Preliminary Analysis of Stroke Participant's Movement

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Analysis notes:

- Movement when the ball is green is removed. (Only matters for 1 or 2 participants)
- Movement when participant is not lifted is removed. (Negligible effect on results)
- Window of +/- 0.3Hz

Ball frequency is a significant factor in nearly every ANOVA that was performed. Because this result could be due to factors other than the participant's ability to produce motion at the ball's resonant frequency, I do not note if ball frequency is significant in this document.

1 Overall results

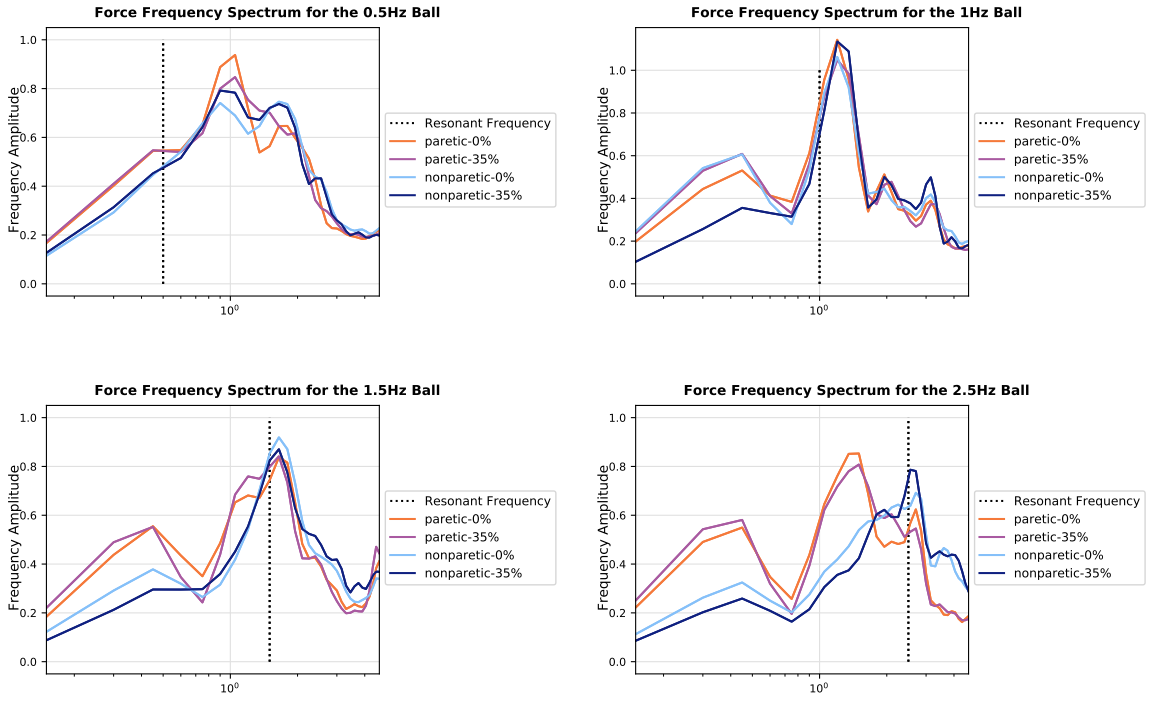

Figure 1: Aggregate Frequency Spectrums. With the 1.5Hz and 2.5Hz ball, participants struggled to reach the resonant frequency with their paretic arm, resulting in a mound (or, for 2.5Hz, a second peak) below the resonant frequency. No trends are apparent at 0.5Hz

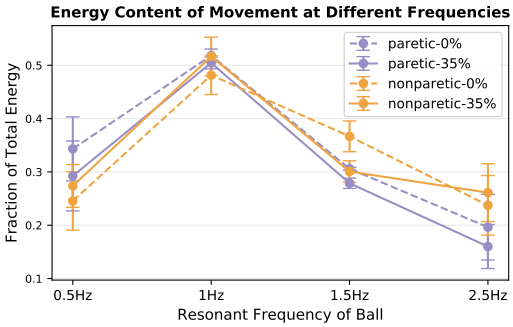

Figure 2: Energy at the resonant frequency of the ball metric. Arm is significant (p=0.015). The interaction effect between arm and ball frequency is significant (p=0.003). For the 2.5Hz ball, arm has a significant effect on the energy at resonance (p<0.001). For the 1.5Hz ball, arm has a significant effect on the energy at resonance (p=0.018). For the 1Hz ball, arm does not have a significant effect on the energy at resonance (p=0.124). For the 0.5Hz ball, arm has a significant effect on the energy at resonance (p=0.030). Within the paretic arm, loading does not affect energy at resonance (p=0.893).

2 Moderate-Severe Stroke Aggregate Results

Included participants: Sub208 (FMA-37), S211 (FMA-17), S212 (FMA-13)

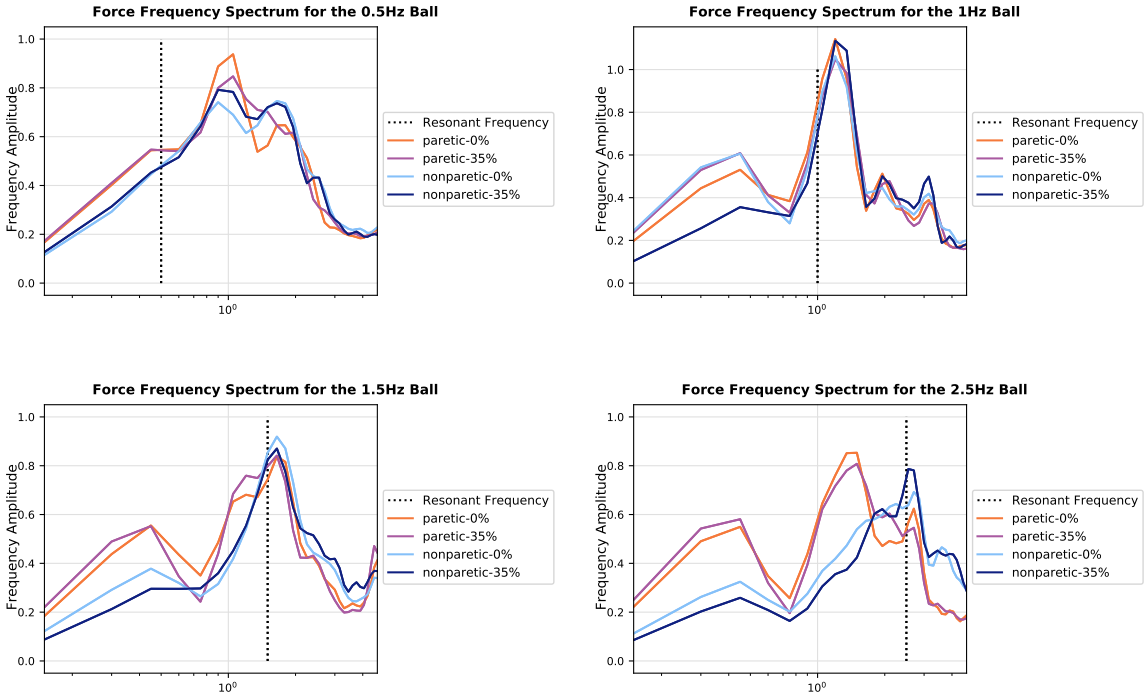

Figure 3: Aggregate Frequency Spectrums for participants with moderate-severe stroke. Trends are stronger than all participants combined. With the 1.5Hz and 2.5Hz ball, participants struggled to reach the resonant frequency with their paretic arm, resulting in a mound (or, for 2.5Hz, a second peak) below the resonant frequency. No trends are apparent at 0.5Hz.

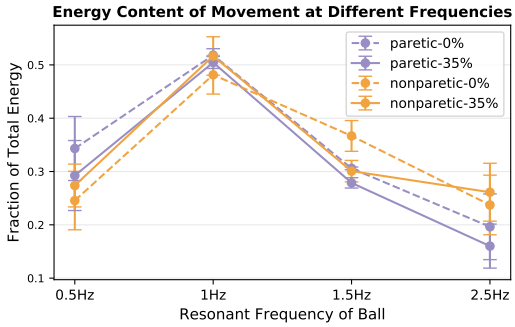

Figure 4: Energy at the resonant frequency of the ball metric for participants with moderate and severe stroke. Loading is close to significance (p=0.122). Arm is close to significance (p=0.113). The interaction effect between arm and ball frequency is significant (p<0.001) with the effect size of arm higher at higher frequencies.

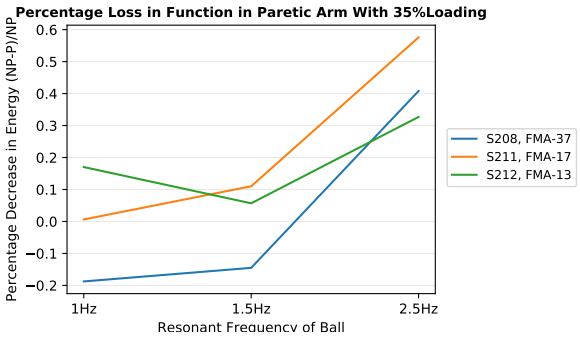

Figure 5: Percent loss in paretic arm with loading in moderate and severe stroke. Positive values indicate better performance in the nonparetic arm. Negative values indicate better performance in the paretic arm. Ball frequency is significant (p=0.003) with energy at resonance using the 2.5Hz ball being different from the rest.

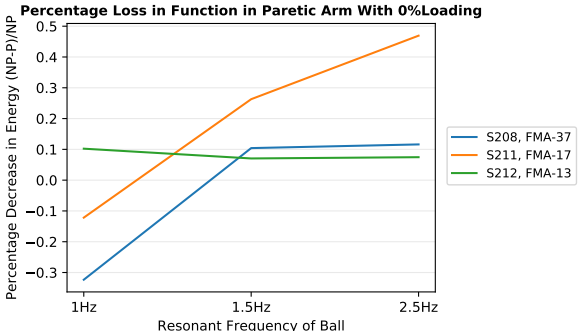

Figure 6: Percent loss in paretic arm with no loading in moderate and severe stroke. Positive values indicate better performance in the nonparetic arm. Negative values indicate better performance in the paretic arm. Ball frequency is not significant (p=0.164) with energy at resonance using the 2.5Hz ball being different from the rest.

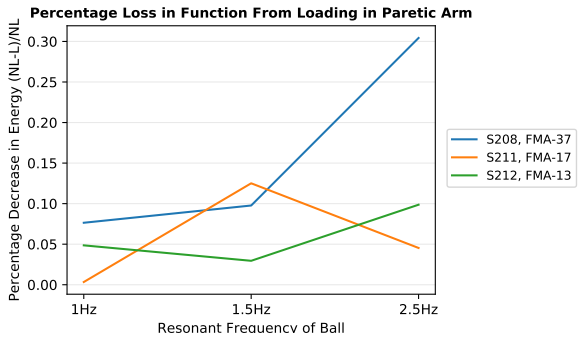

Figure 7: Percent loss in function in the paretic arm due to loading in moderate and severe stroke. Positive values indicate better performance during no loading. Negative values indicate better performance with loading. No trend w.r.t. frequency is apparent. Values are generally positive, indicating better performance without loading. No statistical significance.

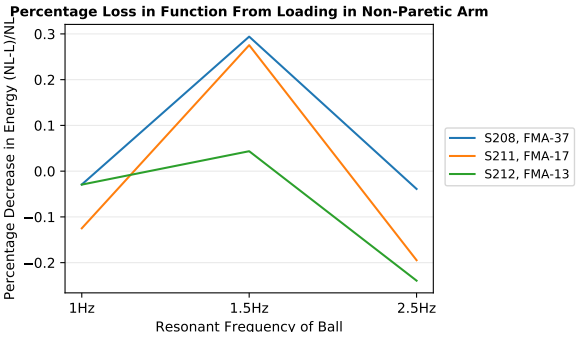

Figure 8: Percent loss in function in the paretic arm due to loading in moderate and severe stroke.. Positive values indicate better performance during no loading. Negative values indicate better performance with loading. No trend is apparent. No statistical significance.

3 Individual Subject Results

3.1 S202; FMA = 51

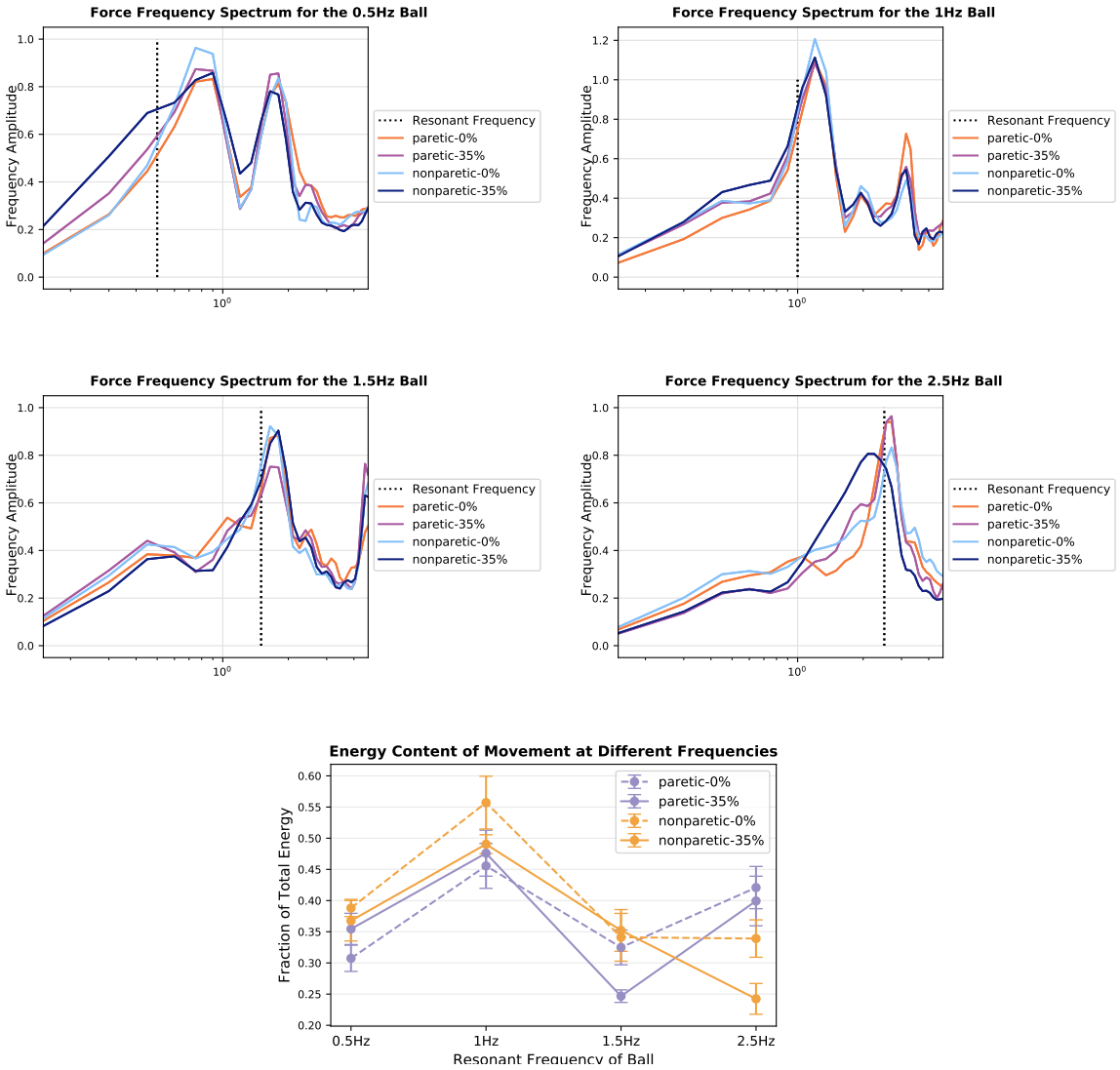

Figure 9: Subject 202 Frequency Spectrums. Interation effect between arm and ball frequency ($p<0.001$). P-values for factor arm is significant for 2.5Hz ball. For the 1.5Hz ball, loading is a significant factor in the paretic arm. For the 2.5Hz ball, loading is a significant factor in the non-paretic arm. Ball frequency is a significant factor for percent decrease in paretic arm with loading with 2.5Hz being different.

3.2 S203; FMA = 49

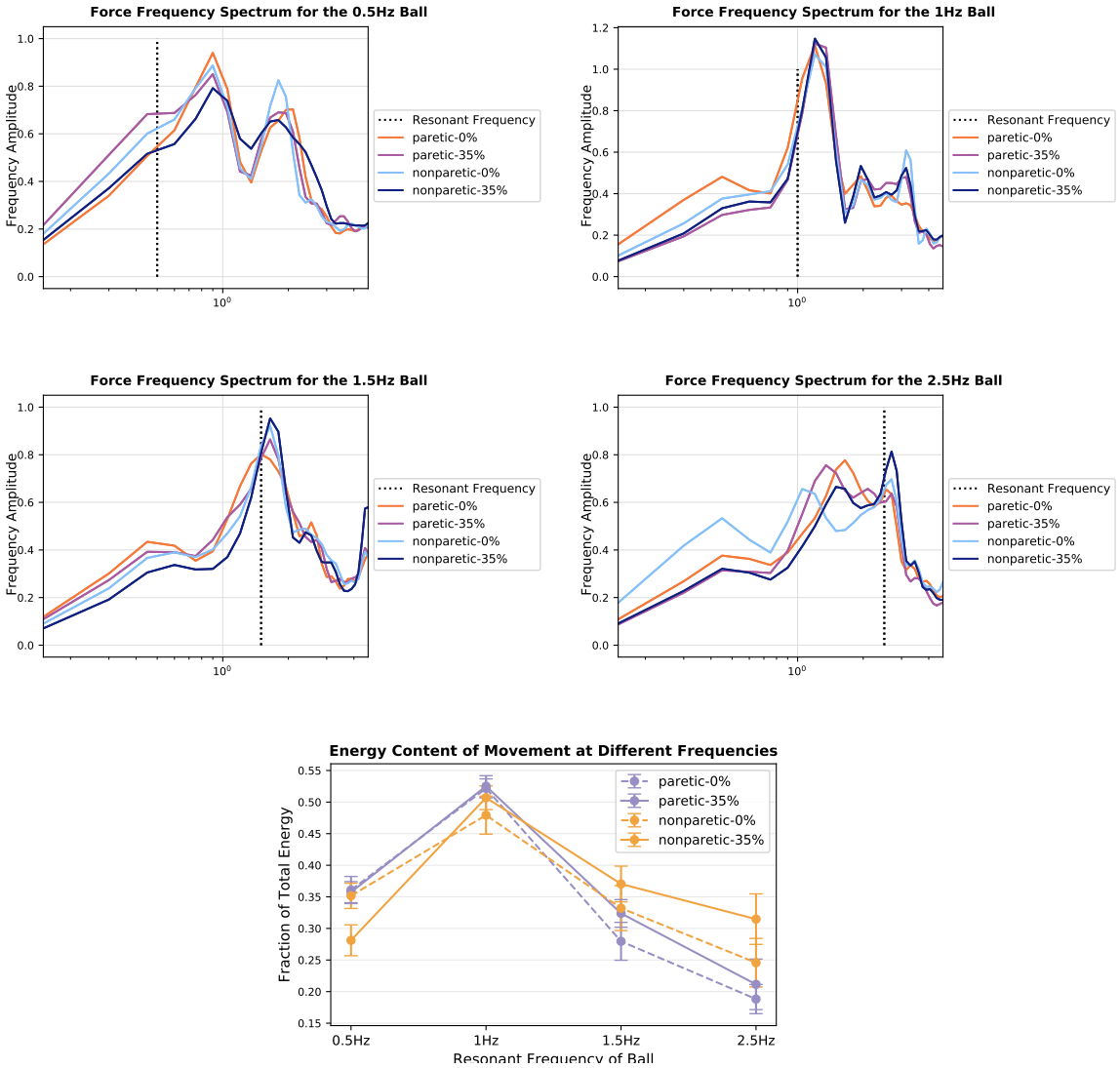

Figure 10: Subject 203 Frequency Spectrums. Interation effect between arm and ball frequency ($p<0.01$). For the 2.5Hz ball, arm is a significant factor. Ball frequency is a significant factor for percent decrease in paretic arm with loading with 0.5Hz being different.

3.3 S205; FMA = 34

The participant was not able to match the resonant frequency of the 1.5Hz and 2.5Hz balls with their nonparetic limb. Therefore, this participant was removed from the aggregate analyses.

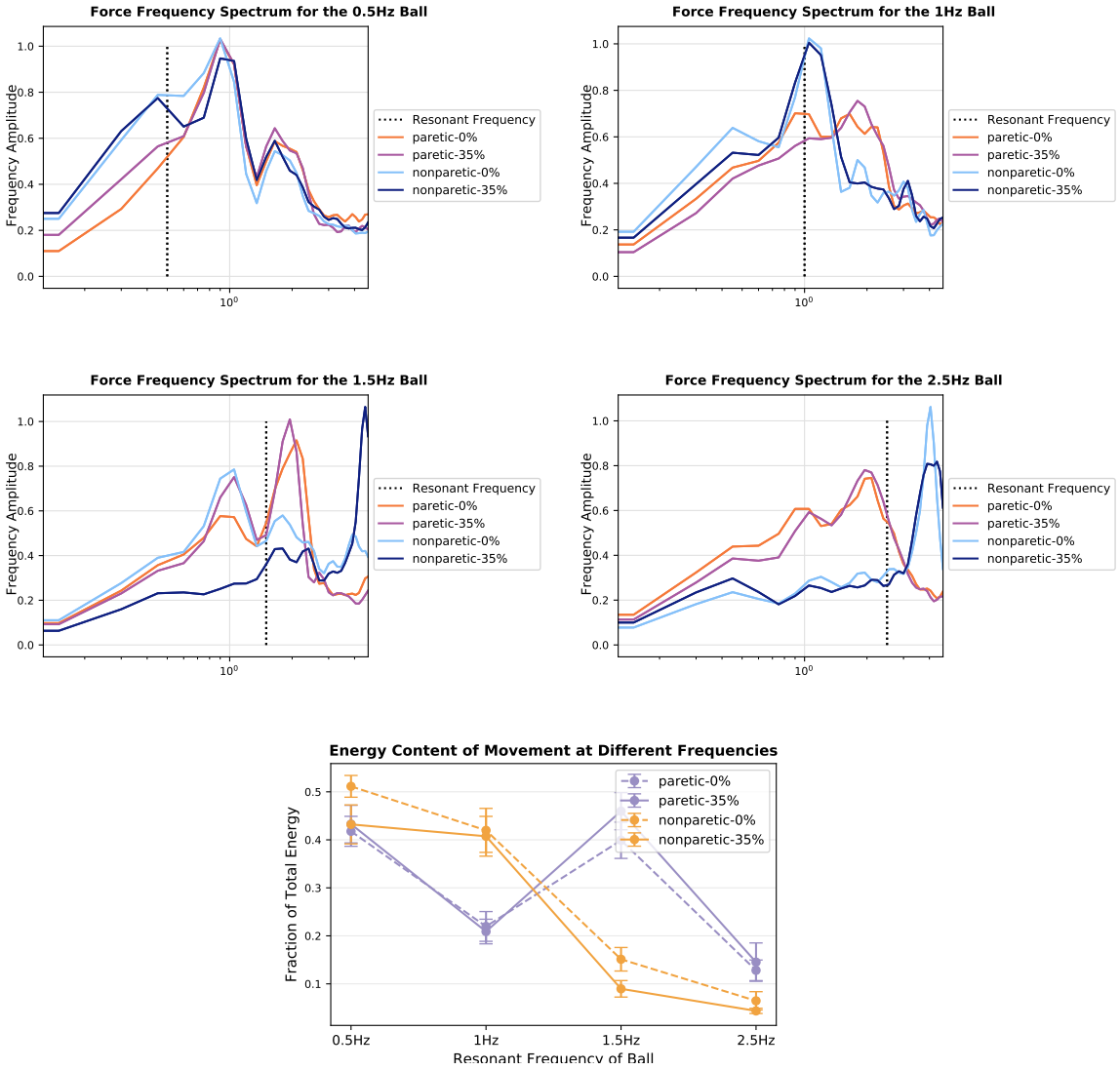

Figure 11: Subject 205 Frequency Spectrums

3.4 S207; FMA = 30

The participant was not able to match the resonant frequency of the 1.5Hz and 2.5Hz balls with their nonparetic limb. Therefore, this participant was removed from the aggregate analyses.

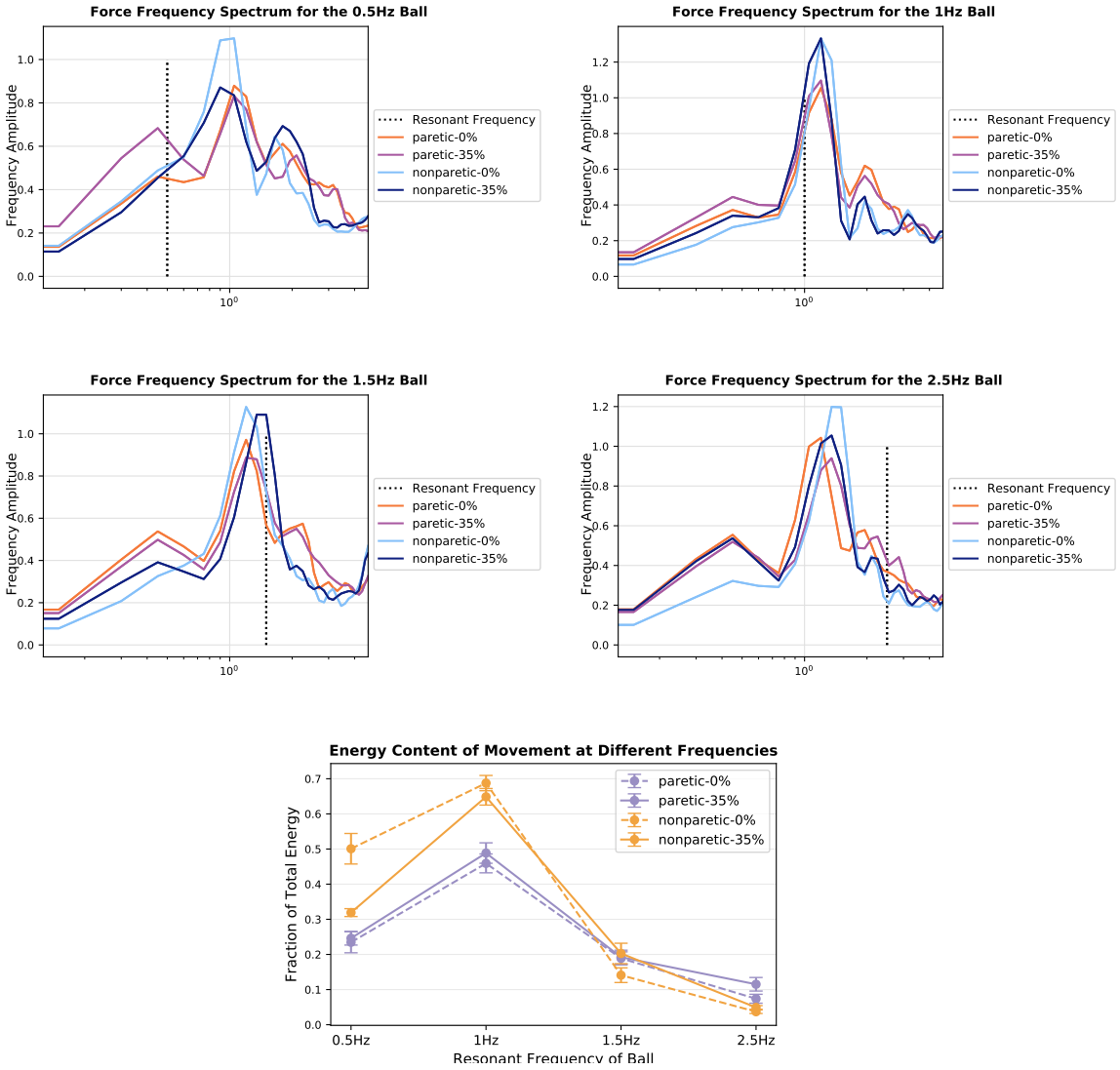

Figure 12: Subject 207 Frequency Spectrums

3.5 S208; FMA = 37

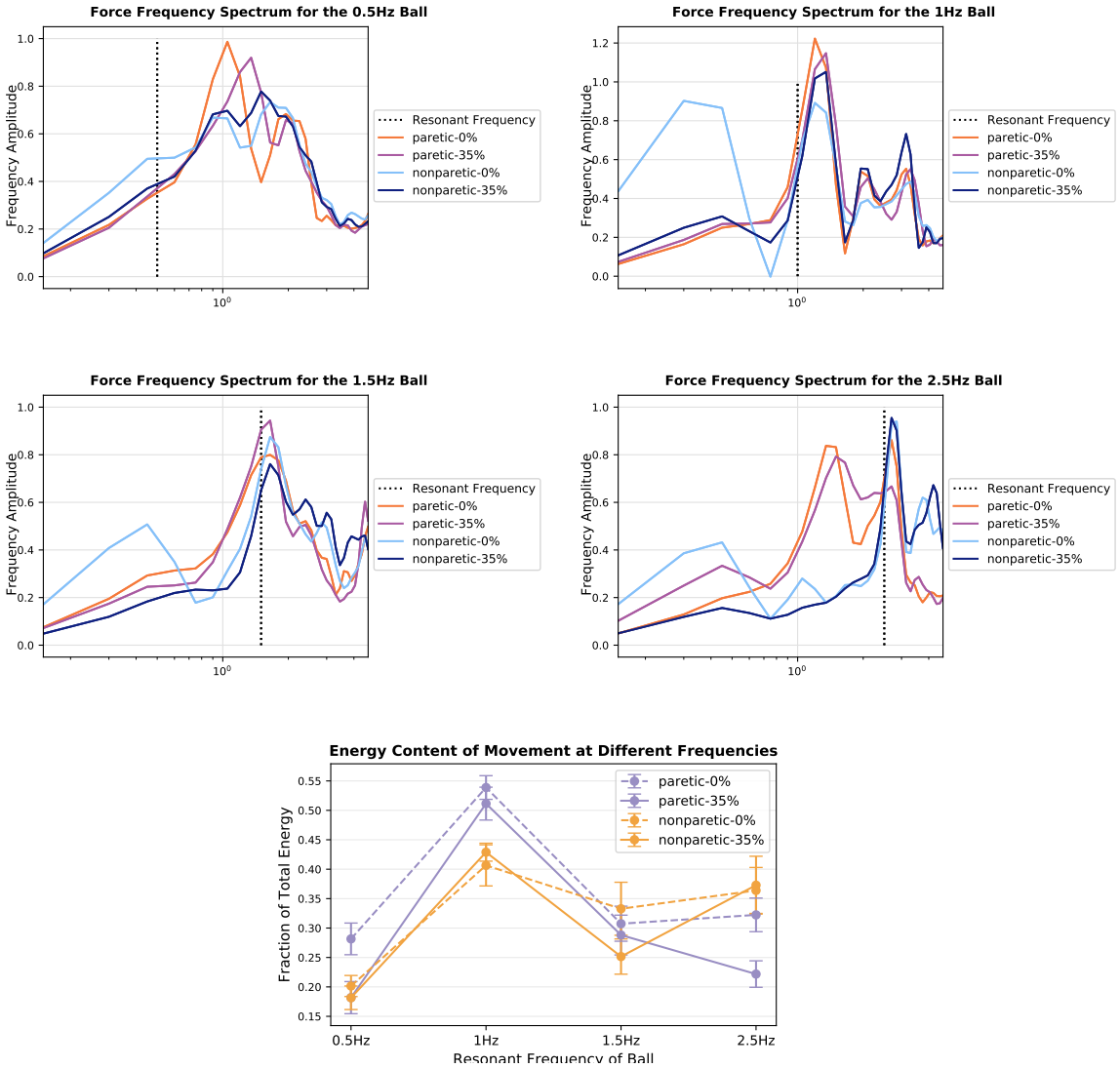

Figure 13: Subject 208 Frequency Spectrums. Interation effect between arm and ball frequency ($p<0.001$). Loading is a significant factor ($p<0.05$). For the 1Hz and 2.5Hz ball, arm is a significant factor, $p<0.001$ and $p<0.05$ respectively. For the 0.5Hz and 2.5Hz ball, loading is a significant factor in the paretic arm ($p<0.05$).

3.6 S209; FMA = 49

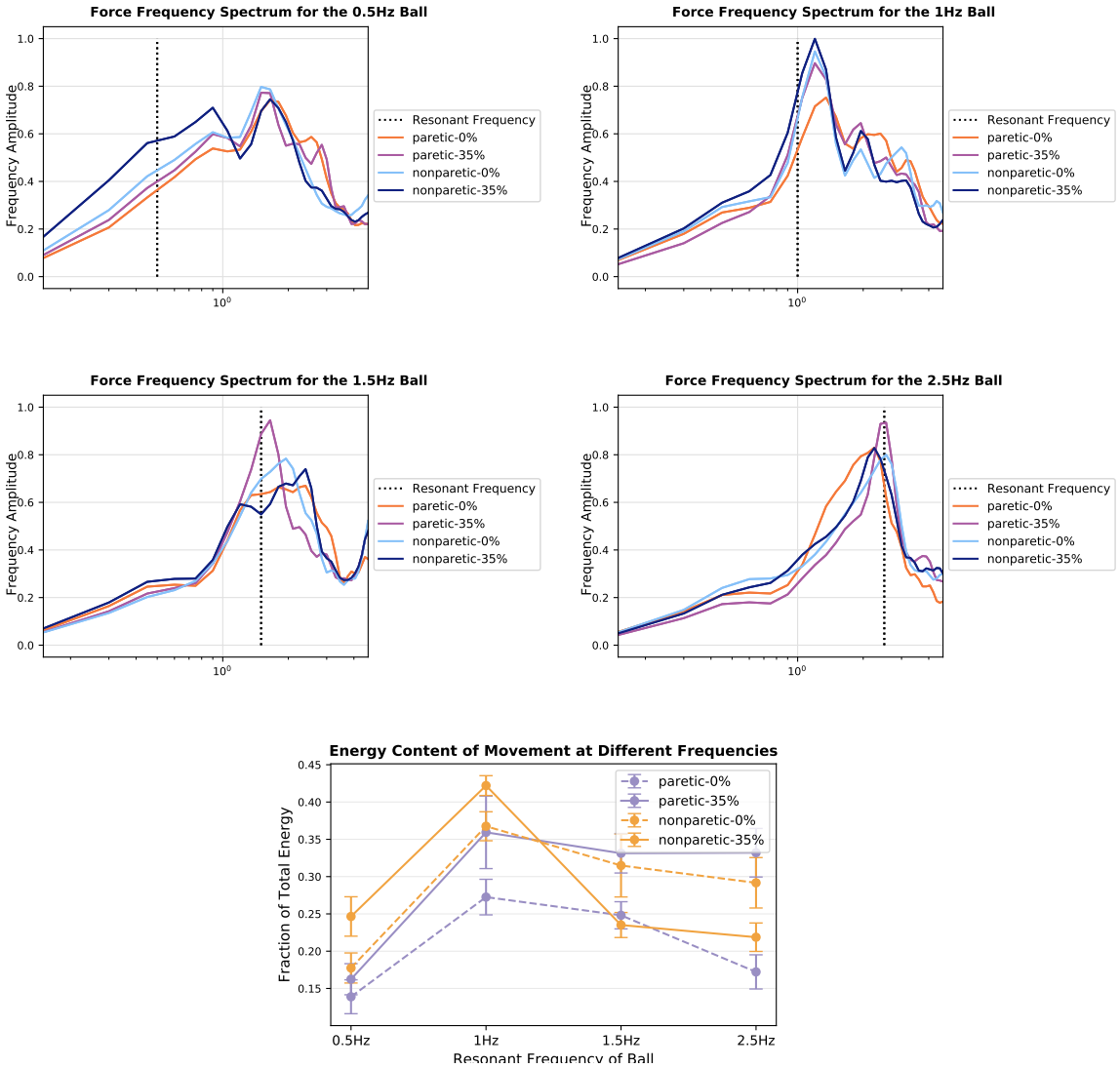

Figure 14: Subject 209 Frequency Spectrums. Interation effect between arm and ball frequency ($p<0.05$). Arm and loading are significant factors. Interaction effect between arm, ball frequency, and loading....pretty much everything is significant.

3.7 S211; FMA = 17

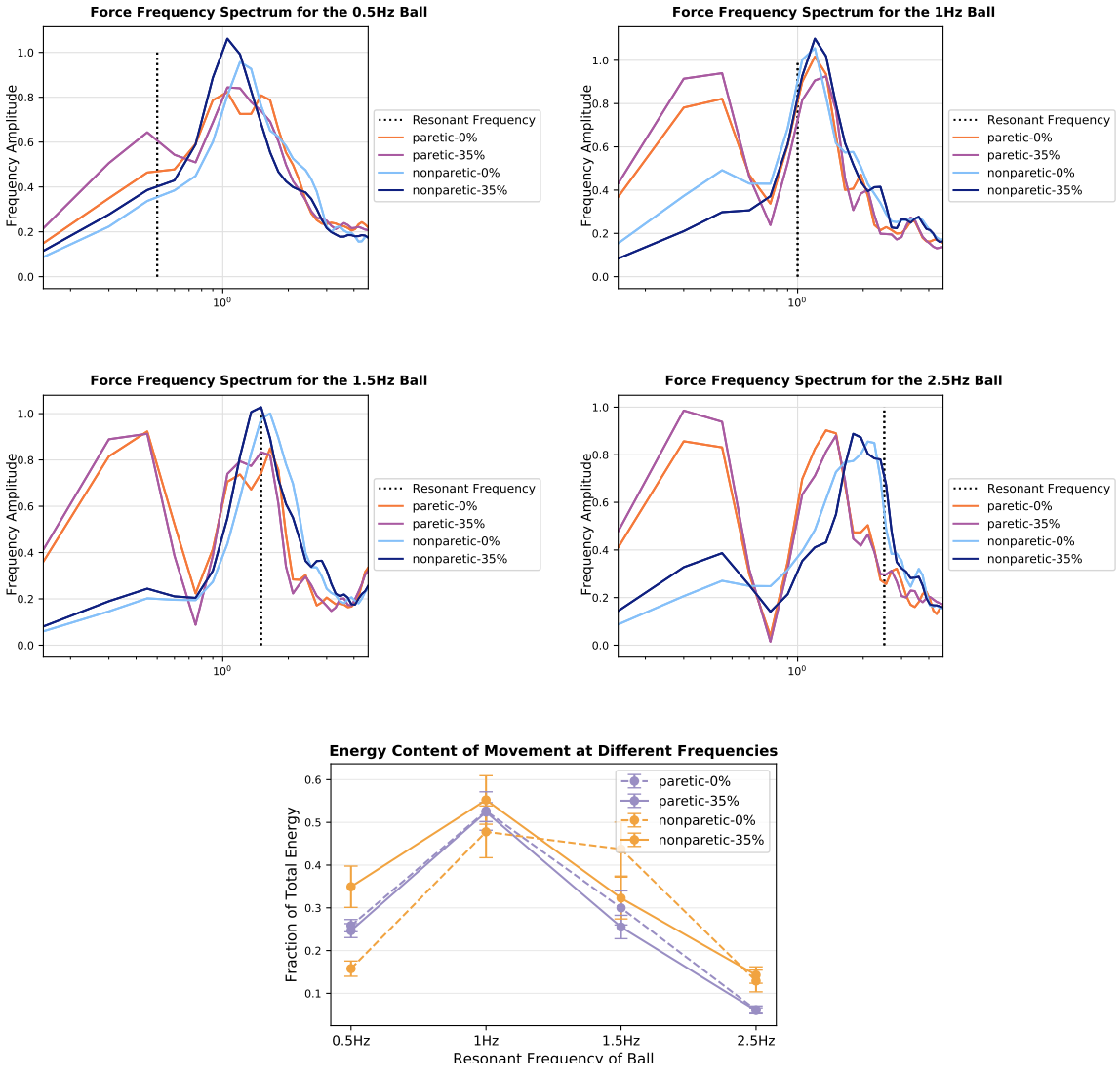

Figure 15: Subject 211 Frequency Spectrums. Interation effect between loading and ball frequency ($p<0.05$). For the 2.5Hz ball, arm is a significant factor.

3.8 S212; FMA = 13

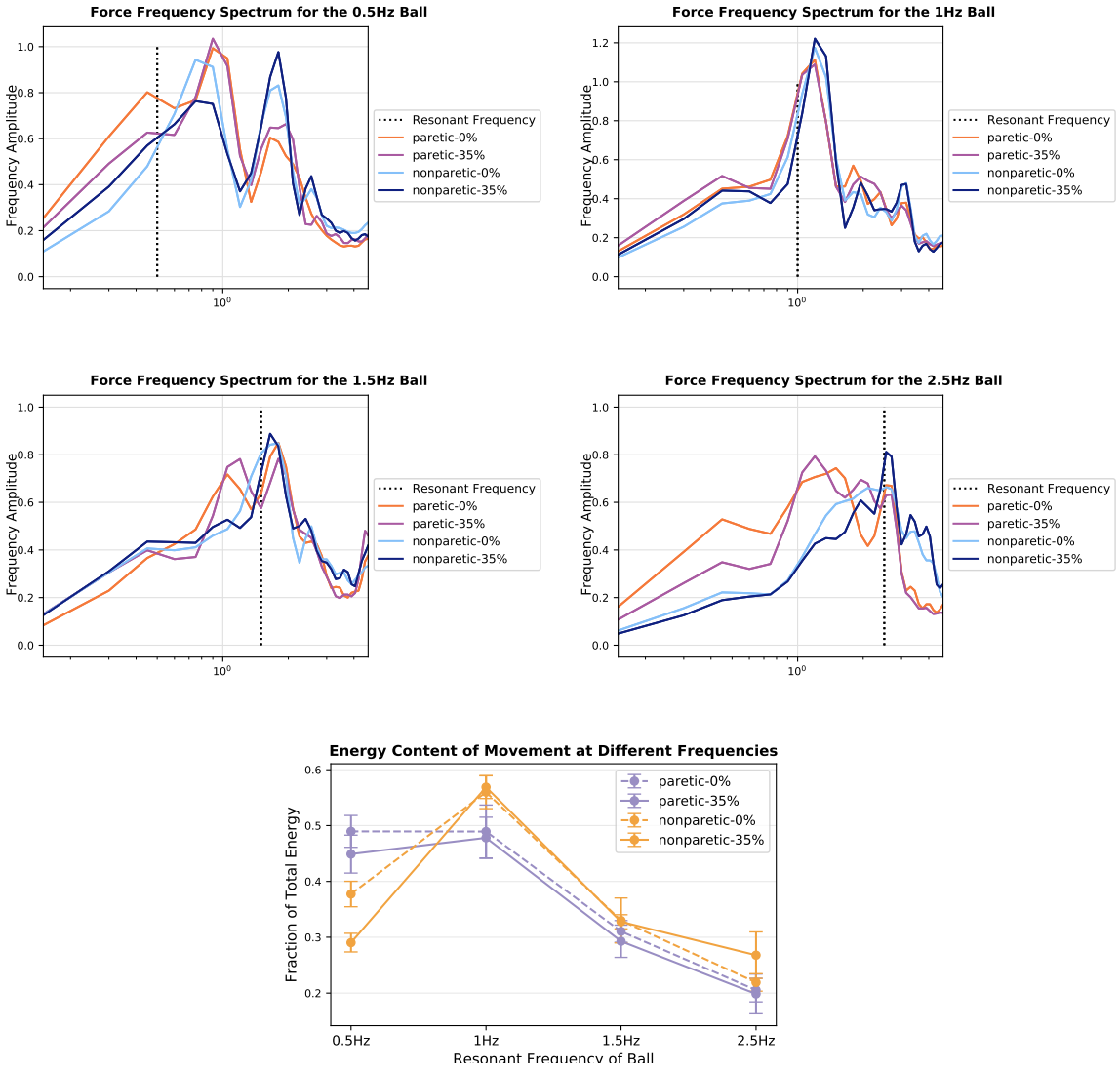

Figure 16: Subject 212 Frequency Spectrums. Interation effect between arm and ball frequency ($p<0.001$). For the 0.5Hz and 1Hz balls, arm is a significant factor. Ball frequency is a significant factor for percent decrease in paretic arm with loading with 0.5Hz being different.

3.9 S214; FMA = 30?

So far, only the first day of the experiment has been completed.

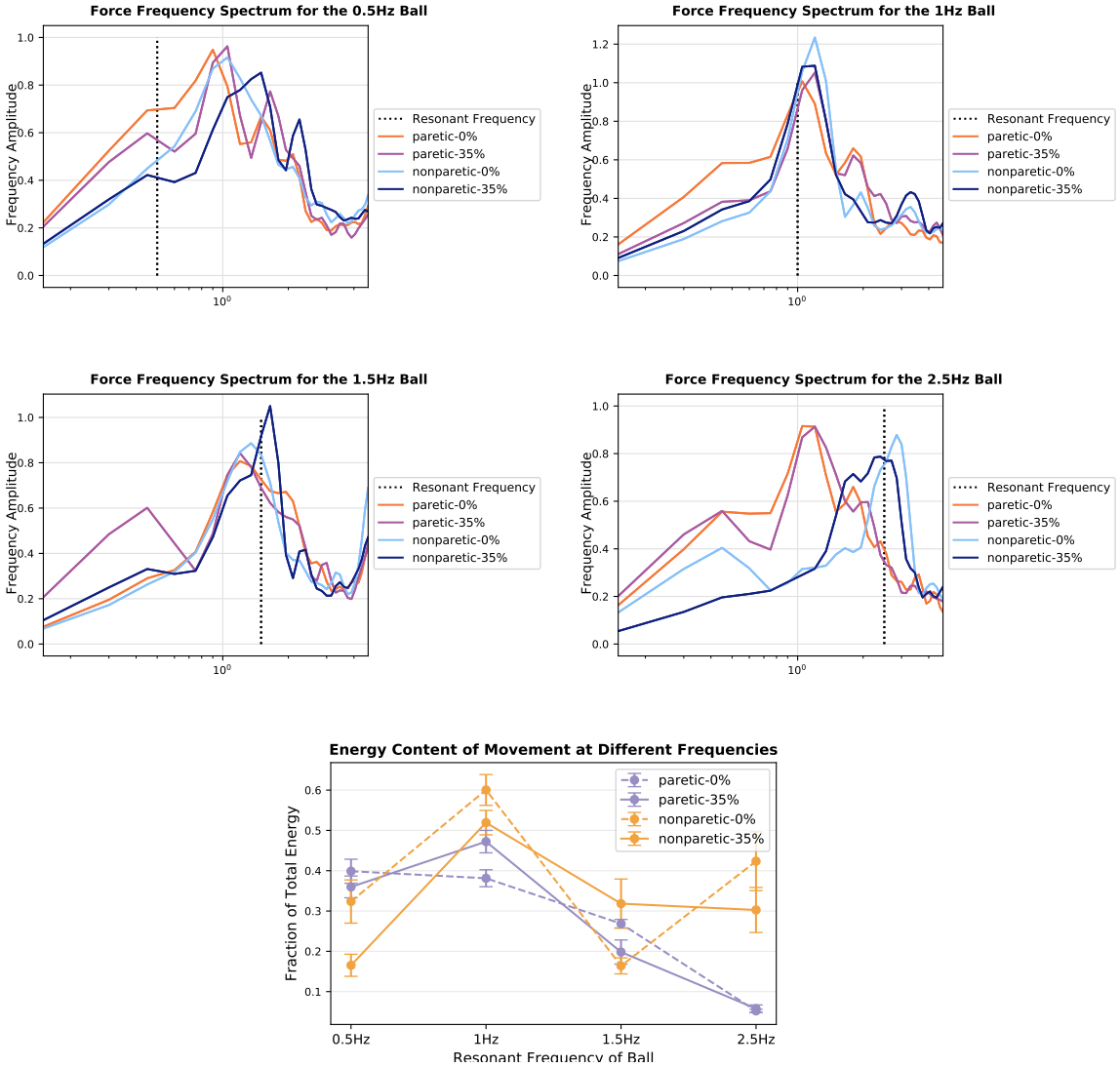

Figure 17: Subject 214 Frequency Spectrums.

3.10 S215; FMA = 50?

The participant was not able to match the resonant frequency of the 1.5Hz and 2.5Hz balls with their nonparetic limb. Therefore, this participant was removed from the aggregate analyses.

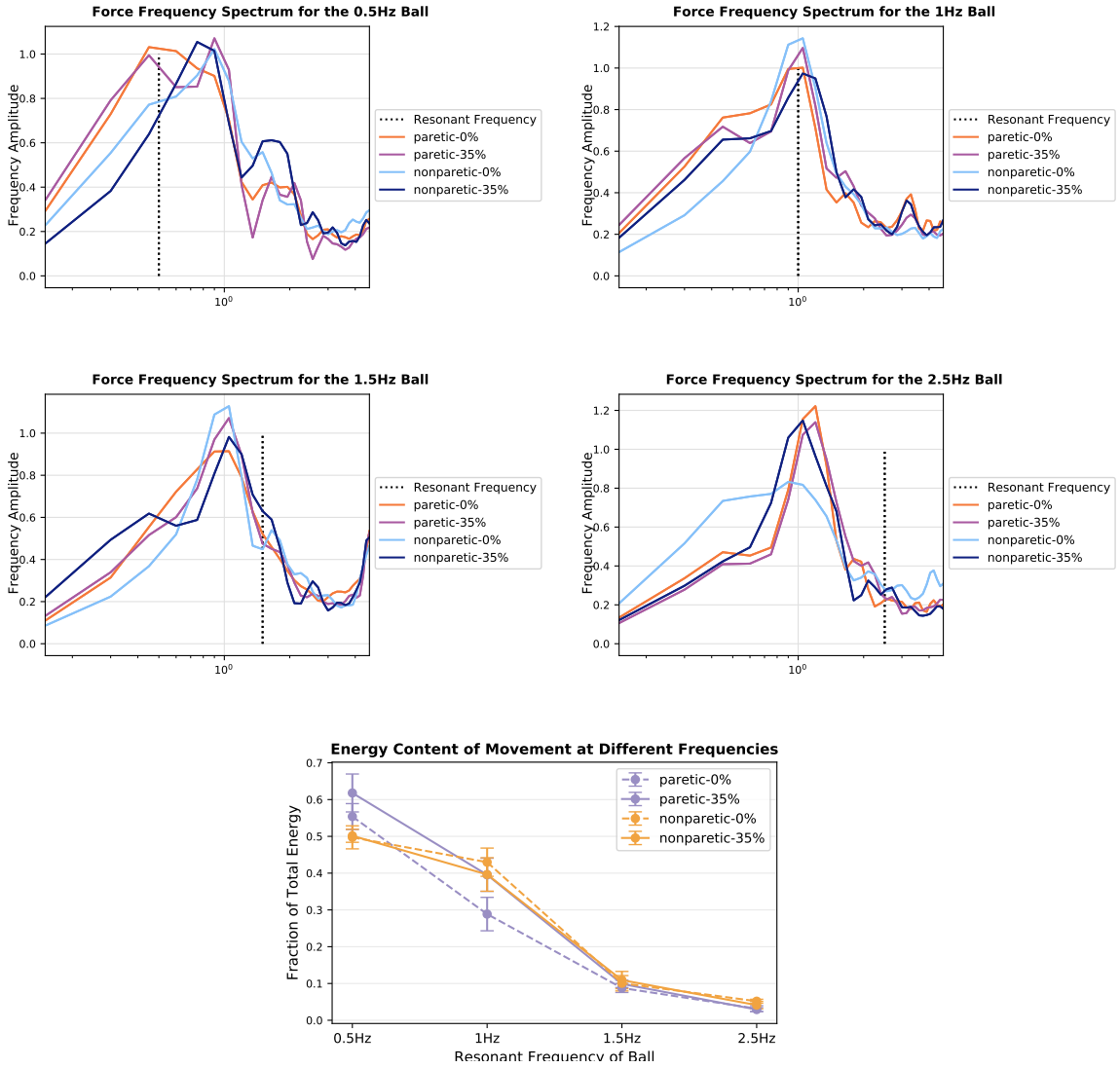

Figure 18: Subject 215 Frequency Spectrums.