Vital lab worksheet #01

Electro-oculography (EOG)

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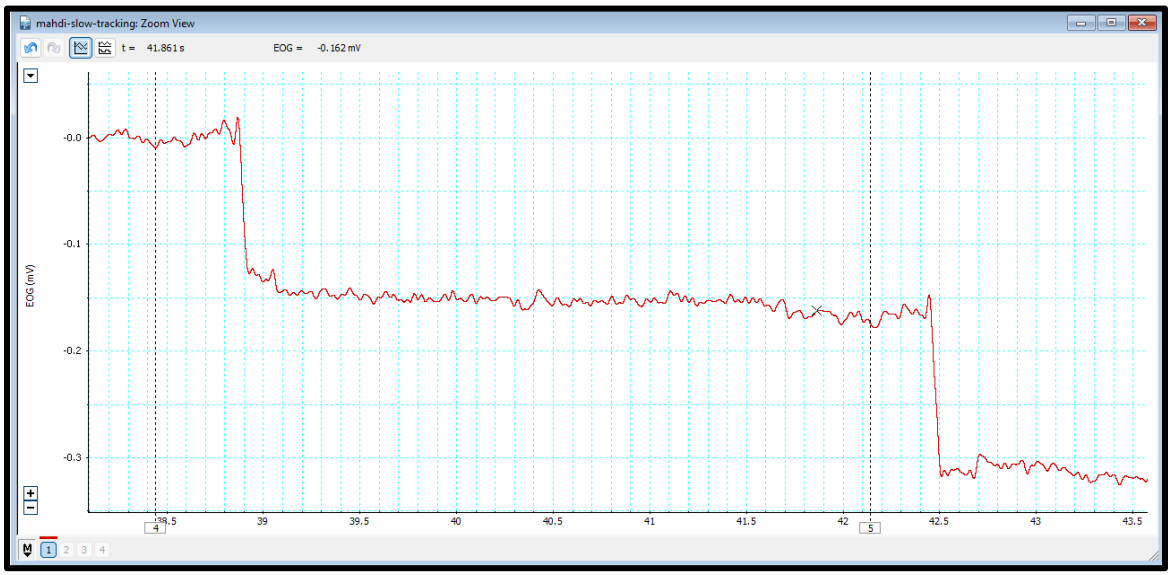
Analysis:

Exercise 1: EOG and angular displacement

View Angle (degrees)	EOG amplitude(mv) MAHDI
0	0.115
15	0.023
30	-0.126
45	-0.317
60	-0.458
75	-0.624
90	-0.696

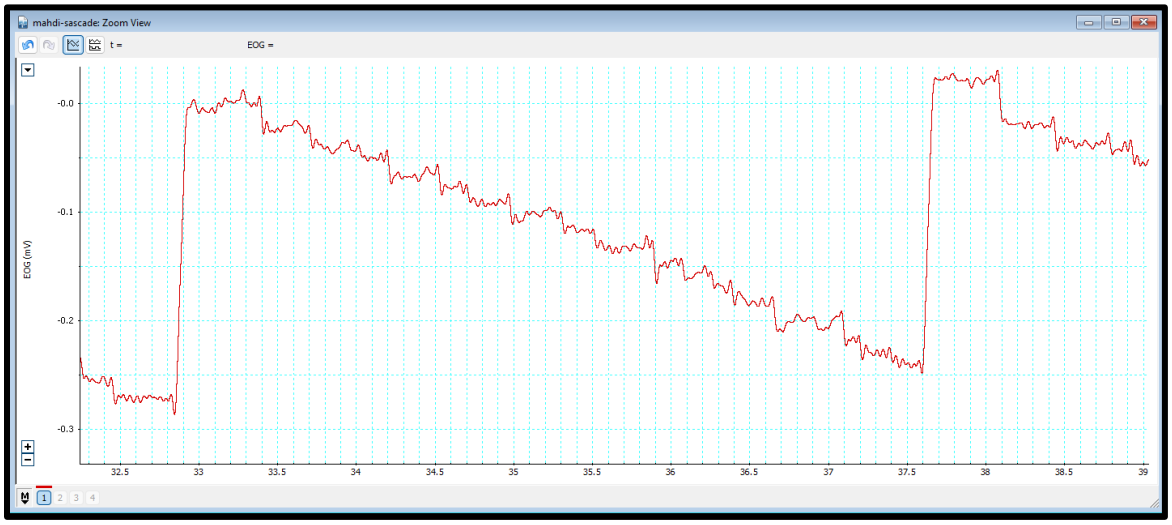
View Angle (degrees)	EOG amplitude(mv) AMIN
0	0.517
15	0.449
30	0.226
45	0.039
60	-0.166
75	-0.381
90	-0.472



Exercise 2: Saccades

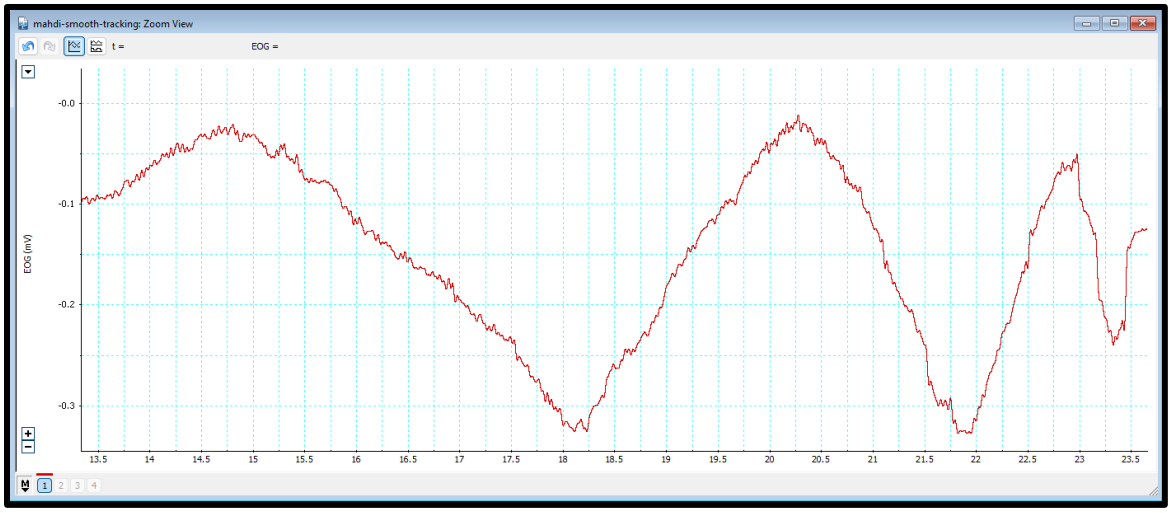
Parameter	Duration (ms) MAHDI
Saccade 1	7154
Saccade 2	6282
Saccade 3	7204
Saccade 4	4763
Average saccade duration	6350.75

Parameter	Duration (ms) AMIN
Saccade 1	7224
Saccade 2	6226
Saccade 3	7162
Saccade 4	6976
Average saccade duration	6892.5



Exercise 3: Smooth tracking

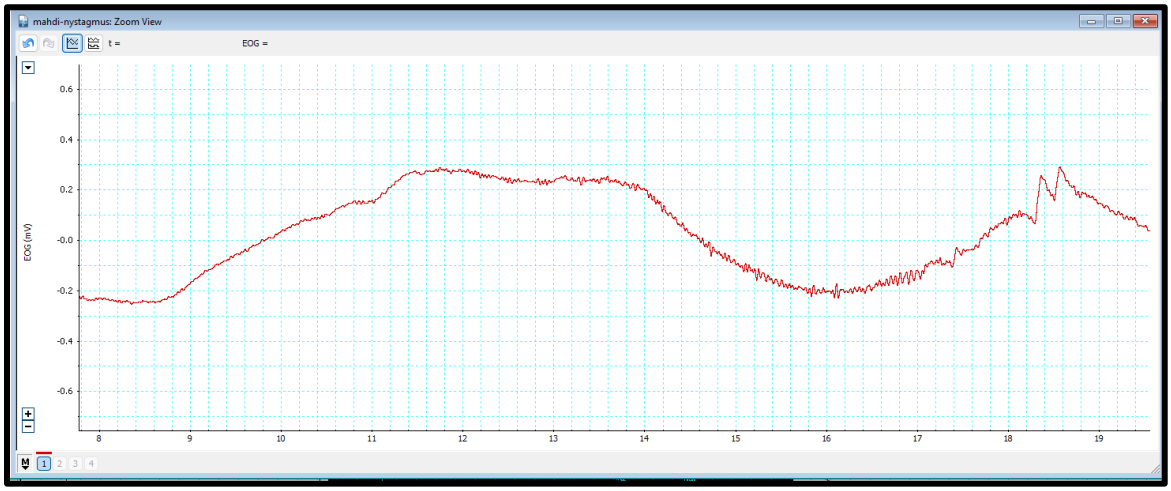
as shown below, there are saccades with different length because the frequency which we moved the pen was increasing.



Exercise 4: Nystagmus

Parameter	Value MAHDI
Maximum EOG amplitude to left	489 (mv)
Maximum EOG amplitude to right	- 461 (mv)
Saccade duration	3840 (ms)

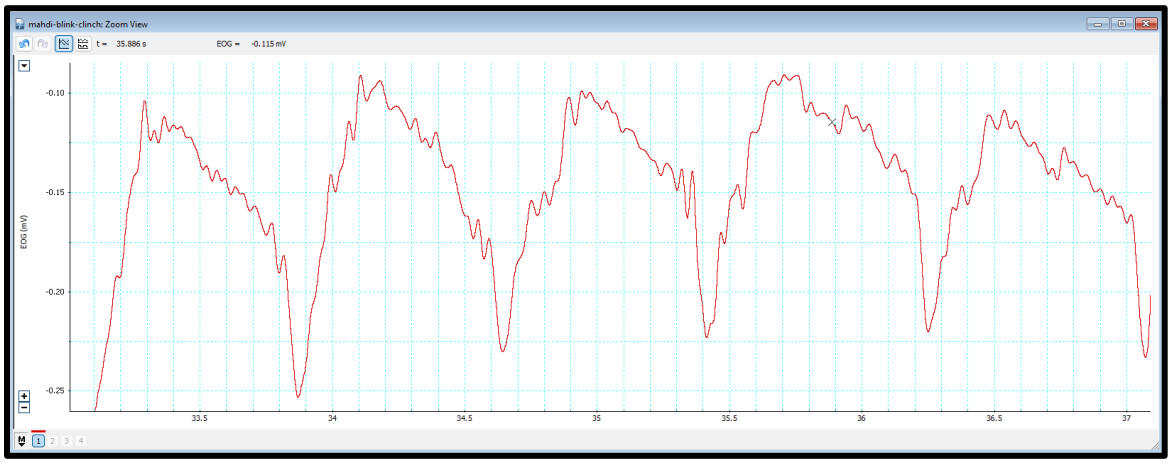
Parameter	Value AMIN
Maximum EOG amplitude to left	563 (mv)
Maximum EOG amplitude to right	- 498 (mv)
Saccade duration	3501 (ms)



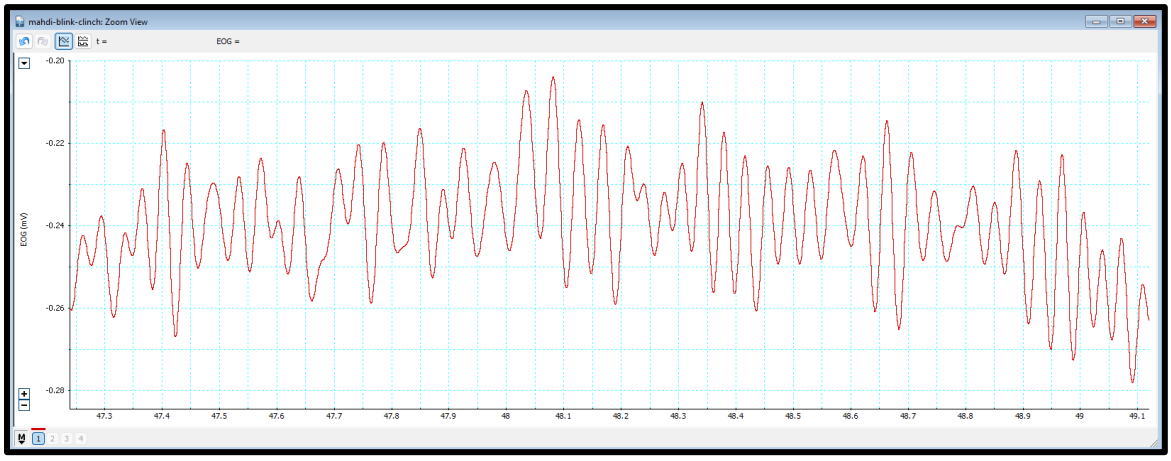
Results:

1. a copy of the zoom view window showing the recording artifacts from EMG and blinking. label each event.

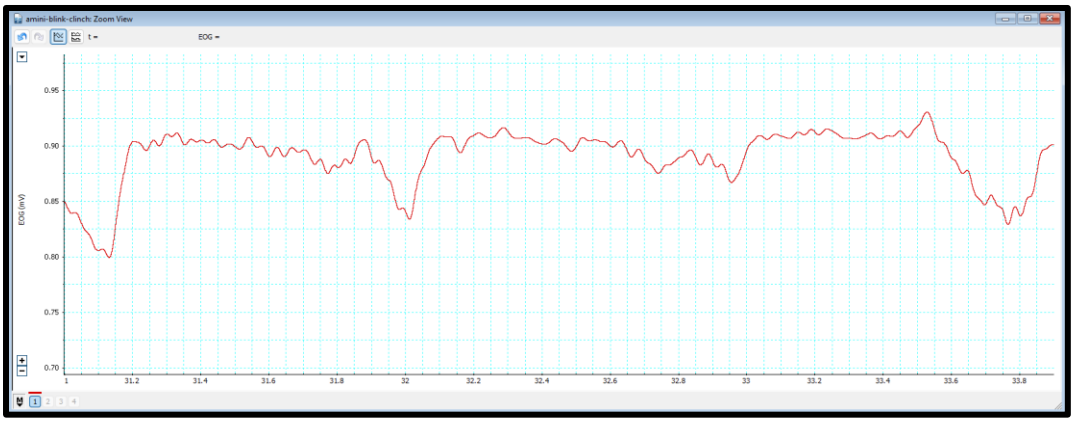
Mahdi's blink:



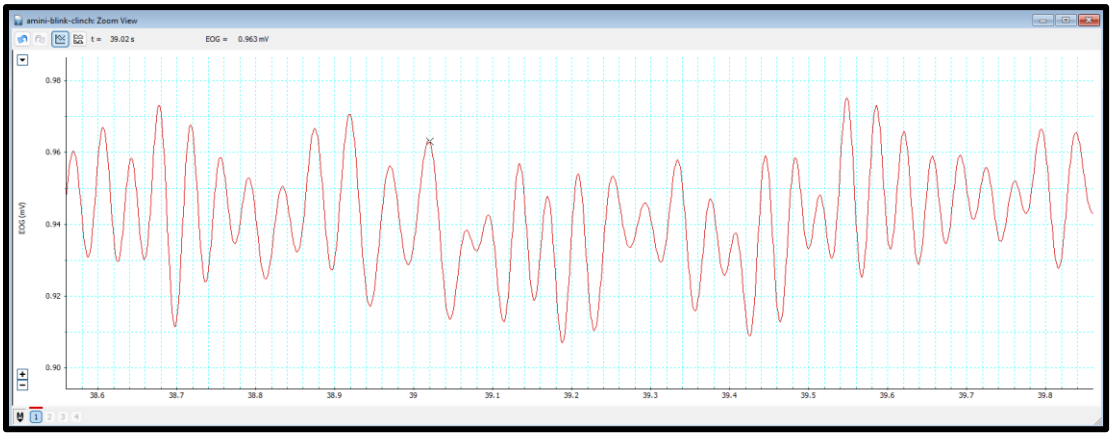
Mahdi's clinch:



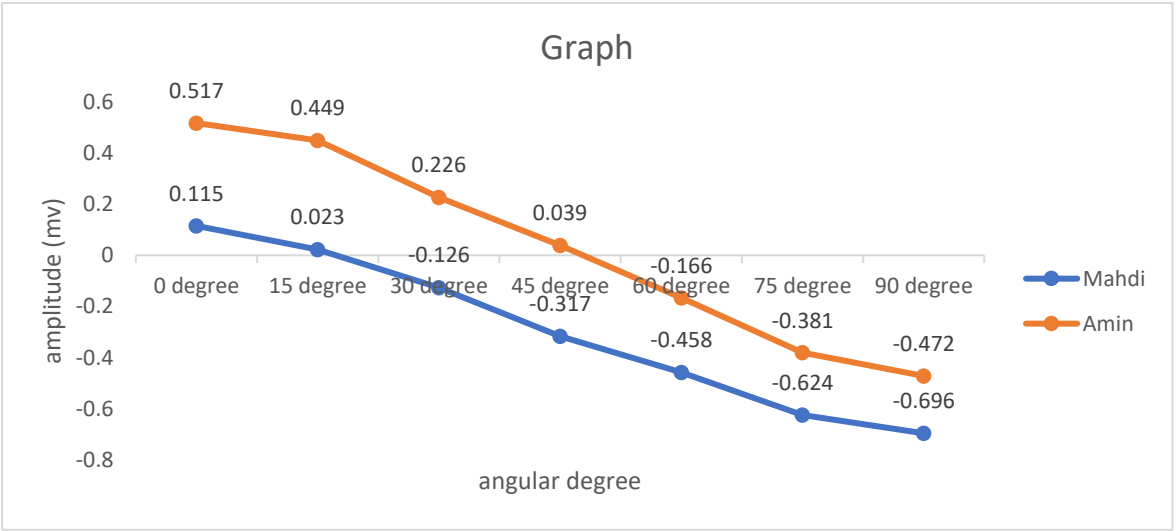
Amin's blink:



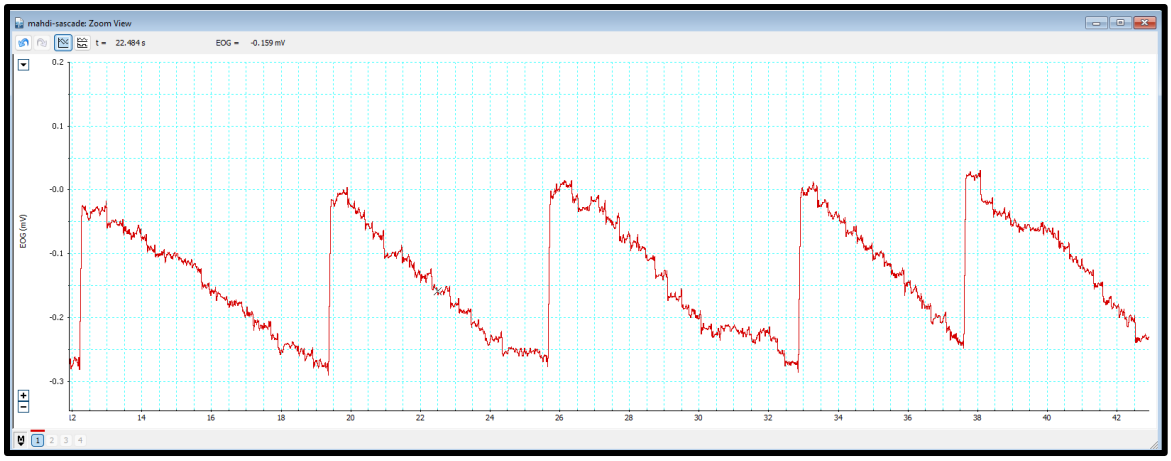
Amin's clinching:



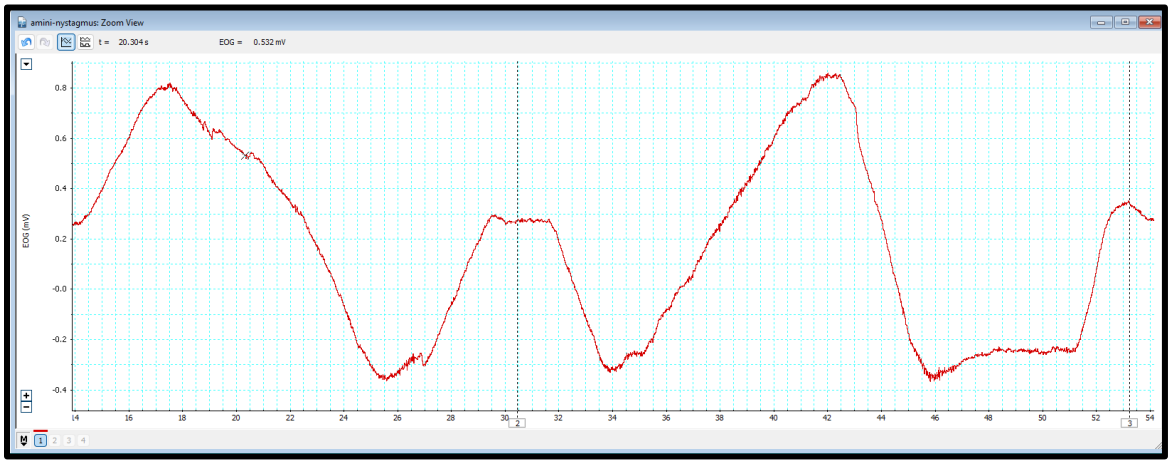
2. a graph of EOG amplitude (mv) versus angular displacement (degrees). On the graph, indicate the best-fit line through the data points.



3. a copy of the zoom view window showing saccade.

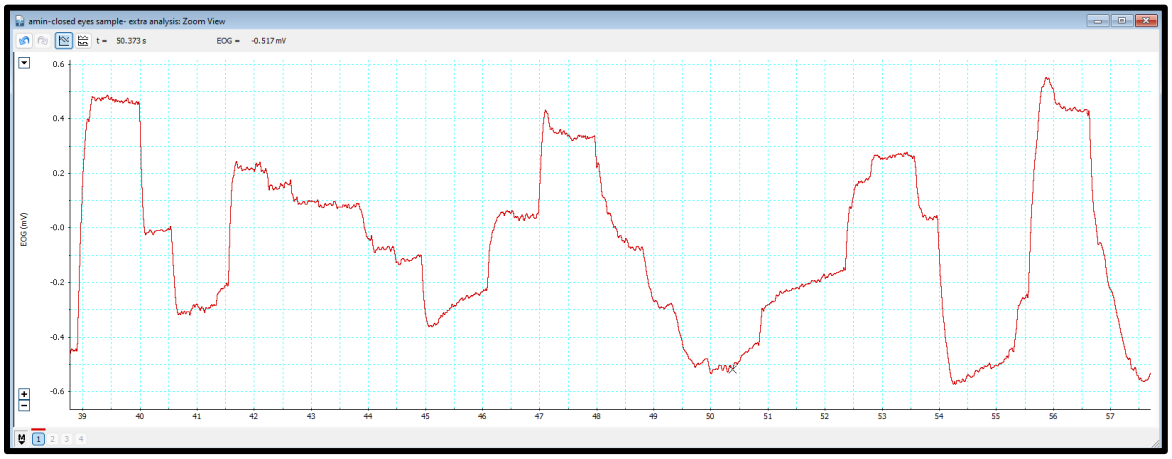


4. a copy of the zoom view window showing the EOG during nystagmus.



5. TESTING NYSTAGMUS WITH CLOSED EYES (EXTRA):

Closed eyes cause an inability to eye moving function. When the eyes are closed, the person is not able to see their surrounding therefor is they are unable to see as proper as they could with open eyes. The difference that is shown in the EOG signal in that when eyes are open the output signal is smoother and continuous in some manners, but when the eyes are closed, the signal is less smooth and more like a discrete signal jumping over multiple stages rapidly. (as explained, the brain doesn't get information of objects and their distances.)



Conclusions:

1. were you able to detect any EMG or blink artifacts in your experimental EOG recording? Briefly discuss why blinking would cause an artifact.

Yes, as shown, the blink signal has the potential to ruin our main signal and cause confusion in analysis. Because blinking causes change in the output signal amplitude. The best way to avoid this kind of confusion is to record the patient while blinking and the compensate the effect of the blink from the signal.

2. describe the relationship between EOG amplitude and angular displacement. was the response linear? discuss why you think you obtained this result.

As shown in the graph, the response is semi-linear and as we move to the right side of the wall (increase in angular displacement) the amplitude decreases while it increases by moving to the left side. The output is predictable because the displacement is increasing in equal proportions so it should be like a linear graph.

3. discuss the velocity of saccades in your recording. why are saccades an important aspect of vision? do you notice saccades when you are reading?

Velocity of saccades depend of the two factors, first factor is the length of line, the longer the line of text, the higher the change in amplitude so the saccades will be more visible and higher.

Saccades are essential for vision because they allow us to quickly and accurately shift our gaze to relevant objects or regions in our visual field. Without saccades, our vision would be static and limited to only the information present at the center of our field of view. Saccadic eye movements enable us to scan scenes, gather information, and make sense of our surroundings in a dynamic and efficient manner.

we're not consciously aware of these saccades, but they are essential for fluent and efficient reading comprehension. If saccadic movements are disrupted or impaired, reading can become slower and more challenging.

4. did saccades occur during slow tracking? if so, how can you explain their appearance in the data?

Yes, it happened but since the frequency of the pen is slow at first and then increases, the duration of saccade is decreasing over the exercise. and since the exercise is slow-tracking it doesn't show a significant change at the end of each side and the change of amplitude is smoother than saccade exercise but as reading a text when you jump to the next line there is a significant difference in the voltage of the signal.

5. how did the EOG amplitude compare between slow tracking and nystagmus? Discuss the relationship between the vestibular system and eye movements.

In slow-tracking the amplitude is discrete and not as smooth as the nystagmus exercise because the movement of the eyes in the slow-tracking exercise is quantized and not continuous therefore the signal is not continuous either.

The relationship between the vestibular system and eye movements is intricate and essential for maintaining visual stability during head movements and spatial orientation. The vestibular system, located in the inner ear, consists of the semicircular canals and otolith organs, which detect angular and linear acceleration, respectively. These signals are integrated with visual and proprioceptive information to coordinate eye movements and maintain gaze stability. When the vestibular system detects head movements, it sends signals to the brainstem and cerebellum, which in turn generate compensatory eye movements to stabilize gaze. This mechanism is crucial for counteracting the destabilizing effects of head motion and ensuring that the eyes remain focused on a target of interest despite changes in head position.