Biopac Student Lab® Lesson 10
ELECTROOCULOGRAM (EOG) I
Analysis Procedure
Rev. 12112014

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V.   DATA ANALYSIS

FAST TRACK Data Analysis

Detailed Explanation of Data Analysis Steps

1.   Enter the **Review Saved Data** mode.

   • Note Channel Number (CH) designations:

Channel	Displays
CH40	**Horizontal**
CH 41	**Vertical**

   • Note measurement box settings:

Channel	Measurement
SC	**Delta T**
CH 40	**P-P**
CH 41	**P-P**

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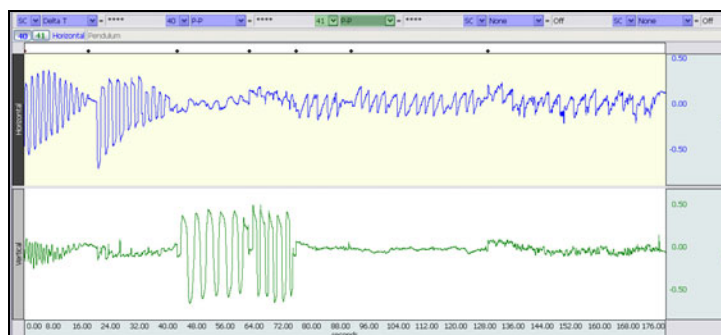
Example data:

Fig. 10.22 Example data

The measurement boxes are above the 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 you click them.

SC is the Selected Channel; the one with the darkened channel label. Channels are selected clicking on the channel selection box or by clicking within the channel display region.

Brief definition of measurements:

   Delta T: Displays the amount of time in the selected area (the difference in time between the endpoints of the selected area).

   P-P (Peak-to-Peak): Subtracts the minimum value from the maximum value found in the selected area.

The "selected area" is the area selected by the I-beam tool (including endpoints).

Note: The append event markers ✦ mark the beginning of each recording. Click on (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: "Alt + click" (Windows) or "Option + click" (Mac) the channel number box to toggle channel display.

2.   Set up your display window for optimal viewing of the "**Pendulum tracking**" data.

Data Analysis continues…

3. Referencing the Horizontal data, select the area of the first tracking cycle. Record the Delta T (period) and P-P measurements. Repeat for each successive tracking cycle.

    📋 A (Table 10.1)

At the start of the tracking cycle, the eyes were looking straight ahead and the data was approximately centered between minimum and maximum values.
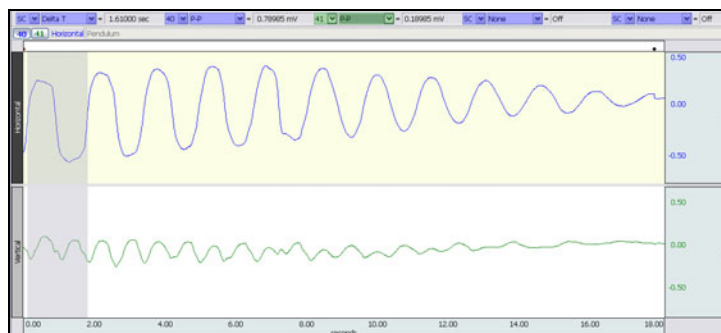

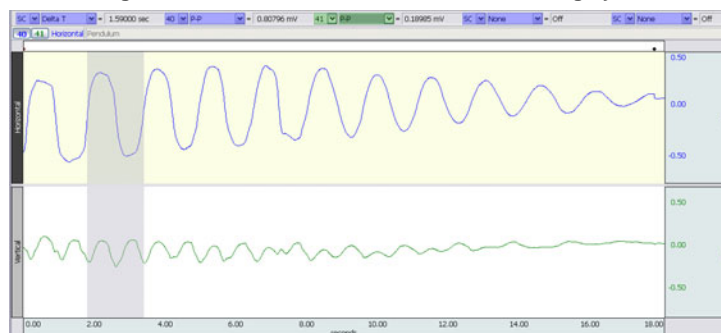**Fig. 10.23—Selection of first Horizontal tracking cycle.**

Fig. 10.24—Selection of second Horizontal tracking cycle.

4. Scroll to "**Simulate pendulum**" data and record the measurements for each successive cycle as in Step 3.

    📋 A

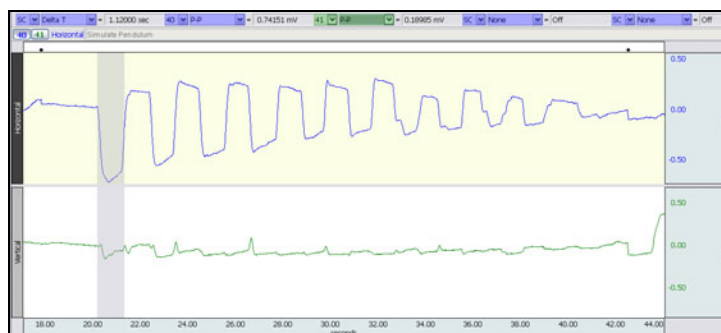5. Scroll to "**Vertical tracking**" data.

Fig. 10.25—Selection of first Horizontal cycle.

6. Referencing the Vertical data, select the area of the first tracking cycle. Record the Delta T (period) and P-P measurements. Repeat for each successive tracking cycle.
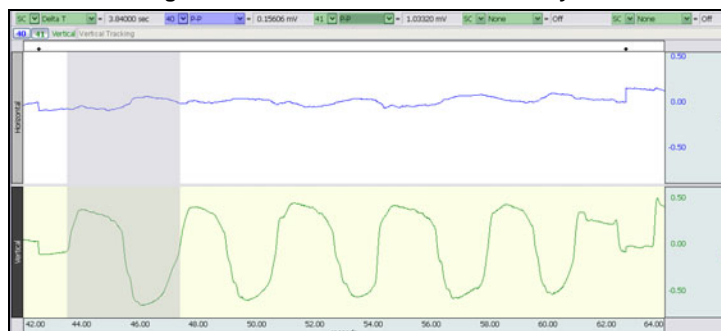
    📋 B (Table 10.2)

Fig. 10.26—Selection of first Vertical tracking cycle.

Data Analysis continues…

7. Scroll to "**Simulate vertical tracking**" data and record the measurements for each successive cycle as in Step 6.

    📑 B

Fig. 10.27—Selection of first Vertical tracking cycle.

8. Set up your display window for optimal viewing of the "**Read silently 1**" data.

Fig. 10.28—Example Read Silently 1 data.

9. Record the number of words in line 1 and line 2 of each passage.

    📑 C (Table 10.3)

10. Zoom in on the data recorded during the reading the first line.

11. Count and record the number of saccades that occurred while reading the line.

    📑 C

12. Measure and record each time interval (period) between saccades (Delta T).

    📑 C

13. Scroll to the data recorded during the reading of the second line and repeat Steps 11 and 12.

    📑 C

In the following examples, the Vertical channel is hidden since all measurements are made on the Horizontal data.

The data for the reading of each line should be easy to discern as there is a large, fast transition when the eyes move from the end of one line to the beginning of the next.

Saccades are the fast transitions in the positive trending data. The period between saccades is the time the **Subject** looked at each word.

Fig. 10.29—Highlight shows saccade intervals.

Fig. 10.30—Example of interval between saccades.

Data Analysis continues…

Scroll to "**Read silently 2**" data and repeat Steps 10 through 13.

C

14. Scroll to "**Read Aloud**" data and repeat Steps 10 through 13.
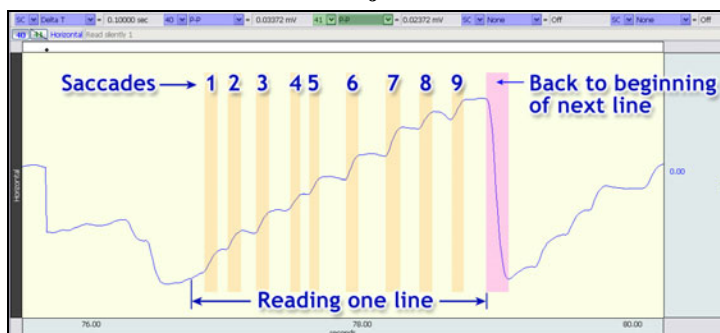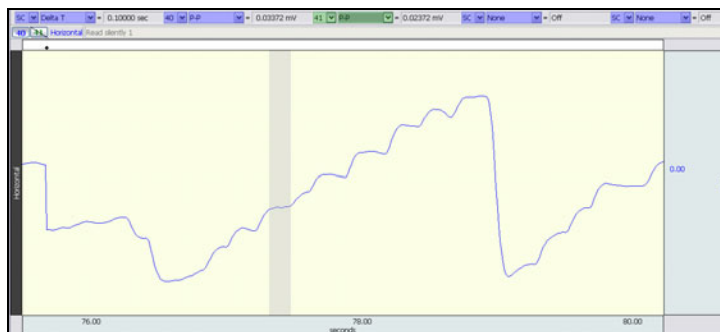
C

It may be more difficult to distinguish the saccades and the interval between saccades because eye movement is more complex when reading aloud. The movement of the facial muscles can also create signal artifact. The following example shows typical data with an interval selected. It is only necessary to measure the intervals between saccades that are clearly distinguished.
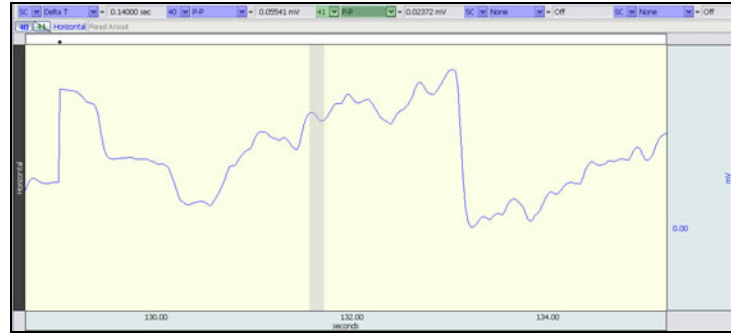
Fig. 10.31—Example of interval between saccades.

15. Answer the questions at the end of the Data Report.
16. **Save** or **Print** the data file.
17. **Quit** the program.

An electronically editable **Data Report** can be found 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 10
Complete the Lesson 10 Data Report that follows.
_____

ELECTROOCULOGRAM

- *EOG*

DATA REPORT

Student's Name: _____

Lab Section: _____

Date: _____

I. Data and Calculations

Subject Profile

Name: _____   Height: _____

Age: _____   Gender: Male / Female   Weight: _____

A. **Pendulum Tracking**—Complete Table 10.1.

> *Note*: Your data may have more or fewer cycles than the 7 allotted in the tables.

Table 10.1 Pendulum Tracking vs. Simulation Tracking (using Horizontal data)

Cycle	Pendulum		Simulation	
	40 Delta T	40 P-P	40 Delta T	40 P-P
1				
2				
3				
4				
5				
6				
7				

B. **Vertical Tracking**—Complete Table 10.2.

Table 10.2 Vertical Tracking vs. Simulation

Cycle	Real Object		Simulation	
	41 Delta T	41 P-P	41 Delta T	41 P-P
1				
2				
3				
4				
5				
6				
7				

C. **Saccades**—Complete Table 10.3.

Table 10.3 Saccades

Measurement	Read Silently 1		Read Silently 2		Read Aloud	
	1ˢᵗ line	2ⁿᵈ line	1ˢᵗ line	2ⁿᵈ line	1ˢᵗ line	2ⁿᵈ line
Number of words						
Number of saccades						
Time interval between saccades #1						
#2						
#3						
#4						
#5						
#6						
#7						
#8						
#9						
Average time interval between saccades (Calculate)						

II. Questions

D. Focusing a camera changes the distance between the lens and the film. Does the eye focus by changing the distance between the lens and the retina? Explain your answer.

E. Define the following terms:

Cone _____

Rod _____

Fovea _____

Visual Field _____

Visual Fixation _____

Saccade / Microsaccade _____

F. Why is vision in darkness more effective when focusing away from the fovea rather than focusing directly on the fovea?

G. Explain the difference between "voluntary fixation" and "involuntary fixation":

_____

_____

_____

H. Examine the data in Table 10.1 and answer the following questions

   a.) Did the amplitude continue to decrease with each successive swing cycle during pendulum tracking? Explain

   _____

   _____

   b.) Did the amplitude continue to decrease with each successive swing cycle during simulated pendulum tracking? Explain

   _____

   _____

   c.) Did the time interval (period) of each successive swing cycle increase, decrease, or remain constant during pendulum movement? Explain

   _____

   _____

   d.) Did the time interval (period) of each successive swing cycle increase, decrease, or remain constant during simulated movement? Explain

   _____

   _____

   e.) Are the waveform shapes different between tracking and simulated tracking data? Explain

   _____

   _____

I. Examine the data in Table 10.2 and answer the following questions:

   a.) Do the cycle amplitudes increase, decrease, or remain constant during vertical tracking? Explain

   _____

   b.) Do the cycle amplitudes increase, decrease, or remain constant during simulated vertical tracking? Explain

   _____

   c.) Do the cycle periods increase, decrease, or remain constant during vertical tracking? Explain

   _____

   d.) Do the cycle periods increase, decrease, or remain constant during simulated vertical tracking? Explain

   _____

   _____

   e.) Are the waveform shapes different between vertical tracking and simulated vertical tracking data? Explain

   _____

   _____

J. Examine the data in Table 10.3 and answer the following questions:

   a.) Did the number of saccades match the number of words for each line? Explain any differences.

   _____

   _____

b.) Is the average time interval between saccades different when reading an easy passage vs. a challenging passage? Explain

_____

_____

c.) Is the average time interval between saccades different when reading the same passage silently vs. aloud?

_____

_____

d.) Are the waveform shapes different between Read Silently 2 and Read Aloud data? Explain

_____

_____

K. Name the cranial nerves tested and the extraocular muscles tested when the subject is asked to follow the eraser on a pencil when moved in a one foot circle, two feet from face.

Cranial Nerves   Extraocular Muscles

_____   _____

_____   _____

_____   _____

                                        _____

                                        _____

                                        _____

L. Define corneal–retinal potential (CRP) and explain its relation to electrooculography and the electrooculogram.

_____
_____
_____
_____
_____

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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_____

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End of Lesson 10 Data Report

Sample Readings

Easy:

You put your right foot in, you put your right foot out, you put your right foot in and you shake it all about. You do the Hokey Pokey and you turn yourself around, that's what it's all about!

Difficult:

O proud right foot, that ventures quick within, then soon upon a backward journey lithe. Anon, once more the gesture, then begin: Command sinistral pedestal to writhe. Commence thou then the fervid Hokey Poke. A mad gyration, hips in wanton swirl. To spin! A wilde release from heaven's yoke, Blessed dervish! Surely canst go, girl. The Hoke, the Poke – banish now thy doubt. Verily, I say, 'tis what it's all about!