

Experiment HM-3: Electroculogram Activity (EOG)

Note – for all these experiments it is important to observe your subject's physical eye movements.

Exercise 1: Saccades

Aim: To demonstrate the type of electrical activity that occurs in the muscles as the subject is reading.

Procedure

1. Select a paragraph for the subject to read as his or her EOG is recorded. The paragraph should be at least 10 lines long with a format and sentence structure that is simple. As you will find out, the number of words in each line, the length of each line, and the formatting of the paragraph will affect the shape of the EOG recording.
2. The subject should avoid any voluntary movements of his or her head or body during the recording. Only the subject's eyes should be moving while he or she is reading.
3. Type <Subject's Name> Saccades in the Mark box to the right of the Mark button on the LabScribe Main window.
4. As the subject is focusing on the first word in the paragraph, click on the Record button to begin the recording. Instruct the subject to begin reading as you click on the Mark button or press the Enter key on the keyboard to mark the recording.
5. After the first cyclic pattern in completed, click on the AutoScale button ([Figure HM-3-L1](#)). Observe the subject's eyes as he or she is reading.

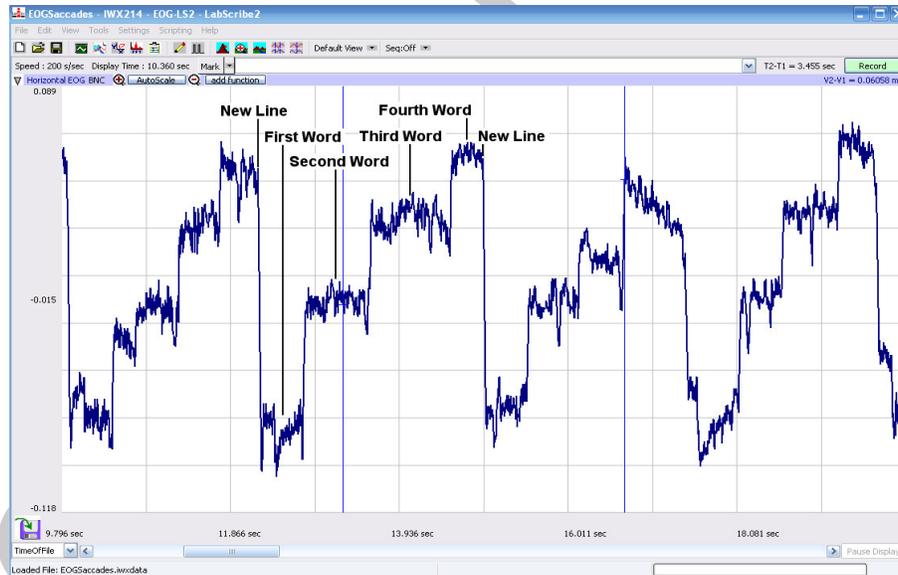


Figure HM-3-L1: Electroculogram (EOG) of a subject reading a list of 5-letter words. Four words are distributed on each line and the subject reads the words from left to right. As the subject moves his eyes to the right to read the next word, the level of the recording rises a step. As the subject moves his eyes back to the beginning of the next line, the amplitude of the EOG drops.

6. Click Stop to halt recording when the subject has finished reading the paragraph.
7. Select Save As in the File menu, type a name for the file. Choose a destination on the computer in which to save the file, like your lab group folder). Designate the file type as *.iwxdata. Click on the Save button to save the data file.
8. Type Slow Saccades in the Mark box to the right of the Mark button on the LabScribe Main window.
9. Instruct the same subject to move from word to word in the same paragraph using a slower saccadic movement.
10. Repeat Steps 4 through 6 while the subject reads slowly.
11. Select Save in the File menu.
12. Type New Paragraph in the Mark box to the right of the Mark button on the LabScribe Main window.
13. Instruct the same subject to read a paragraph with a more complex format, like a paragraph with multiple columns or more words per line.
14. Repeat Steps 4 through 6 while the subject reads the new paragraph.
15. Select Save in the File menu.

Questions

1. How does the pattern of the EOG recorded during the “slow saccadic” reading of the first paragraph compare to the normal reading of the same paragraph? How does the motion of the subject’s eyes differ between these readings?
2. How does the pattern of the EOG recorded during the reading of the first paragraph compare to the pattern during the reading of the second paragraph? How do the paragraphs differ?

Exercise 2: VOR

Aim: To demonstrate the type of electrical activity that occurs in the muscles as the subject remains focused on an image or word on a page while rotating his or her head from side to side.

Note: Be sure to observe the subject’s eye movements as well as the pattern of the recording.

Procedure

1. Select an image or word on a printed page upon which the subject can focus as the subject rotates his or her head from side to side. Pick an image or word that is distinct from the items on the rest of the page, it will be easier for the subject to focus on this target.
2. Inform the subject to avoid any voluntary movements of his or her body during the recording. Only the subject’s head should be moving while he or she is focusing on the target.
3. Type <Subject’s Name> VOR in the Mark box to the right of the Mark button on the LabScribe Main window.

4. As the subject is focusing on the image or word on the page and begins rotating his or her head side to side, click on the Record button to begin the recording. Click on the Mark button or press the Enter key on the keyboard to mark the recording.
5. After the first cyclic EOG pattern is completed, click on the AutoScale button ([Figure HM-3-L2](#)). Observe the subject's eyes as the subject is rotating his or her head.
6. Click Stop to halt recording when the subject has finished the exercise.
7. Select Save in the File menu.
8. Type <Subject's Name> Atypical VOR in the Mark box to the right of the Mark button on the LabScribe Main window.
9. Repeat Steps 4 through 6 on the same subject while he or she increases or decreases the degree or velocity of head rotation.
10. Select Save in the File menu.

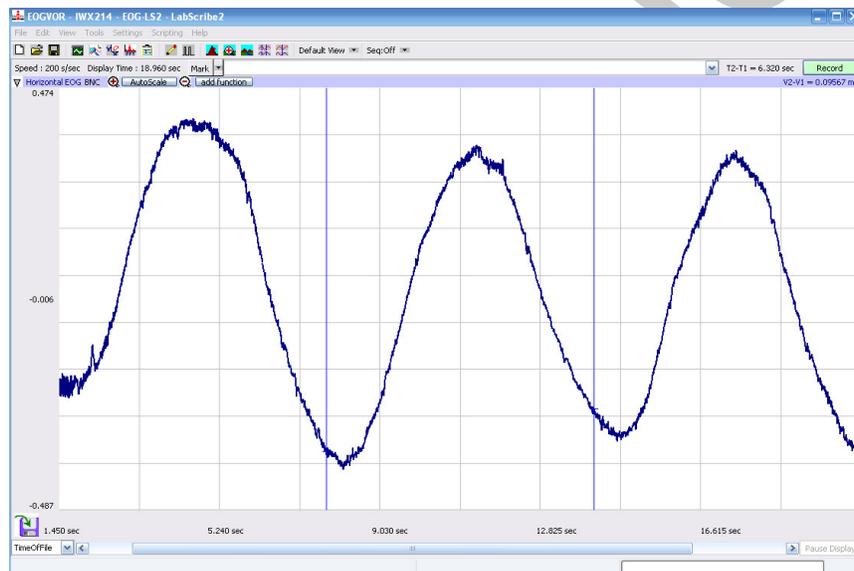


Figure HM-3-L2: Electroculogram (EOG) of a subject rotating his head from side to side as his eyes remain focused on the target.

Questions

1. How does the pattern of the EOG recorded while the subject is rotating his or her head slowly compare to the pattern during the period when the rotation of the head is to a different degree or with a different velocity?
2. Describe the motion of the subject's eyes during VOR. Is it smooth or saccadic?
3. Does the motion of the subject's eyes differ between VOR's of different degrees or velocities?

Exercise 3: Pursuit

Aim: To demonstrate the type of electrical activity that occurs in the muscles as the subject follows a moving target.

Note: Be sure to observe the subject's eye movements as well as the pattern of the recording.

Procedure

1. Suspend a target, like a tennis ball on a fine string, in front of a uniform background of a contrasting color, like a blackboard or a wall. Set the length of the string at about 3 feet. You should be able to swing the target from side to side like a pendulum. Inform the subject to avoid any voluntary movements of his or her head or body during the recording. Only the subject's eyes should be moving while he or she is following the target.
2. Type <Subject's Name> Pursuit in the Mark box to the right of the Mark button on the LabScribe Main window.
3. Pull the target to the side in preparation for its swinging like a pendulum; the subject should be focused on the target and ready to follow it when it is released.
4. As the target is released and the subject begins following the target with his or her eyes, click on the Record button to begin the recording. Click on the Mark button or press the Enter key on the keyboard to mark the recording.
5. After the first cyclic EOG pattern is completed, click on the AutoScale button ([Figure HM-3-L3](#)). Observe the subject's eyes as the subject is following the target.
6. Click Stop to halt recording when the target has completed about 10 oscillations.
7. Select Save in the File menu.
8. Lengthen the string used suspend the target by a foot or more, so the target will swing more slowly.
9. Type <Subject's Name> Slow Pursuit in the Mark box.
10. Repeat Steps 4 through 7 on the same subject while the target swings slowly.
11. Select Save in the File menu.

Questions

1. How does the pattern of the EOG recorded while the subject is pursuing a fast moving target compare to the pattern during the pursuit of the slower moving target?
2. Describe the motion of the subject's eyes during pursuit. Is it smooth or saccadic?
3. How does the motion of the subject's eyes differ between pursuits of different velocities?

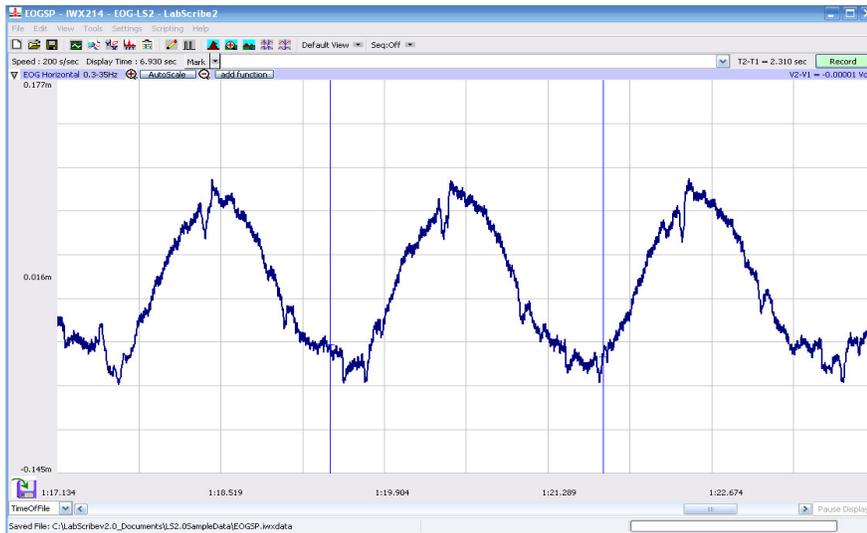


Figure HM-3-L3: Electroculogram (EOG) of a subject following an oscillating target.

Exercise 4: Vergence

Aim: To demonstrate the type of electrical activity that occurs in the muscles as the subject focuses from a distant to a near target and back.

Note: Be sure to observe the subject's eye movements as well as the pattern of the recording.

Procedure

1. Find two targets that are similar in size and shape. Place one target 2 to 3 feet in front of the subject. The second target should be twice the distance (4 to 6 feet) from the subject as the first target. The targets should be aligned so the subject can see both targets without moving his or her head or body.
2. Instruct the subject to:
 - Focus on the distant target for four seconds followed by focusing on the near target for four seconds.
 - Alternate focusing on the distant and near targets for four second periods throughout the recording.
 - Avoid any voluntary movements of his or her head or body during the recording. Only the subject's eyes should be moving while focusing on the near or distant targets.
3. Type <Subject's Name> C, for convergence, in the Mark box to the right of the Mark button on the LabScribe Main window.
4. As the subject is focusing on the distant target, click on the Record button to begin recording.
5. After the subject has focused on the distant target for four seconds, click on the Mark button or press the Enter key on the keyboard to mark the recording as you instruct the subject to move his or her focus to the near target for four seconds. Aligning both eyes to focus from a distant target to a near target is known as convergence.

6. Type D, for divergence, in the Mark box to the right of the Mark button on the LabScribe Main window.
7. After the subject has focused on the near target for four seconds, click on the Mark button or press the Enter key on the keyboard to mark the recording as you instruct the subject to move his or her focus to the distant target for four seconds. Aligning both eyes to focus from a near target to a distant target is known as divergence.
8. After the first cyclic EOG pattern in completed, click on the AutoScale button ([Figure HM-3-L4](#)). Observe the subject's eyes as the subject moves his or her focus between the two targets.
9. The subject should continue to alternate focusing on the distant and the near targets about ten times. During the recording, mark the recording with the letter C to indicate convergence or the letter D to indicate divergence.
10. Click Stop to halt recording when the subject has finished the exercise. Select Save in the File menu.
11. Repeat Steps 4 through 10 while the subject is moving his or her focus from one target to the other more slowly.
12. Select Save in the File menu.

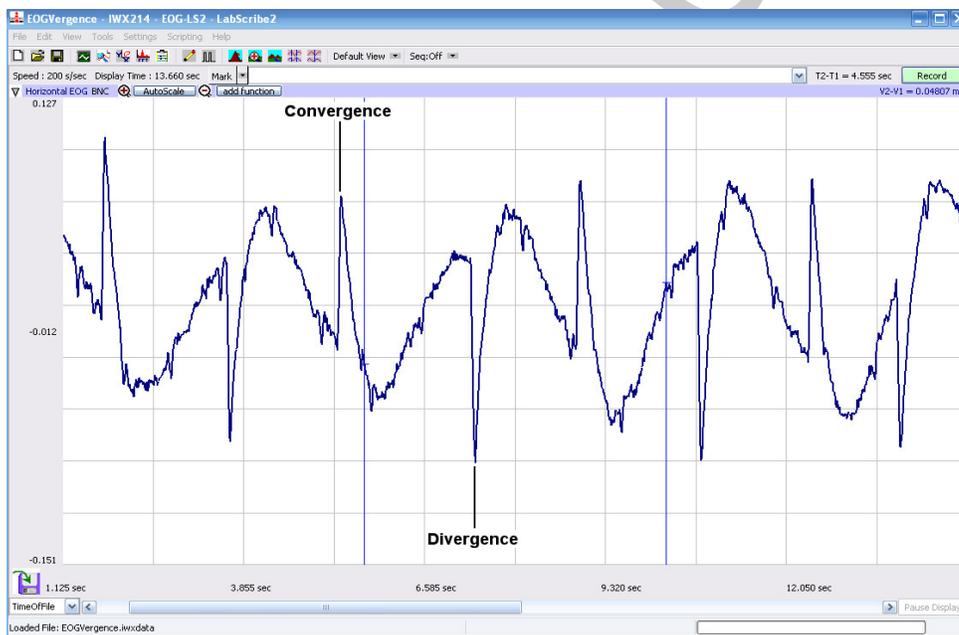


Figure HM-3-L4: Electroculogram (EOG) of a subject focusing on distant and near targets.

Questions

1. How does the pattern for convergence differ from the pattern for divergence?
2. How does the pattern of the EOG from quick movements between targets compare to the pattern from slow movements between targets?
3. Describe the motion of the subject's eyes while focusing from one target to the other and back.
4. How does the motion of the subject's eyes differ between quick and slow vergences?