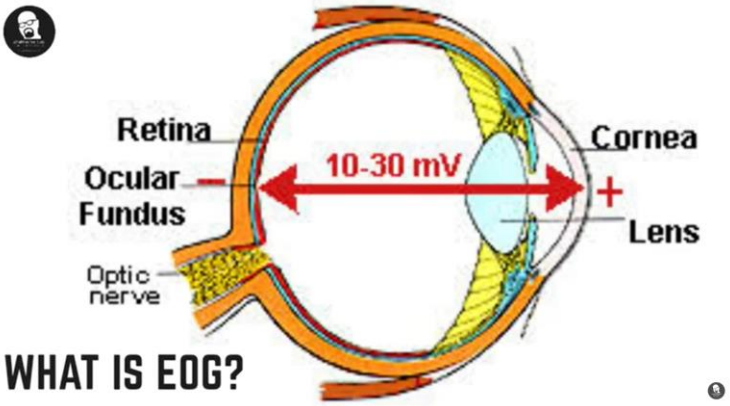
EOG:



Study Questions:

0. Write a paragraph that explains the physiological principles of why eye movements can be recorded. What do you expect to learn from this experiment? Briefly describe the techniques and equipment you will use to record the electro-oculogram.

   Eye movements can be recorded because of the electrical potential difference between the cornea and the retina. If the eye moves from center position toward one of the two electrodes, this electrode "sees" the positive side of the retina and the opposite electrode "sees" the negative side of the retina. By recording the EOG, we can study different types of eye movements, such as saccades while reading, vestibular system affecting eye movements, and slow tracking.

   To record the EOG, we will use a PowerLab system, EOG Pod, lead wires, and pre-gelled ECG electrodes, along with software on our computers to capture and analyze the signals. We place 3 electrodes, 2 on each side of eyes, and one on the forehead. Then we connect the wires and turn the system on.

   First of all, we calibrate the EOG pod because it's DC-coupled. Then we have to recognize artifacts such as blinking and clenching.

   Now we have 4 experiments.

   First one is the angular displacement. The subject sits in one meter away from the wall. There are some points on the wall that we have drawn, and subject tracks them from left to right without moving their head.

   The second one is saccades that the subject have to read multiple lines of a book.

   The third one is smooth tracking. A pen is held and moved from left to right 50cm away from the subject. The subject has to track it smoothly.

   Nystagmus: The head tilts and the eyes are focused on one point.

1. Why do you suppose it is important to recognize artifacts in your data trace? What are the most noticeable artifacts in EOG?

   Recognizing artifacts in the EOG is important to ensure the accuracy of the data. Artifacts can distort the signal, making it difficult to differentiate between actual eye movements and

unintended movements or other physiological signals. The most noticeable artifacts in the EOG include **blinking** and **clenching**.

2. Do you think that the recorded EOG signal is proportional to eye movement? In other words, is the response linear over the range of eye movement? Please explain? (Notice: to answer the question you need to study more!)

   EOG signal is mostly proportional to eye movement.
   Its behavior is practically linear for gaze angles +-30.
   Why? 1.electrode positioning: The fixed locations of electrodes on the skin may not capture the full extent of the eye's rotation accurately at wider angles. 2.Geometry of the eye: The curvature of the eyeball and the relationship between the retina and cornea alter how the electrical field changes as the eye moves, especially at extreme angles. 3.Skin and tissue resistance: The variability in electrical properties of the skin and underlying tissues can also contribute to signal distortion, particularly during larger eye movements.

Reference: System for assisted mobility using eye movements based on electrooculography…

3. When you observe saccadic eye movements during reading (see Figure 4), what activity do you suppose correlated with the largest response?

   During saccadic eye movements observed while reading, the largest response is likely correlated with the moments when the eyes make rapid jumps from the end of one line to the beginning of the next. These quick, jerky movements (saccades) generate larger changes in the EOG signal compared to the slower movements during word tracking within a line.

4. Is there evidence of saccades during the slow tracking exercise? If so, why do you suppose they occurred.

   There may be evidence of small saccadic movements during the slow tracking exercise, although they are less frequent than in fast tracking situations. These saccades could occur as minor corrective adjustments, helping to keep the moving object in focus on the fovea. Even during slow tracking, the eye occasionally makes small, rapid movements to refine focus and compensate for any drift.