Juan Marino

Professor Okerblom

Human Physiology

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Lab #9-Demonstration of Electromyograph (EMG)

Purpose

The purpose of this lab is to be able learn how to properly use/operate an EMG. With an EMG properly set up we can measure the grip force of our hands via agonist, and antagonist synergist muscles. We can then create a graph to show just how long it takes for those muscles to fatigue and compare our left and right grip force.

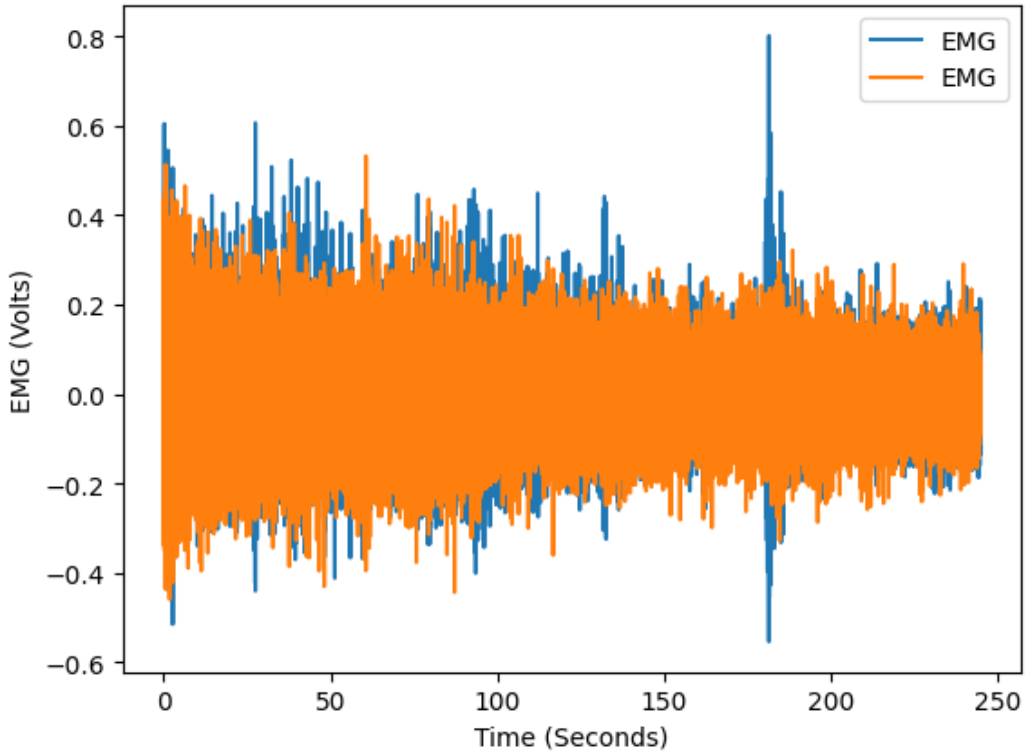
Procedures

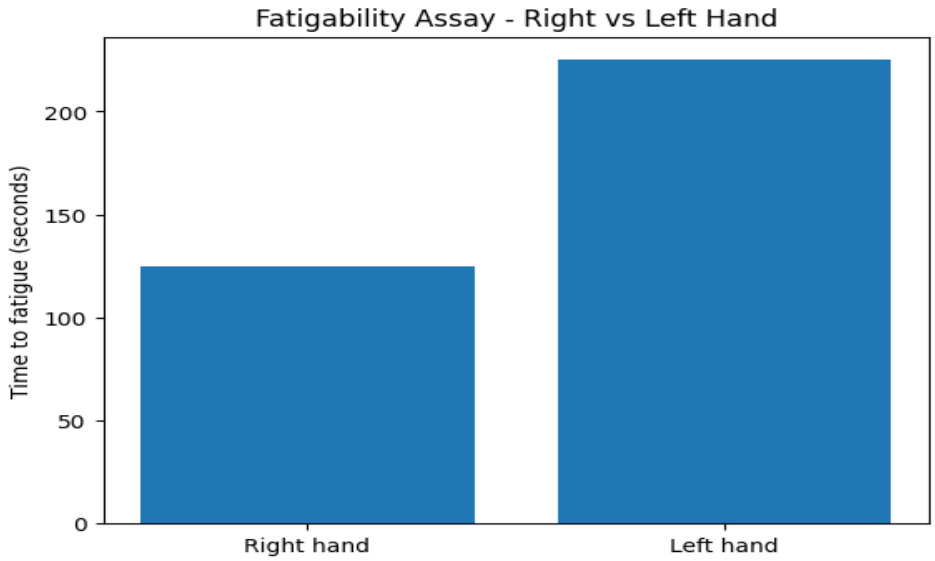
1. To get things started
   Before you turn anything on, be sure theIWX/214 unit is plugged in, and that theIWX/214 unit is connected to the laptop by USB cable.
   Be sure that theC-AAMI-504 EEG cable is inserted into the isolated inputs ofChannels 1 and 2 of the IWX/214. Be sure that the color-coded lead wires are correctly inserted in the lead pedestal of the C-AAMI-504 EEG cable. Insert the connectors on the electrode lead wires into the color-coded matching sockets on the lead pedestal of the ECG cable. Once everything is connected,FIRST turn on the laptop and allow it to fully boot up before you turn on the IWX/214 unit. Once the Iworx unit is on, the red indicator light on the Iworx unit should light up and you may hear the USB chime from the laptop if the laptop does not default to mute (many are set to default to mute).
2. Open theLabscribe3program by clicking on theLabscribe3 icon on the desktop. As Soon as the program opens, you should see a window pop-up that says “Hardware foundIWX214:2008-1-24,” click “OK.”
3. In the second from the top row (the row that says “File Edit View Tools SettingsAdvanced External Devices Help”), click on the “Settings” tab. About Halfway down drop-down window should be a tab called “Human Muscle.” Click on that tab and that should lead you to another drop-down list with the second tab from the top called“Antagonistic Muscle,” click on that tab and close the pdf file that appears, you don't need it.
4. Instruct the subject to remove all jewelry from his/her arm and wrist. Use an alcohol swab to clean the regions of skin on the forearm you are going to use (Fig. 9-1.). Let the area dry. Remove a disposable electrode from its plastic shield, and apply the electrode to the six locations.
5. Place the electrodes from proximal to distal on the forearm in the following order: +2,-2on the posterior and +1,-1 and ground on the anterior.(Fig.9-1.)Snap the lead wires onto the electrodes as follows:the red“+1” lead is attached to the proximal electrode on the anterior surface.the black“-1” lead is attached to the distal electrode on the anterior forearm.the green“C” lead (the ground) is attached to theremainingelectrode on the anterior surface.the white “+2”lead is attached to the proximal electrode on the posterior forearm.thebrown “-2”lead is attached to the distal electrode on the posterior surface.The

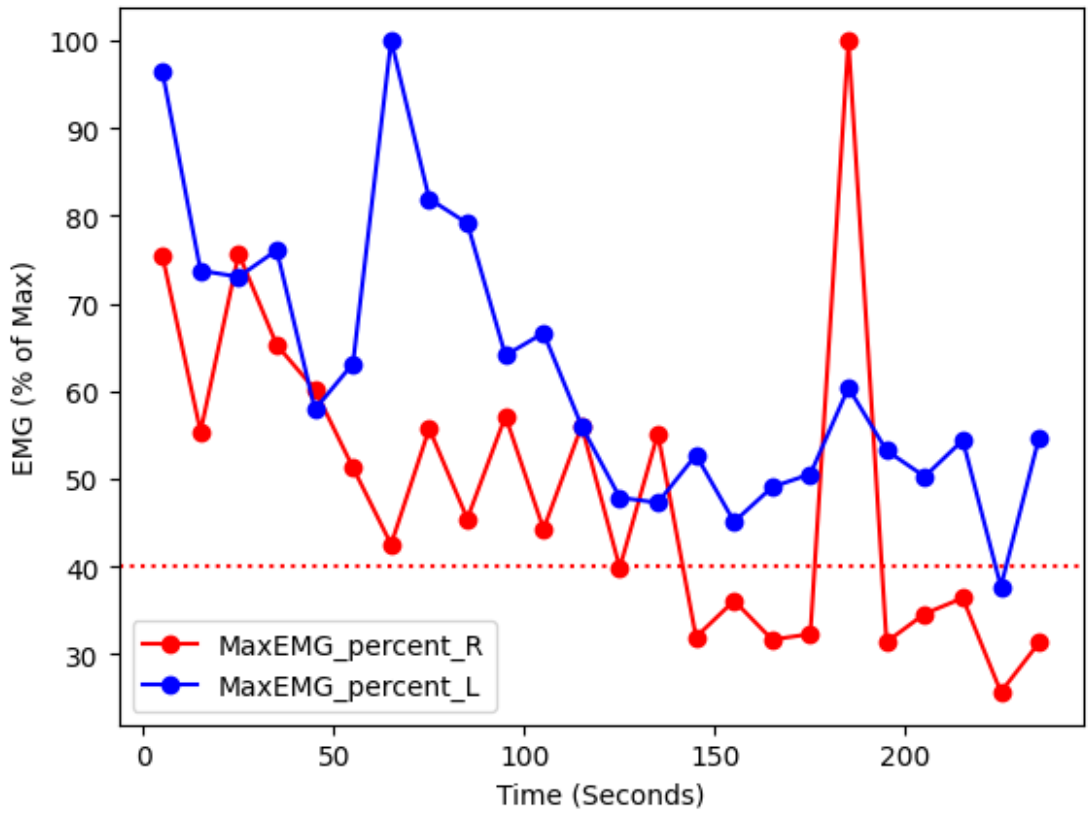
Experimental set-up should look like the illustration in Fig. 9-2.Fig. 9-1: Electrode placement Fig. 9-2: Experimental set-up

6. Record an EMG of the muscles of the forearm illustrating agonistic and antagonistic muscle activity for each of the exercises described below.Type The student's name and the appropriate letter for the activity(A, B, C, D–see below)in the Mark box to the right of theMark button.Click the red"Rec"button to begin the recording; then, press the Enter key on the keyboard to mark the beginning of each the activity.The recording for exercise"A"should look like Fig. 9-3.If you do not see anything, try clicking on the Auto Scale tab and/or checking the electrode contacts.Repeat these procedures for each of the remaining activities.

Results







Time at ~40 % of max for right hand: 124.9995 seconds

Time at ~40 % of max for left hand: 224.9995 seconds

Discussion

The results were essentially what I expected it to be. As a left handed person I assumed that it would take my left hand longer to fatigue compared to my right, the graphs above all reflect the same finding. The data also shows that my left hand takes around 225 seconds to reach fatigue while the right takes 125 seconds to fatigue. I thought this was interesting because even though the left is my dominant hand, it still only took 100 seconds more to fatigue as compared to my right. The spikes in the graphs could be due to me accidentally laughing during the reading or re-gripping the ball after loosening my hand a bit. Something interesting but unrelated is after four minutes of gripping the tennis ball as hard as I could, once I let go it almost hurt my hand to go back to its regular resting position.

Conclusion

Time to fatigue in our hands varies person to person , one thing we all have in common is our agonist and antagonist synergist muscles. Our agonist muscles are responsible for being our prime movers, this muscle contracts to provide the main force behind the ability to move our bones in the joints that they are in. Overall muscles that are contracting are agonist in nature

while muscles that are relaxing and increasing in length are antagonist in nature. The muscle that is in use during wrist flexion would be the palmaris longus, that is considered to be agonist.