate between grips within a group, tense your muscles to fully open the fingers, then continue to hold the tense for more than a second. To switch between the different groups, press and release the Hand Button.

Single-Site Control process:

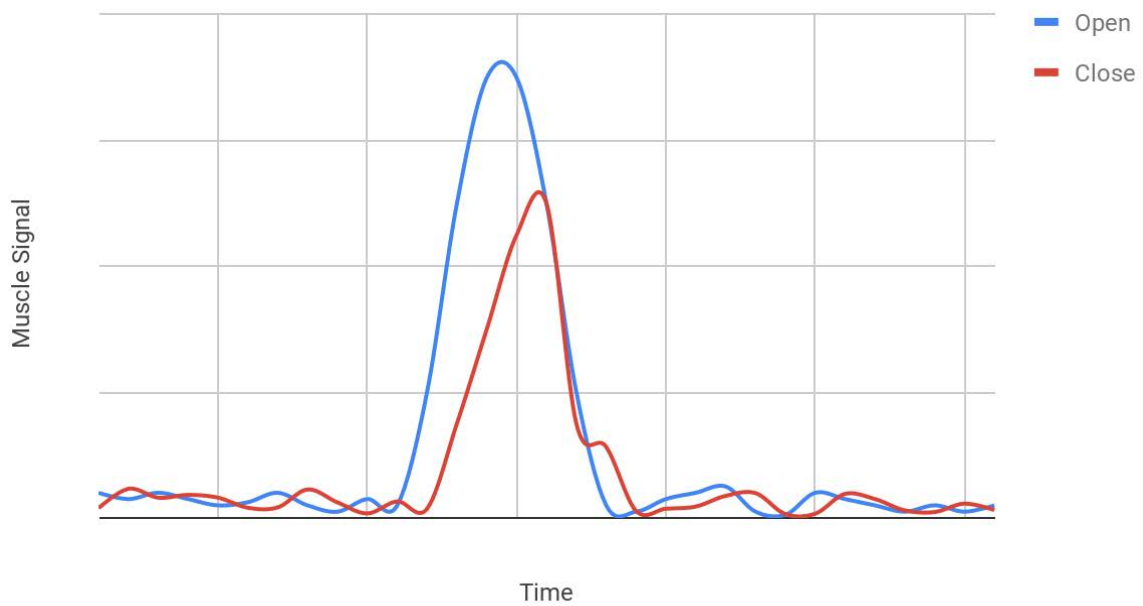


3.1.2. Separating Muscle Sites

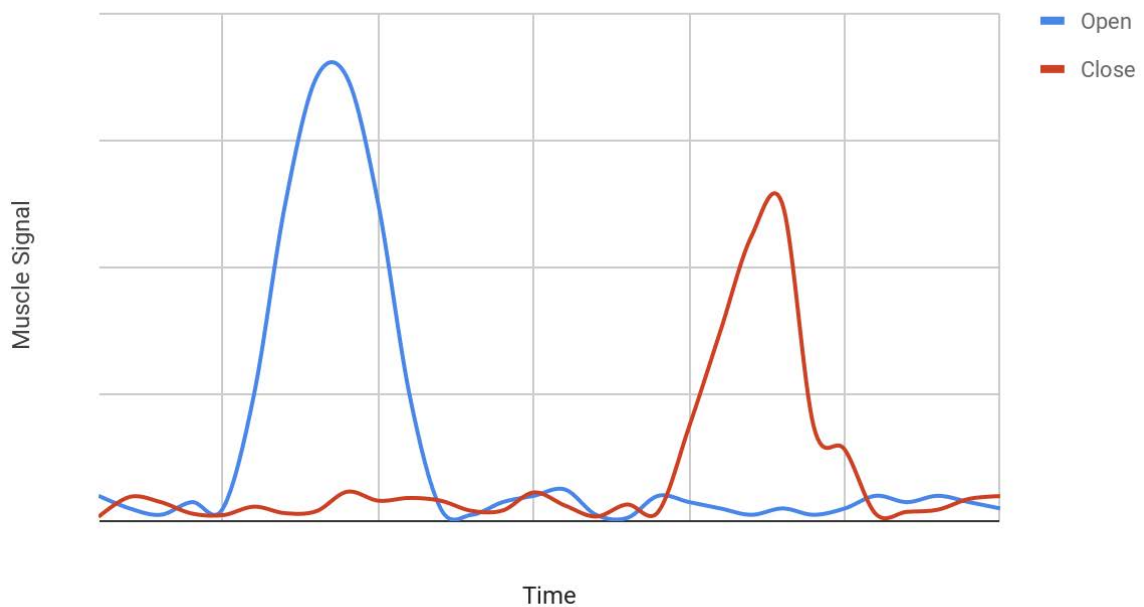
Some patients have trouble separating the two myo sites to provide two separate signals. These patients contract both the “open” and “close” muscles simultaneously, in an action called “co-contraction”. In order to have control over both the “open” and “close” signals independently to control the Hero Arm, the patient must learn to separate the two signals. This may take some practice.



Co-Contraction:



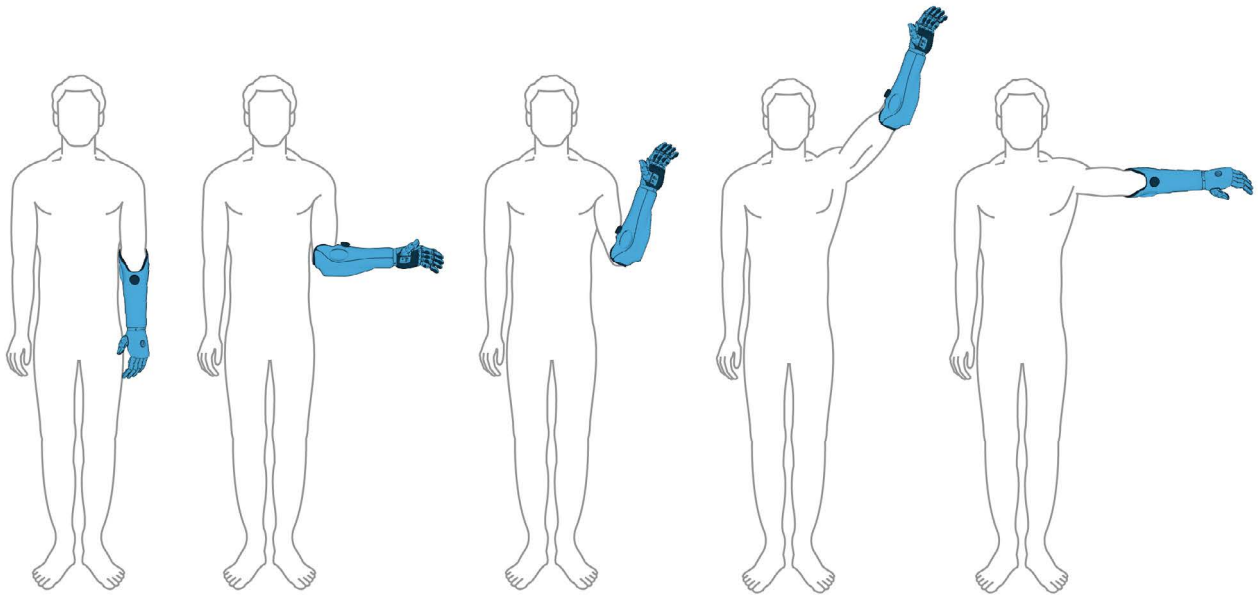
Independent Contraction:



3.1.3. Range of Motion

Once the patient is comfortable opening and closing the hand, work with them to learn to operate the hand with their arm in various different positions. They should learn to operate the hand while supporting the full weight of the arm without any

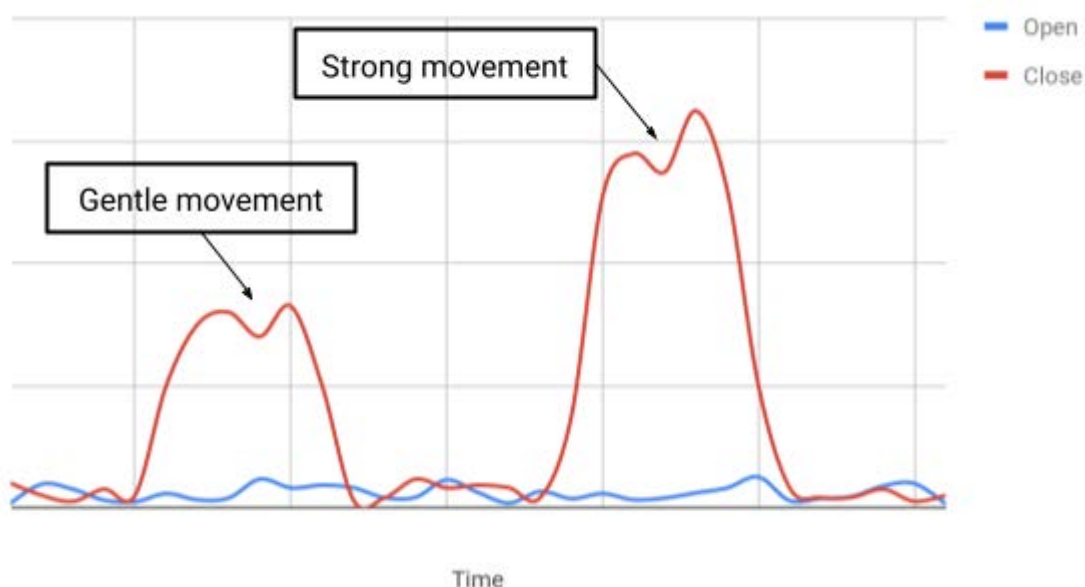
support from their unaffected arm or a table surface. Run through a full range of upper limb motions with them in both a seated and standing position and have them open and close the Hero Arm in each position.



3.1.4. Speed Control

([Video Link](#))

Once you've established the patient can reliably open and close the fingers of their Hero Arm and has a good range of motion that doesn't interfere with the signals, work with them to learn to control more subtle movements of the fingers. With short muscle movements, they will be able to stop the fingers half-way between open and closed. With practice, they will be able to send signals of variable strength to the Hero Arm, which will cause the fingers to move slowly, rather than at their full speed.



3.1.5. Strength Training

Some patients may find it difficult at first and may experience muscle fatigue after operating the Hero Arm for an extended period of time. This is to be expected, since they're activating muscles which they haven't used for some time. To overcome this, the patient will need to practice using their Hero Arm. A schedule can be established, and it's recommended patients try to use their Hero Arm every day for at least 30 minutes to build up their muscles.

3.2. Changing the Sensitivity of Electrodes

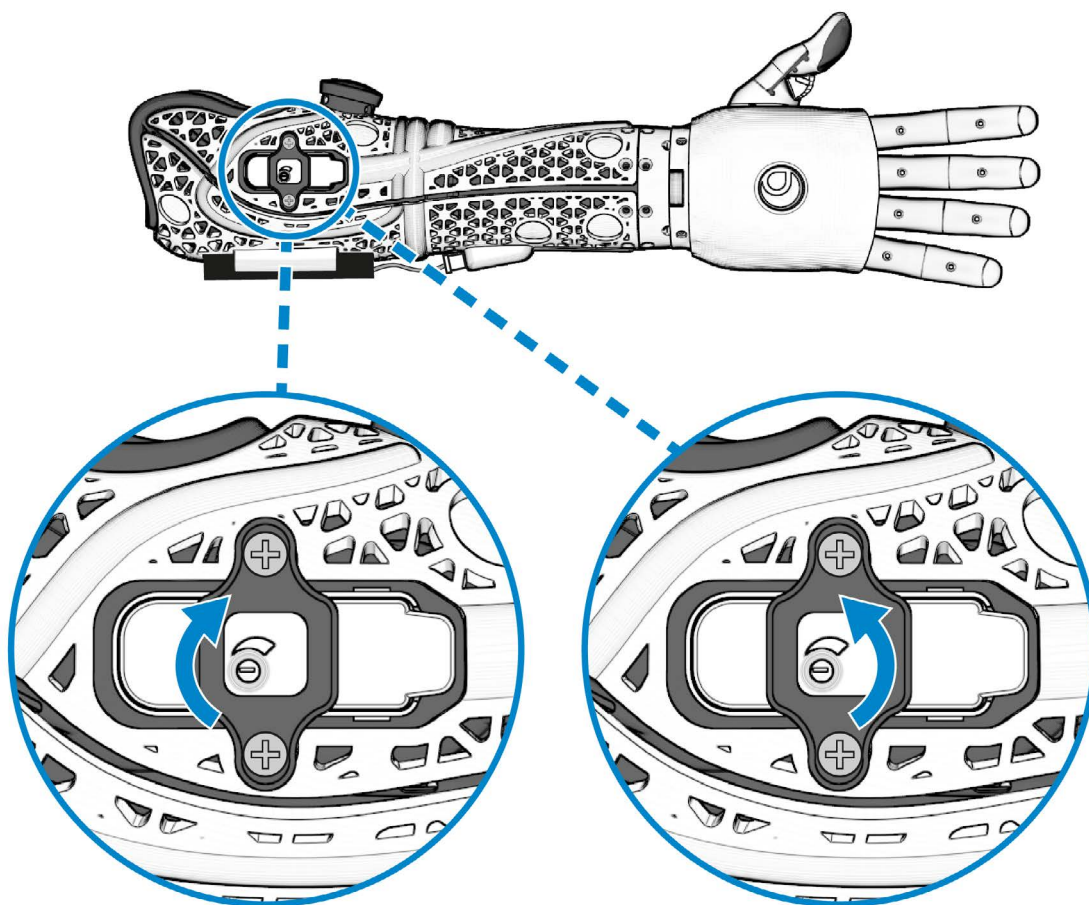
To adjust the electrode sensitivity, you will need an electrode gain adjustment tool, provided by Open Bionics, as shown below.



To increase the sensitivity of the electrode, rotate the dial clockwise. To reduce the sensitivity of the electrode, rotate the dial anti-clockwise. The dial rotates a total of 270 degrees, and is shipped at the mid-position. It's recommended that the first trial of the Hero Arm is done with both electrodes at their mid position.



Do not force the dial if it has reached its minimum or maximum. You should be able to move it with just a small amount of force and feel a resistance when it reaches the minimum or maximum.



Clockwise:
Increase Sensitivity

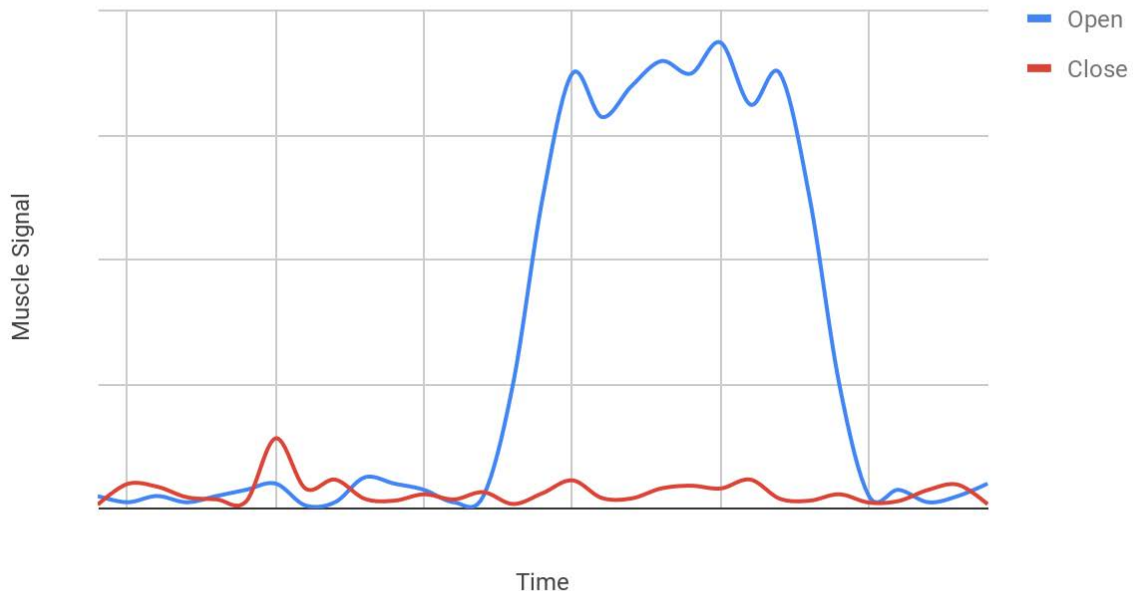
Anti-Clockwise:
Decrease Sensitivity

3.3. Selecting Different Grip Modes

([Video Link](#))

To switch between grips within a group, the patient must move the hand into the open position, relax, then hold an “open” signal for more than a second.

Hold Open Signal (Grip Change):



If successful, they will feel a long vibration on the “open” electrode, and the Hand Button will flash green a number of times to indicate which grip number they have selected; 1 flash for the 1st grip in the group, and 2 flashes for the 2nd grip in the group.

	Green (flash)		Grip change (number of flashes indicates grip number)
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3.4. Activating Freeze Mode

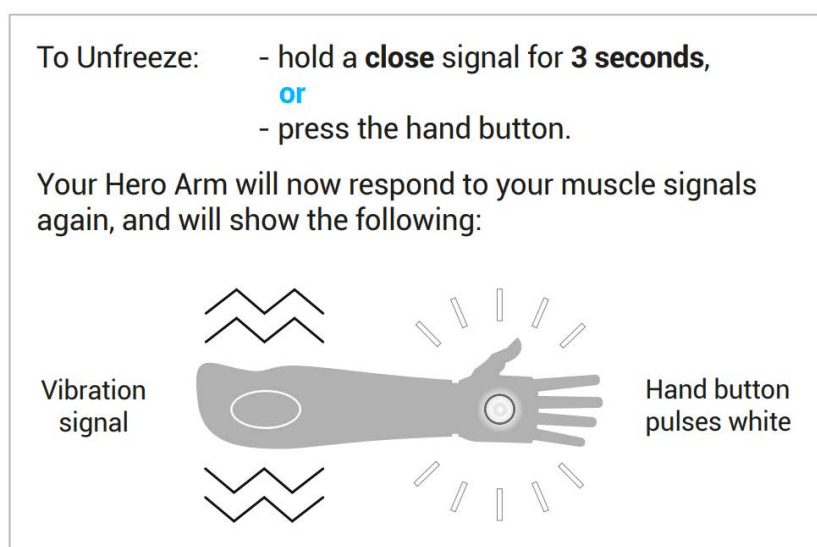
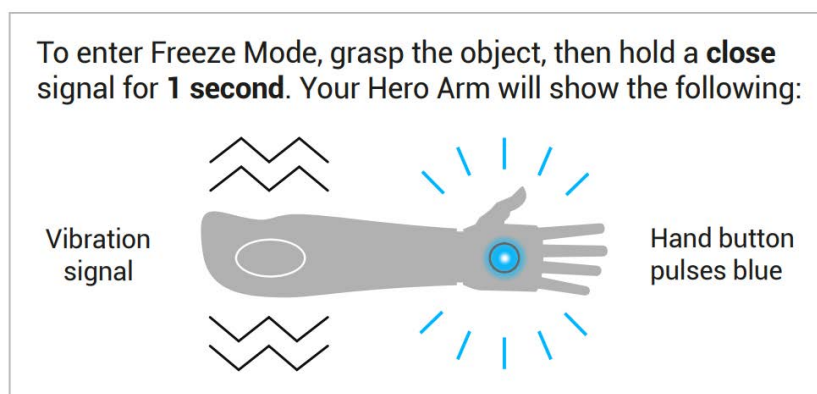
([Video Link](#))

Freeze Mode can be used with any of the grip patterns to temporarily freeze the position of the hand and disable the muscle control - this allows the patient to set a grip position without worrying about accidentally sending a muscle signal and releasing their grip.

To activate Freeze Mode, tense the “Close” muscles for 1 second while holding an object. The Hand will change to light blue and there will be a long vibration.

	Blue (pulsing)		Freeze Mode active
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To disable freeze mode, press the hand button or hold a “close” signal for 3 seconds. The hand will then respond to muscle signals as normal.



If your Hero Arm has been set up to use single-site control, hold the muscle signal for longer when the hand is on the closing action to engage freeze mode.

3.5. Changing Grip Groups

By default the Hero Arm has 4 or 6 different grip modes depending on the size, with the small size having 4 grip modes, and the medium and large hands having 6 grip modes. The patient can hold the open signal to change between grip modes, as described above, but can also use the hand button to change between grip groups by pressing it. The hand button will flash purple a number of times that indicates which grip groups they have entered.

	Purple (flash)		Grip group change (number of flashes indicates group number)
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3.6. Other Functions

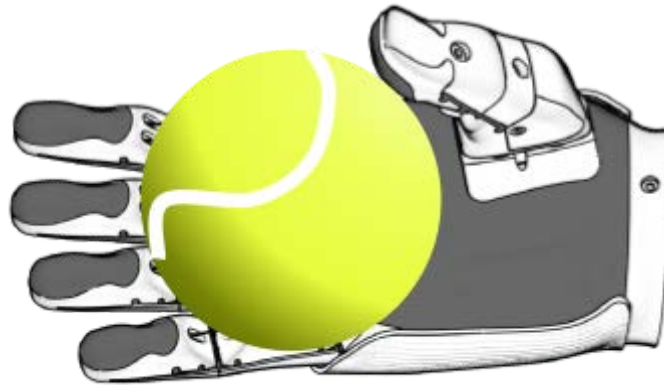
For other functions including moving the wrist, moving the thumb, displaying battery life, charging the battery, please refer to the [Hero Arm User Manual](#) or the Sidekick™ app.

4. Putting it Into Practice

4.1. Grasping Objects - Tennis Ball

([Video Link](#))

Now the patient understands the basic controls of the Hero Arm, it's time to put their learning into practice by grasping physical objects. Start in grip-group 1 in the fist grip and give the patient a spherical object to grasp such as a tennis ball. For best results, the patient should put the ball firmly into the palm of the hand so it's touching the palm, thumb and fingers of the hand with as much contact as possible for a firm grip.



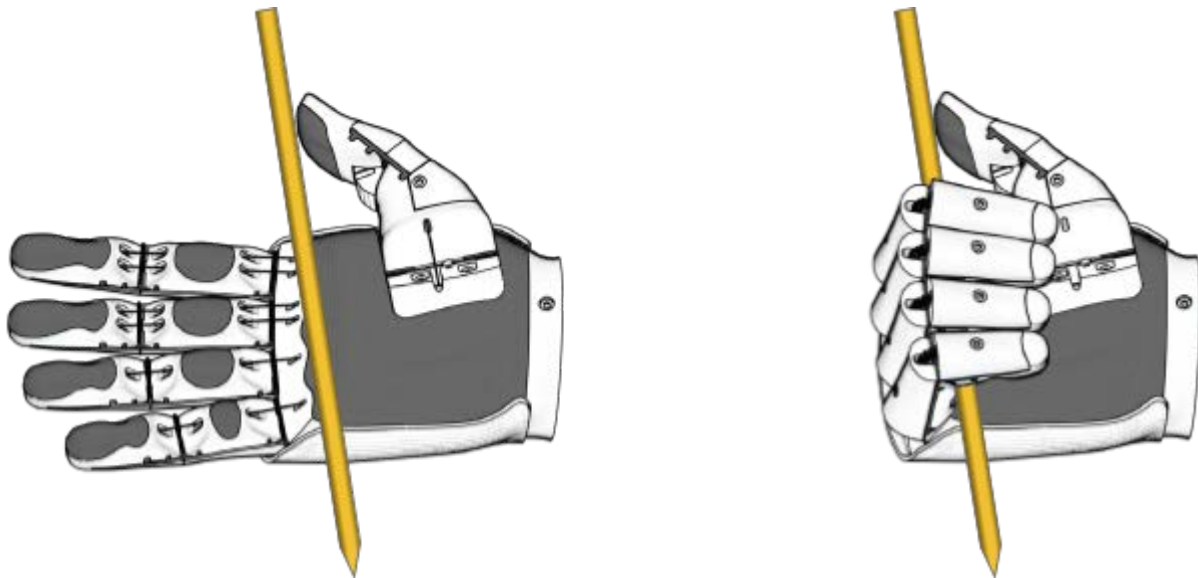
Have the patient grasp the tennis ball and gradually progress through tasks as shown below, completing each one successfully before progressing to the next. Reaching stage 4 is sufficient to progress to the next part of the training.

Stage	Task
1	Pass the tennis ball from the unaffected hand to the Hero Arm.
2	Hold the tennis ball in their Hero Arm, and move the arm around their full range of movement, including shoulder and elbow movements, both standing up and sitting down. Try to do this without dropping the ball.
3	Pick the tennis ball up from a table with the Hero Arm and put it back on the table. Practice this several times.
4	Pick the tennis ball up from the floor with the Hero Arm and put it back down on the floor. Practice this several times.
5	Gently throw the tennis ball with the Hero Arm.
6	Catch the tennis ball off a bounce, with the Hero Arm

4.2. Grasping Objects - Pen

([Video Link](#))

From the fist grip mode, still in group 1, have the patient hold an “open” signal to change to the hook grip. You should see the thumb change position. Give the patient a long, thin object to grasp such as a drumstick, pen, or pencil. The hook grip is very effective for this type of object, but it’s important to position it correctly as shown in the diagram below, as close as possible to the metacarpophalangeal joint. The grip force comes from multiple contact points on the object, from the fingers, the thumb and the palm of the hand.



If you have a whiteboard and whiteboard marker in the room, have the patient use the hook grip to grasp a whiteboard pen and write on the board.

4.3. Moving objects - Cones

Using the fist grip, encourage patients to move cones from one place to another on a table top. This exercise helps several areas:

- Learning to get optimal positions in space with the Hero Arm (approaching an object, understanding the “length” of the Hero Arm, avoiding the table or the other cones...)
- Control the speed and grip strength to improve the precision
- Releasing objects in a particular area

4.4. Adding weight - Carrying a bag

Use a shopping bag or “laptop” bag to check the function of the Hero Arm with added weight. The Hook grip is the preferred grip option for this task. Check the posture of the patient and any interference that could result from the added weight. Please note the maximum carry load for the Hero Arm is 13kg.

4.5. Play

When working with children in particular, it can be helpful to introduce some games at this point to put what they've learned into practice. A few suggestions are shown below.

- Jenga
- Throwing and Catching a bean-bag
- Barrel of Monkeys
- Drawing on a whiteboard
- Target practice with a Nerf Gun (fine control needed on the trigger)

5. Hero Arm for Activities of Daily Living (ADLs)

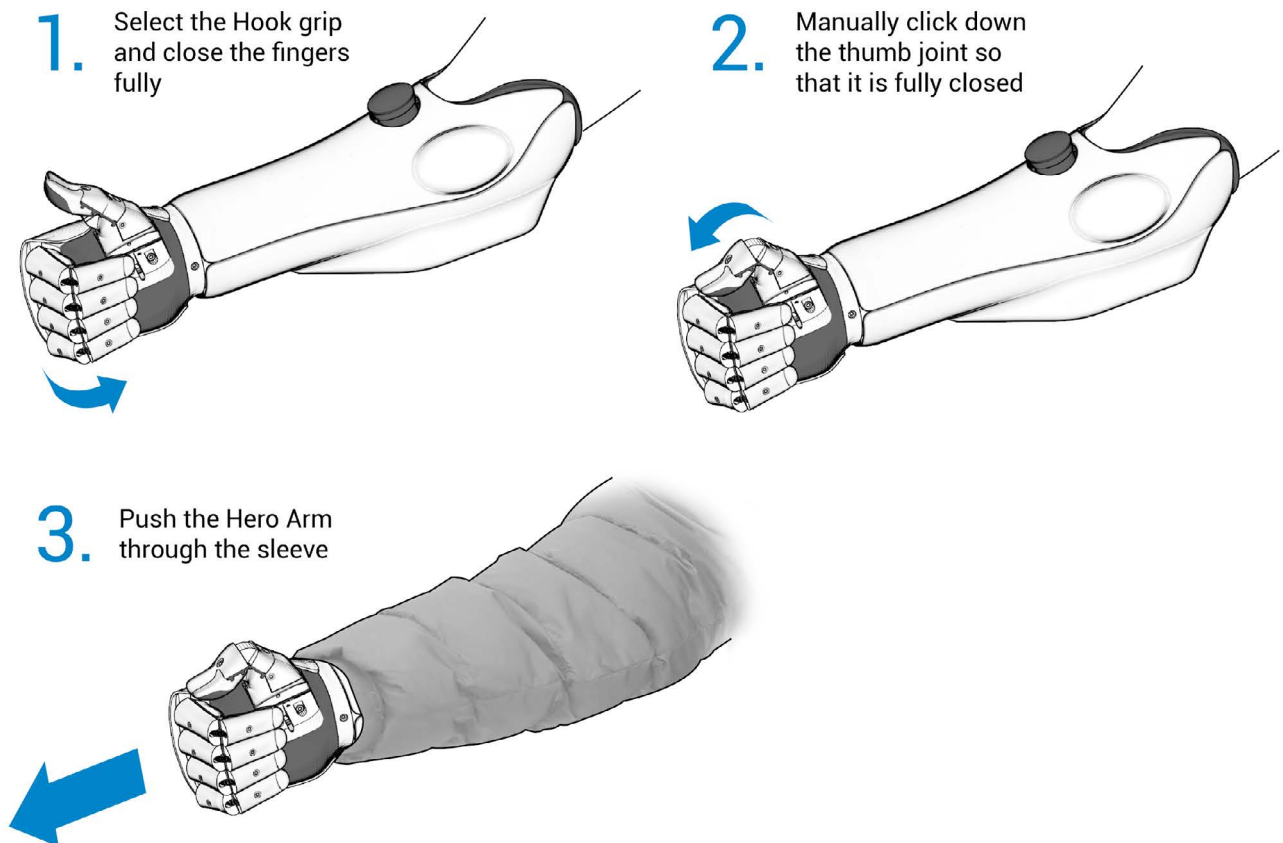
Work with the patient to try some or all of the ADLs shown below. Some tips are shown, but you or they may find better ways of completing these tasks.

5.1. Getting Dressed

5.1.1. Putting a Coat On and Off

([Video Link](#))

Put the hand into the hook grip and close the thumb manually, this will reduce the chance of fingers getting caught as the arm goes through the sleeve. Please note, for patients with the “external battery” version of the Hero Arm, as detailed in the [Hero Arm User Manual](#), patients may have difficulty getting their arm through a smaller coat sleeve.

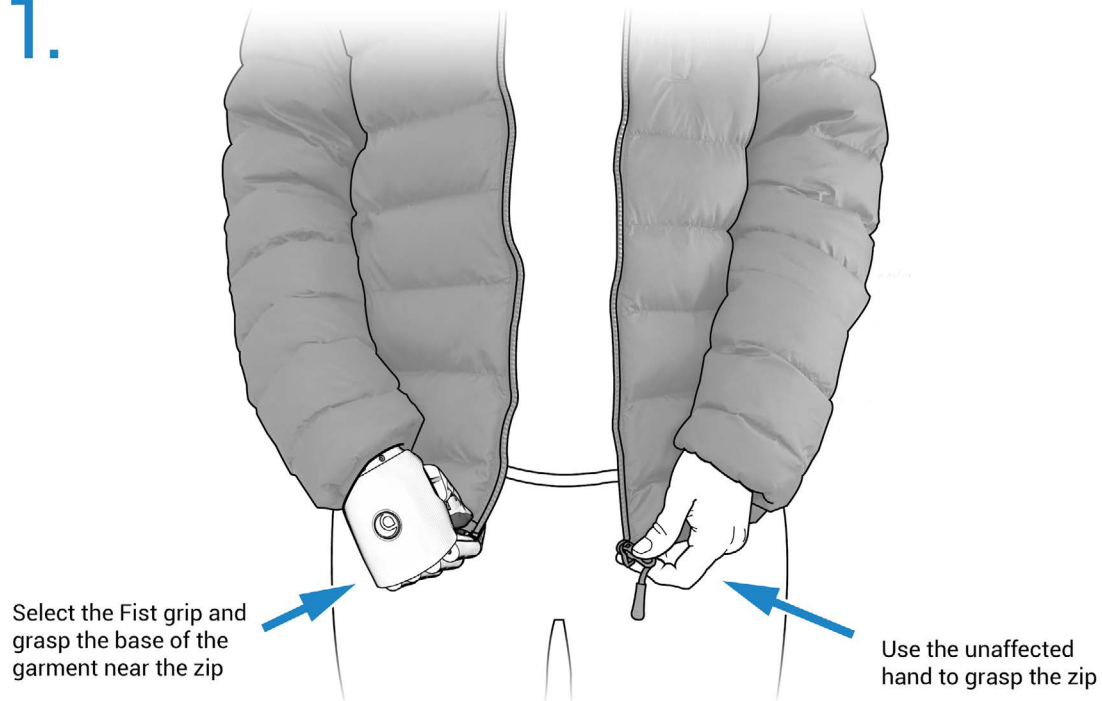


5.1.2. Using a Zip

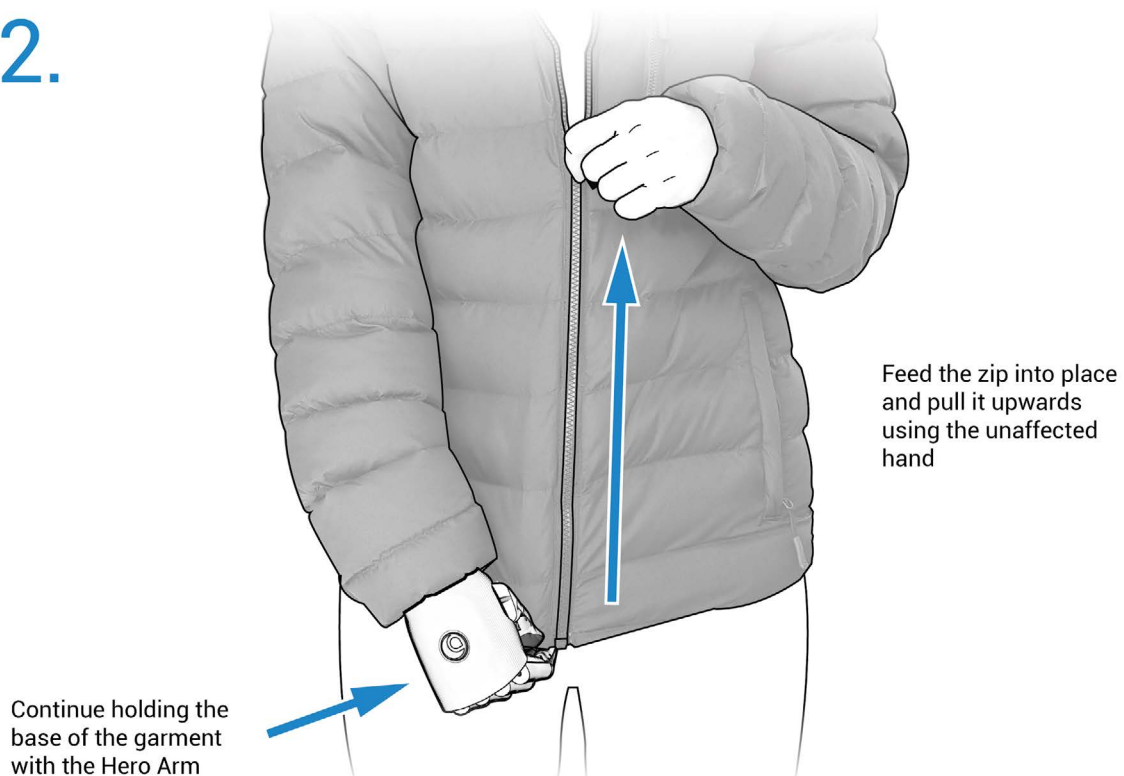
[\(Video Link\)](#)

Put the Hero Arm into the fist grip mode. Use the Hero Arm to grasp the base of the garment near the zip and use the unaffected hand to grasp the zip, feed it into place and pull it upwards.

1.



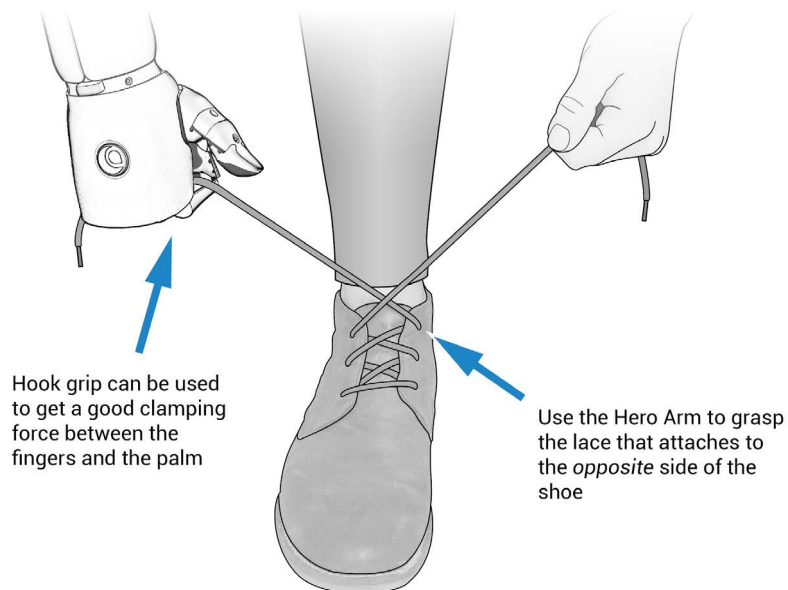
2.



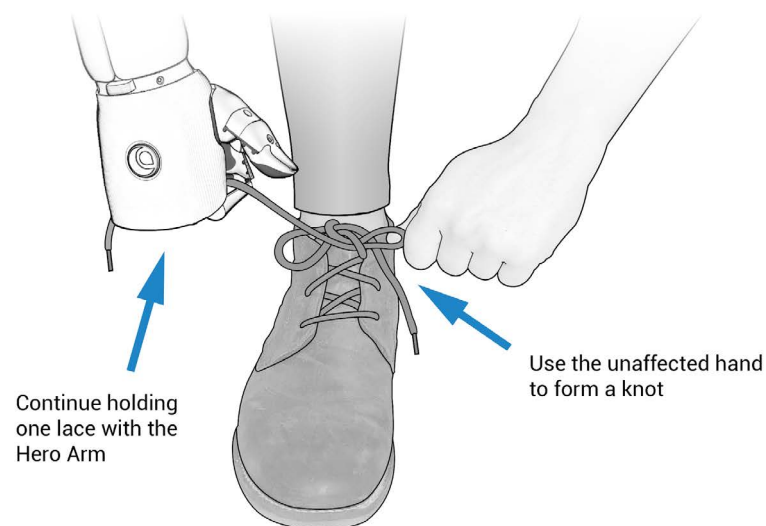
5.1.3. Tying Laces

Using the hook grip, grasp one shoestring with the Hero Hand towards the end, and use the other hand to tie the knot.

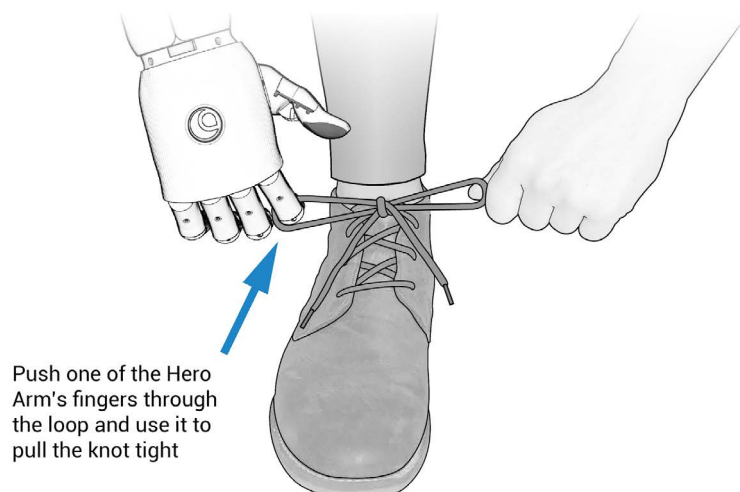
1.



2.



3.



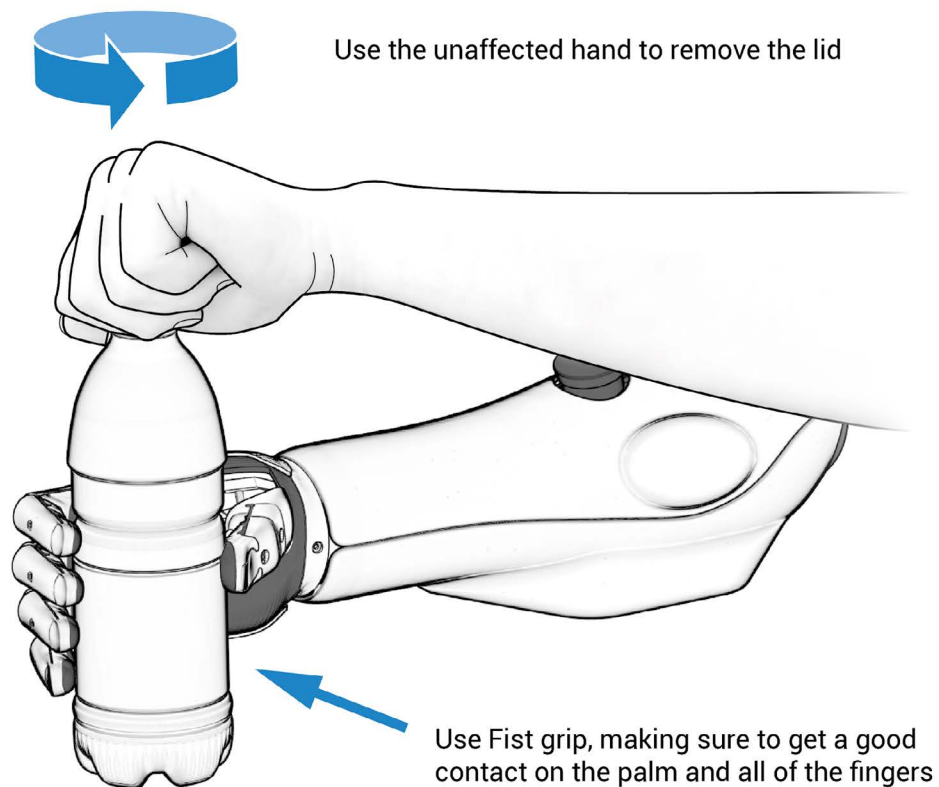
5.2. Eating/Drinking

5.2.1. Plastic Bottles - Opening, Drinking from and Closing [\(Video Link\)](#)

Using the fist grip mode, grasp the bottle around its centre, making sure to get a good contact on the palm and all of the fingers in as many places as possible.

Activate Freeze Mode, using the method outlined in Section 3.4.

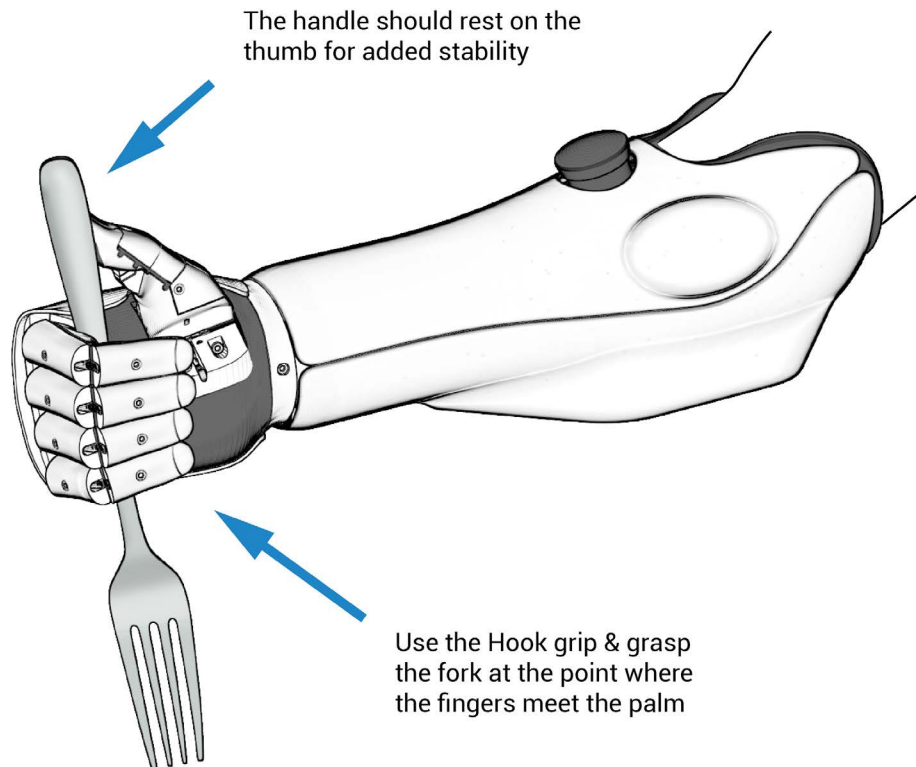
Using the unaffected hand, unscrew the lid. The patient can then try bringing the bottle up to their mouth using their Hero Arm, or switch to their unaffected arm to take a drink.



5.2.2. Using a Fork

[\(Video Link\)](#)

Using the hook mode and the technique demonstrated above, grasp the handle of the fork, with the forked end pointing away from the thumb. This grasp will hold the fork very securely, and optionally, freeze mode can be enabled. The fork can then be used to steady food such as steak or pizza while it's being cut with a knife held in the unaffected hand.



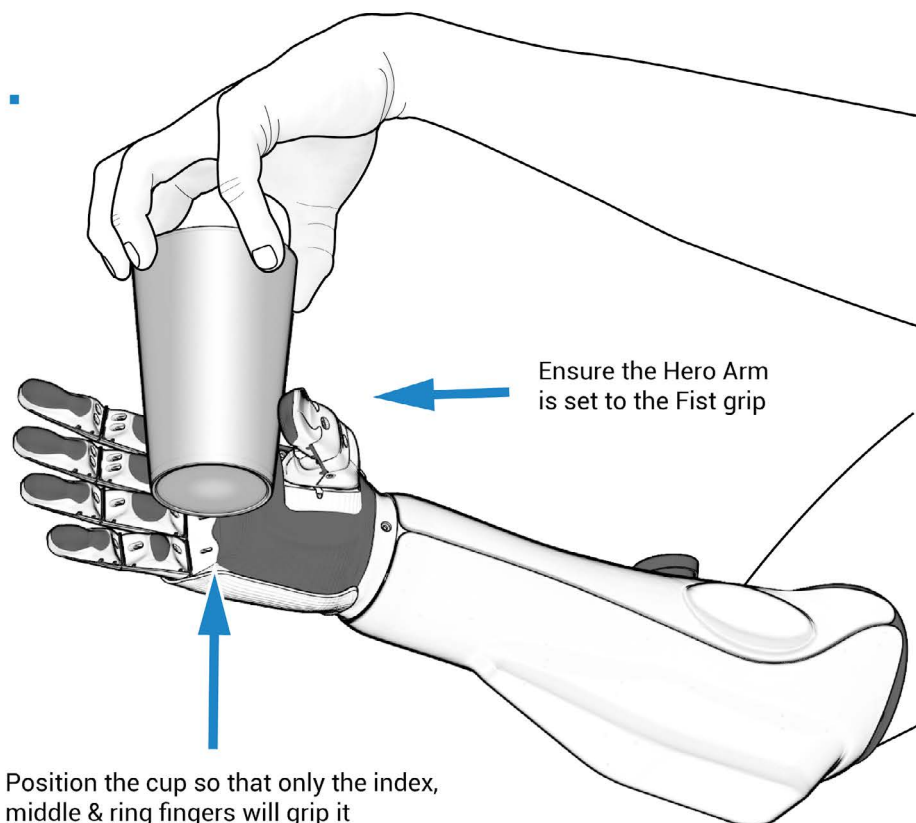
5.3. Toileting

Discuss with your patient if it's a concern for them. See cleaning instructions below. If the patient has bilateral limb-loss then this is a key consideration which the occupational therapist should discuss.

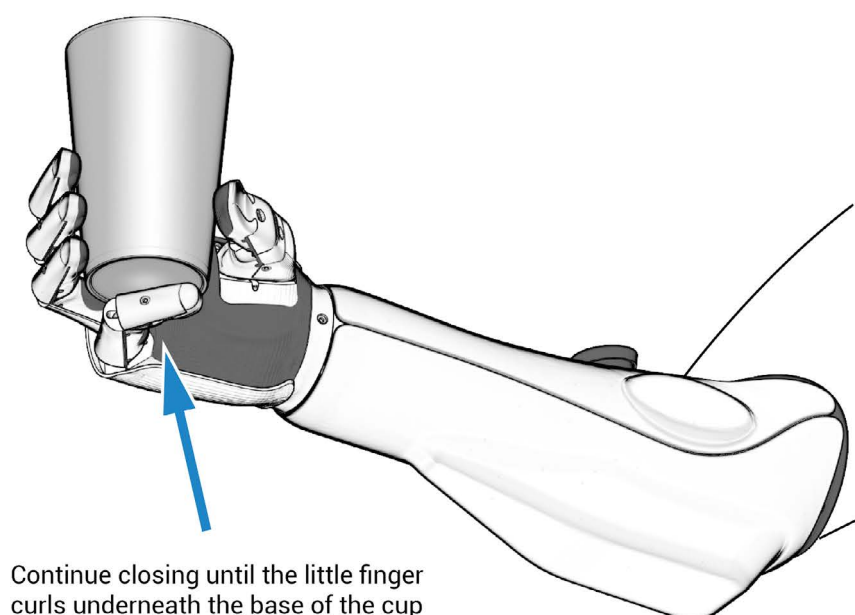
5.4. Holding a plastic cup

Using the fist grip mode, grasp the plastic cup gently, being careful to position the fingers such that the little finger is underneath the base of the cup. This technique enables the cup to be supported by the little finger of the Hero Arm, helping to build confidence that it won't slip. This can be practiced at first without liquid in order to build confidence.

1.



2.



5.5. Using a keyboard

Using the hook grip mode, encourage the patient to stall the index finger when closing the others. This will create an index pointed mode useful to use a keyboard. As an option, freeze mode can be enabled to secure the position of the index finger. Notice that several options could be used to stall the index fingers: use the sound side to apply a resistance on the index finger or use the edge of a table (this second option may be preferred by bilateral patients).

5.6. Other ADL Videos

[Making a Sandwich](#)

[Writing](#)

[Drinking From a Mug](#)

[Picking up Small Objects](#)

[Using a Knife](#)

[Applying Make-up](#)

[Troubleshooting](#)

6. Ongoing Care and Self-Improvement

6.1. How to Care for the Hero Arm

6.1.1. Cleaning

The Hero Arm can be cleaned using alcohol-free antibacterial wipes that are approved for skin contact* or unscented soap and water. In addition, the flexible internal socket is easily removable from the frame of your Hero Arm to make cleaning easy. If using soap and water, please ensure the inner socket is removed from the arm. You should clean the flexible socket using warm, soapy water on a regular basis. Daily cleaning of the socket is recommended. Please ensure socket is fully dry before donning. Do not allow any liquids to get underneath electrode sensors. If sensors get wet from sweat or moisture, please wipe them with a dry cloth to clean them.

See the [Hero Arm User Manual](#) for more details.

Do NOT use household cleaning wipes to clean the liner/inner socket. This may result in a chemical burn

7. For Patients with Bi-Lateral Limb Loss

7.1. Special Considerations When Wearing One Hero Arm

Patients with bi-lateral limb loss may find it challenging to use the BOA™ to adjust the tightness of their Hero Arm.

Patients with bi-lateral limb loss may find it challenging to operate the wrist button to rotate the wrist of their Hero Arm.

To take advantage of multi-touch inputs of devices like an iPad, bi-lateral users will need to remove their Hero Arm.

7.2. Special Considerations When Wearing Two Hero Arms

Bi-lateral users may find it challenging to operate the wrist button to rotate the wrist of their Hero Arm.

Bi-lateral users may find it challenging to press the hand button of one Hero Arm with the other Hero Arm.

Bi-lateral users won't be able to operate touchscreen devices while wearing two Hero Arms; to take advantage of multi-touch inputs of devices like an iPad, bi-lateral users will need to remove both Hero Arms or use a stylus pen.