**Report on Loom Movement Data:**

12-18-23:

Meeting with Leanne notes:

* Discussed the long term goal of submission to a journal.
* Discussed need for additional matched control participants.

I started off the discussion showing Leanne the plot below and link this article:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1693116/pdf/12639336.pdf>

and Showing this Figure:

Which shows the general movement of the right hand going from grab to drop movements

The general discussion with Leanne around this data is that we need to find a way to characterize all the various measures in this study around central points in time. This type of data could be a way to identify the START and END position times for Movement analysis including:

* Velocity
* Acceleration
* Jerk

But also to time stamp the moments that we want to evaluate gaze and arousal as well.

**Next steps included: using not only the x-pos of the had but also the y and z to potentially isolate a more accurate start and end time for the movements.**

This is a portion of the plot from above. The circled segment is indicative that this data may require some filtering. After some research and a conversation with Juila, I am going to try a butterworth low pass filter. Julia also sent me this paper which I am using to create the filter parameters for order and cutoff frequency:

FILTERING SIGNALS FOR MOVEMENT ANALYSIS IN BIOMECHANICS - Francesco Crenna, 2015



I currently need to decide what filter order I am going to use, but to test out the various types I need to set up a trial filter. I can not seem to find a single study that analyses VR Controller movement data AND uses a filter (smooths) the data. I am not sure if this is because it is unnecessary or some other reason… I have identified what I think is most likely noise in the plot above but, it really doesn’t seem like a big deal.

I think the best option at this point is to plug and play to see if anything changes.

So I have tired multiple different kinds of butterworth filters and none of them seem to work as intended, which I probably my fault, however I also looked high and low for any kind of VR movement analysis that is doing filtering and I can not find a single instance.

I did find this paper:

<https://link.springer.com/article/10.1007/s10055-022-00722-7>

Which talk about the use of controller movement vs hand movements in VR.

VR Movement References of Note:

1. <https://academic.oup.com/ptj/article/95/3/415/2686558>
   1. Discussing the validity of VR movements
2. <https://link.springer.com/article/10.1186/1743-0003-8-36>
   1. Measurement of movement in VR