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Biopac Student Lab® Lesson 2
ELECTROMYOGRAPHY (EMG) II
Analysis Procedure

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V.   DATA ANALYSIS

FAST TRACK Data Analysis

1. Enter the **Review Saved Data** mode
   - Note Channel Number (CH) designations:

Channel	Displays
CH 1	**EMG** (hidden*)
CH 40	**Integrated EMG**
CH 41	**Clench Force**

   - Note measurement settings:

Channel	Measurement
CH 41	**Mean**
CH 40	**Mean**
CH 41	**Value**
CH 40	**Delta T**

Detailed Explanation of Data Analysis Steps

If entering Review Saved Data mode from the Startup dialog or Lessons menu, make sure to choose the correct file.

The data window should resemble Fig. 2.16.

Fig. 2.16 Example data

The measurement boxes are above the event marker region in the data window. Each measurement has three sections: channel number, measurement type, and result. The first two sections are pull-down menus that are activated when clicked.

Brief definition of measurements:

Mean: Displays the average value in the selected area.

Value: Displays the amplitude value at the point selected by the I-beam cursor. If an area is selected, displays the value of the endpoint based on the direction the cursor was dragged.

Delta T: Measures the difference in time between the end and beginning of the selected area.

The õselected areaö is the area selected by the I-Beam tool (including endpoints)

Analysis of Increasing Clench Force

2. Setup your display for optimal viewing of **"Dominant arm: Increasing clench force"** data.

Note: The append event markers ✦ mark the beginning of each recording. Click (activate) the event marker to display its label.

Useful tools for changing view:

Display menu: Autoscale Horizontal, Autoscale Waveforms, Zoom Back, Zoom Forward

Scroll Bars: Time (Horizontal); Amplitude (Vertical)

Cursor Tools: Zoom Tool

Buttons: Overlap, Split, Show Grid, Hide Grid, -, +

Hide/Show Channel: õAlt + clickö (Windows) or õOption + clickö (Mac) the channel number box to toggle channel display.

3. Read the journal and note your force increment in the Data Report.

   🗐 A

The Journal summary shows the force increment used in your recordings. The grid divisions should use the same increment. Note this increment in Table 2.1 in the second column, **Force (kg) Increments** for Peak #1. For subsequent peaks, add the increment (i.e., 5, 10, 15 kg or 10, 20, 30 kg).

Data Analysis continues….

4. Use the **I-Beam** cursor to select an area on the plateau phase of the first clench (Fig. 2.17).

   📄 A

5. **Repeat** Step 4 on the plateau of each successive clench.

   📄 A

Fig. 2.17 Plateau of first clench selected

6. Scroll to marker labeled **"Nondominant arm: Increasing clench force"** and set up your display for optimal viewing.

7. **Repeat** Steps 3 ó 4 for this recording.

Analysis of Continued Clench

8. Scroll to **"Dominant arm: Continued clench at maximum force"** and set up your display for optimal viewing.

9. Use the **I-Beam** cursor to select a point of maximal clench force immediately following the start of the recording (Fig. 2.18).

   📄 B

This recording begins at the append event marker labeled õ**Dominant arm: Continued clench at maximum force**.ö

Fig. 2.18

The point selected should represent the maximal clench force at the <u>start</u> of continuous maximal clench recording, as shown in Fig. 2.18.

10. Calculate 50% of the maximum clench force from Step 9.

    📄 B

This number is necessary in order to complete Step 11.

11. Find the point of 50% maximum clench force by using the I-beam cursor and leave the cursor at this point.

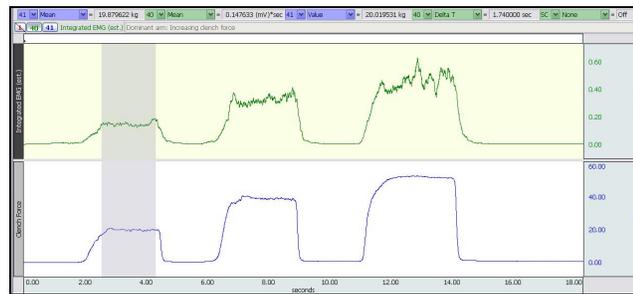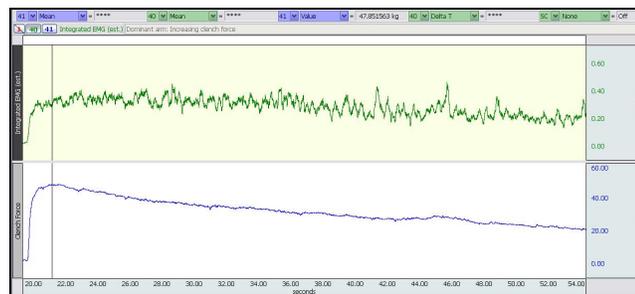Make an eyeball approximation of the point that is 50% down from the maximal clench point. Then, use the I-beam cursor to click points near this region, noting the value displayed in the measurement box, until you are on a point within 5% of the maximal clench force. Leave the cursor at this point.

Data Analysis continues….

12. Select the area from the point of 50% clench force back to the point of maximal clench force by using the I-beam cursor and dragging (Fig. 2.19). Note the time to fatigue measurement (CH 40 Delta T).

    📑 B

    Scroll to marker labeled **"Non dominant arm: Continued clench at maximum force"** and set up your display for optimal viewing.

13. **Repeat** Steps 8 ó 12 for this recording.

One way to select the area is as follows: The cursor should be flashing on the point of 50% maximal clench force. Hold down the mouse button and drag to the left of this point until you reach the point of maximal clench force, then release the mouse button.

Note: You do not need to indicate the Delta T polarity as it only reflects the direction the "I-beam" cursor was dragged to select the data. Data selected left to right will have a positive ("+") polarity, while data selected right to left will have a negative ("-") polarity.
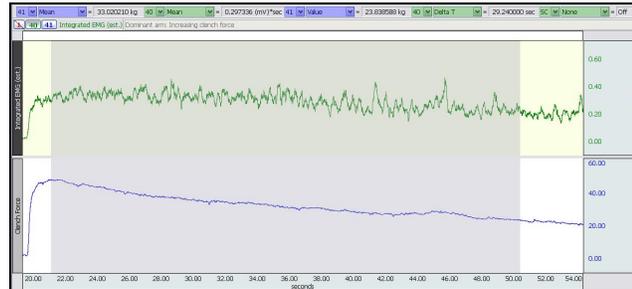

Fig. 2.19 showing area max-50%

14. Answer the questions at the end of the Data Report.

15. **Save** or **Print** the data file.

16. **Quit** the program.

An electronically editable **Data Report** is located in the journal (following the lesson summary,) or immediately following this Data Analysis section. Your instructor will recommend the preferred format for your lab.

   END OF DATA ANALYSIS

END OF LESSON 2
Complete the Lesson 2 Data Report that follows.

ELECTROMYOGRAPHY II

- *Motor unit recruitment and Fatigue*

DATA REPORT

Student's Name: _____

Lab Section: _____

Date: _____

Subject Profile

Name: _____ Height: _____ Gender: Male / Female

Age: _____ Weight: _____ Dominant arm: Right / Left

I.   Data and Calculations

Motor Unit Recruitment

A. **Complete Table 2.1 using *Dominant arm* and *Nondominant arm* data**. In the "Force (kg) Increments" column, note the force increment assigned for your recording under Peak #1; the increment was pasted to the Journal and should be noted below from Data Analysis' Step 2. For subsequent peaks, add the increment (i.e., 500, 1000, 1500). You may not need eight peaks to reach max.

Table 2.1 Increasing Clench Force Data

Peak #	Assigned Force Increment SS25L/LA = Kg SS56L = kgf/m^2	(Dominant arm)		(Nondominant arm)	
		Force at Peak `[41] Mean`	**Integrated EMG (mV)** `[40] Mean`	**Force at Peak** `[41] Mean`	**Integrated EMG (mV)** `[40] Mean`
1					
2					
3					
4					
5					
6					
7					
8					

Fatigue

B. **Complete Table 2.2 using *Dominant arm* and *Nondominant arm* data.**

Table 2.2 Maximum Clench Force Data

(Dominant arm)			(Nondominant arm)		
Maximum Clench Force `[41] Value`	**50% of Max Clench Force** *calculate*	**Time to Fatigue** `[40] Delta T`	**Maximum Clench Force** `[41] Value`	**50% of Max Clench force** *calculate*	**Time to fatigue** `[40] Delta T`

II.   Questions

C. Is the strength of your right arm different than your left arm? _____Yes   _____No

D. Is there a difference in the absolute values of force generated by males and females in your class? _____Yes_____No

What might explain any difference?

_____

_____

_____

E. When holding an object, does the number of motor units remain the same? Are the same motor units used for the duration of holding the object?

_____

_____

F. As you fatigue, the force exerted by your muscles decreases. What physiological processes explain the decline in strength?

_____

_____

_____

G. Define **Motor unit**

_____

_____

_____

H. Define **Motor unit recruitment**

_____

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_____

I. Define **Fatigue**

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J. Define **EMG**

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K. Define **Dynamometry**

_____

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_____

III. OPTIONAL Active Learning Portion

A. *Hypothesis*

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B. *Materials*

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C. *Method*

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D. *Set Up*

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E. *Experimental Results*

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End of Lesson 2 Data Report