

**Case Report Forms**

**TONIC VIBRATION REFLEX CHARACTERIZATION AND APPLICATION FOR EMG CONTROL**

**Case Report Forms**

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| **Location** | Imperial College London |
| **Tested By** | Xinyao Wu |
| **Supervised by** | Mr. Patrick Sagastegui Alva, Prof. Dario Farina |

**Preliminary information**

**Checklist**

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|  |  |
| Fulfilment of inclusion/exclusion criteria | ❒ |
| Participant information sheet | ❒ |
| Consent form | ❒ |
| Measurement arm diameter | ❒ |
| Photo of the setup | ❒ |
|  | ❒ |
| Connect MCU | ❒ |
| Connect Bracelet | ❒ |
| Connect Force sensor if necessary | ❒ |
|  | ❒ |
| Universal tactor controller + C-2 HDFL Tactor | ❒ |
| Alcohol wipes and paper towels | ❒ |
| External Monitor | ❒ |

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| --- | --- | --- | --- | --- | --- |
| **Personal INFORMATION** | | | | | |
| Gender | ❒ male ❒ female | | | | |
| Date of birth: | \_\_ \_\_ /\_\_ \_\_ / \_\_ \_\_ | | | | |
| Dominant Hand | ❒ right ❒ left | | | | |
| Are there any relevant diseases? (stroke, cancer, surgeries,…) | | Yes ❒ | | No ❒ | |
| If yes, please specify: | | | | | |
| Is the participant currently taking any medication? | | | Yes ❒ | | No ❒ |
| If yes, please specify (include dose): | | | | | |

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| --- |
| **General Comments** |
| Comments regarding the electrode position, stimulator placement:  Comments on tasks or testing:  Measurement of Arm (Diameter & length):  Optimal frequency: 120Hz |

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**PREREQUISITE (~5 minutes)**

* Ask the dominant arm, age
* Clean forearm and EMG with alcohol wipes and dry with paper towels
* Locate flexor common tendon – Place stimulator on top of tendon – Indicate position on comments
* Set up EMG as in figure of general comments – Electrode 4 on top of the radial area
* If EMG loose, use medical gauze to increase contact with the skin
* Write subject ID

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**SETUP (~5 minutes)**

* Connect distribution power to MCU and stimulator controller
* Connect Stimulator by USB to computer
* Connect Stimulator to 1st port of stimulator controller and force sensor to 2nd input of MCU (Vcc-3V)
* Connect EMG to MCU
* Connect battery and turn on MCU

Graphical user interface

Description automatically generated

**CALIBRATION – MEASUREMENT OF MAXIMAL VOLUNTARY CONTRACTION (~2 min) ------------------------------------------------------**

Common to both days before starting the experiments.

* Ask the subject to release and rest their palms over the force sensors.
* Check EMG signal out of noises – without and with stimulation
* Activate PlotRadial EMG: Visually inspect which channel generates the higher activity
* Press ‘MVC’ at target %
* Indicate subject to emulate movements in the arm
* Select EMG channel feedback corresponding to the highest EMG amplitude. Chan [L|R]: \_\_\_\_\_

**Time: (3s right + 10s rest + 3s left) x 2 repetitions + 20s rest = 1.3 min**

**PHYSIOLOGICAL (TRAINING) [10 min] ------------------------------------------------------------------------------------------------------------------------------------**

* Enable visual feedback – Feedback: Individual
* Set frequency to 0
* Press ‘Start’
* 5 times training with visual feedback
* 5 times training asking the subject to close eyes after 5 seconds. Guide the subject verbally to maintain the corresponding force for the rest of the trial

**Time: (5s reach target + 20s trial + 20s rest) x 20 repetitions x 3 strap. force = 45 min**

**PHYSIOLOGICAL (BLOCK I-A) – STRAP. FORCE RESPONSE [45 min] -------------------------------------------------------------------------------------**

Do 5 trials for each considered stimulation amplitude

* Disable visual feedback – Feedback: Blind
* Set the optimal frequency and %MVC
* Define strapping force – pressure: 2 (low), 7 (medium), 12 (high) levels
* Make sure force sensor is ON
* Press ‘Start’
* 5 repetitions each pressure (20 reps)
* Activate PlotRadial EMG – during trials visually inspect which channel produce higher AEMG
* Do offline analysis - Select the channel with the higher AEMG: \_\_\_\_

**Time: (5s reach target + 20s trial + 20s rest) x 20 repetitions x 2 materials = 30 min**

**PHYSIOLOGICAL (BLOCK I-B) – STRAP. FORCE FLUCTUATION REDUCTION [30 min] ----------------------------------------------------------**

Do 5 trials for each considered stimulation amplitude

* Disable visual feedback – Feedback: Blind
* Set the optimal frequency, %MVC, strap. Force = 2N
* Press ‘Start’
* 5 repetitions each pressure (20 reps)
* Activate PlotRadial EMG – during trials visually inspect which channel produce higher AEMG
* Do offline analysis - Select the channel with the higher AEMG: \_\_\_\_

**Time: (5s reach target + 20s trial + 5s rest) x 20 repetitions x 4 %MVC = 60 min**

**PHYSIOLOGICAL (BLOCK II) - AMPLITUDE & %MVC RESPONSE [60 min] ------------------------------------------------------------------------------**

Do 5 trials for each considered stimulation amplitude

* Disable visual feedback – Feedback: Blind
* Set Strapping force to 2N, contact point at 9mm
* Define amplitudes – Amplitudes: zero-low-medium-high in the range of 0-255 at 120Hz.
* Experiment conducted under %MVC at 0%, 10%, 20%, 30% MVC
* Press ‘Start’
* 5 repetitions each amplitude (30 reps)
* Activate PlotRadial EMG – during trials visually inspect which channel produce higher AEMG
* Do offline analysis - Select the channel with the higher AEMG: \_\_\_\_

**Time: (5s reach target + 20s trial + 5s rest) x 20 repetitions x 2 contact area diameter = 30 min**

**PHYSIOLOGICAL (BLOCK III-A) – CONTACT AREA RESPONSE [30 min] --------------------------------------------------------------------------------**

Do 5 trials for each considered stimulation amplitude

* Disable visual feedback – Feedback: Blind
* Set the optimal frequency = 120Hz, %MVC = 10%, strap. Force = 2N
* Define contact point – higher diameter contact point: 9, 15mm
* Press ‘Start’
* 5 repetitions each pressure (30 reps)
* Activate PlotRadial EMG – during trials visually inspect which channel produce higher AEMG
* Do offline analysis - Select the channel with the higher AEMG: \_\_\_\_

**Time: (5s reach target + 20s trial + 5s rest) x 20 repetitions x 2 models = 30 min**

**PHYSIOLOGICAL (BLOCK III-B) – BI-STIMULATOR PILOT TEST [30 min] -------------------------------------------------------------------------------**

Do 5 trials for each considered stimulation amplitude

* Disable visual feedback – Feedback: Blind
* Set the optimal frequency = 120Hz, %MVC = 10%, strap. Force = 2N, contact area diameter = 9cm
* Define the second position of the stimulator proximal to the first.
* Press ‘Start’
* 5 repetitions each pressure (20 reps)
* Activate PlotRadial EMG – during trials visually inspect which channel produce higher AEMG
* Do offline analysis - Select the channel with the higher AEMG: \_\_\_\_

**Time: (5s reach target + 20s trial + 5s rest) x 20 repetitions x 3 models = 45 min**

**PHYSIOLOGICAL (BLOCK III-C) – BI-STIMULATOR MODEL [45 min] --------------------------------------------------------------------------------**

Do 5 trials for each considered stimulation amplitude

* Disable visual feedback – Feedback: Blind
* Set the optimal frequency = 120Hz, %MVC = 10%, strap. Force = 2N, contact area diameter = 9cm
* Define 3 bi-stimulator models: Single Proximal, Dual Proximal, Proximal+Distal
* Press ‘Start’
* 5 repetitions each pressure (30 reps)
* Activate PlotRadial EMG – during trials visually inspect which channel produce higher AEMG
* Do offline analysis - Select the channel with the higher AEMG: \_\_\_\_

**AFTER EXPERIMENT -----------------------------------------------------------------------------------------------------------------------------------------------------**

Take pictures of:

* EMG and stimulator on the arm – try to capture in the picture the EMG channels distribution around the forearm
* Marks left by the stimulator and EMG around the forearm – for precise location