

Increased muscle power generation and absorption improves walking speed in persons early post stroke – A pilot study

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Introduction

- Stroke patients have decreased walking capability and walking speed compared to healthy controls
- Gait kinematics and kinetics are decreased in both limb compared to healthy controls
- Descriptive studies have reported highly positive correlations between power variables in sagittal plan (Hip: H1-S, H3-S; Knee: K3-S; Ankle: A2-S) and in frontal plan (Hip: H3-F) and in walking speed. This is reported both in the non-impaired side (NS) and in the impaired side (IS)
- Few intervention studies have shown an increase in H1-S on both sides and A2-S on IS chronic stroke patients (> 6 month) together with an increase in walking speed
- No causal relationship between the presented power variables and walking speed has been evaluated in subacute stroke patients

Hypothesis

- Muscle power generation and absorption peak during gait (H1-S, H3-S, K3-S, A2-S and H3-F) increase in both limb when walking speed increases in subacute stroke patients

Materials and Method

- Inclusion: Subacute stroke patients (< 3 month; middle cerebral artery) With a walking speed less than 0.5 m/s with or without support by a stick
- Intervention: Three weeks of gait training in a body weight supported treadmill assisted by a robotic orthosis followed by three weeks of conventional gait rehabilitation
- Power variables were collected in a 3D gait analysis lab (Vicon Motion lab, V612) at inclusion and after six weeks
- Changes in variables were visually examined at graphs for differences at baseline and after intervention

Results

- A median improvement of 0.39 m/s (range: 0.34-0.76 m/s) in walking speed was seen after gait training
- Power variables increased with improvement in walking speed
- Power graphs of one participant are shown in figure 1-8

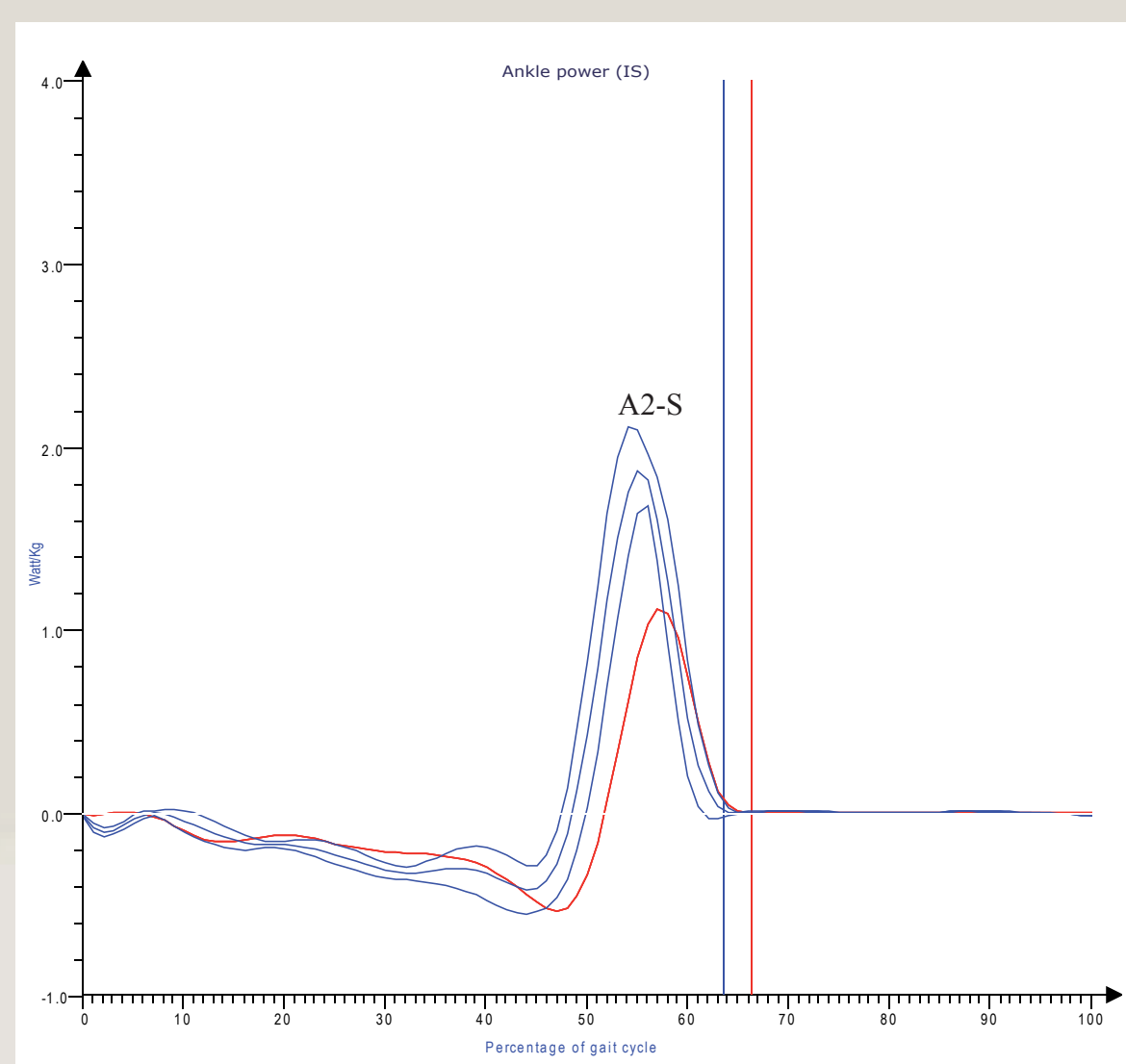


Fig. 1. Mean (SD) and single ankle power on the impaired side (IS) are measured in the sagittal plan and normalised to percentage gait cycle. Red curve represent baseline ankle power and blue curve represent ankle power after intervention. Vertical red and blue line represent end of stance face (toe-off) at baseline and follow-up, respectively.

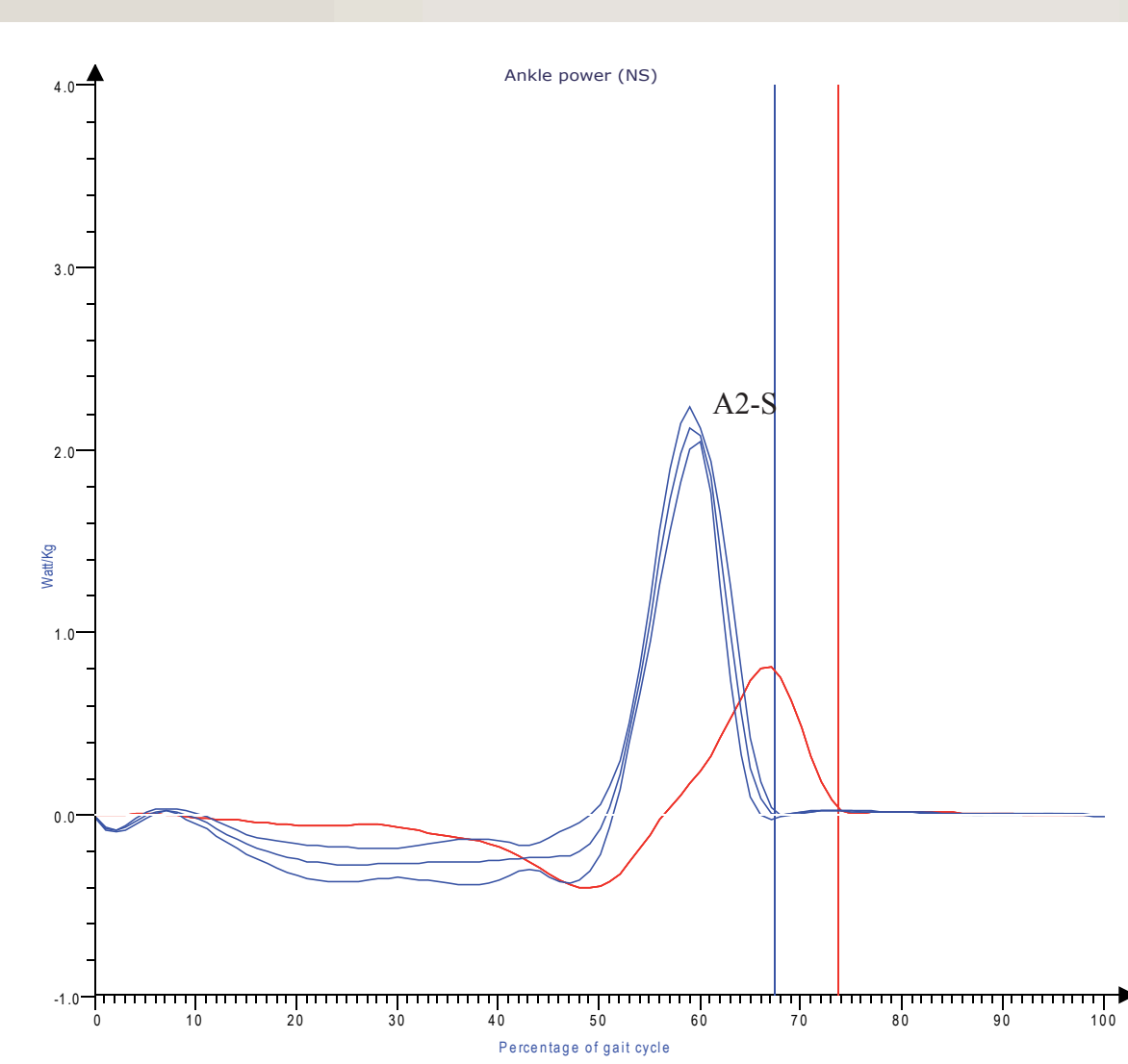


Fig. 2. Mean (SD) and single ankle power on the non-impaired side (NS) are measured in the sagittal plan and normalised to percentage gait cycle. Red curve represent baseline ankle power and blue curve represent ankle power after intervention. Vertical red and blue line represent end of stance face (toe-off) at baseline and follow-up, respectively.

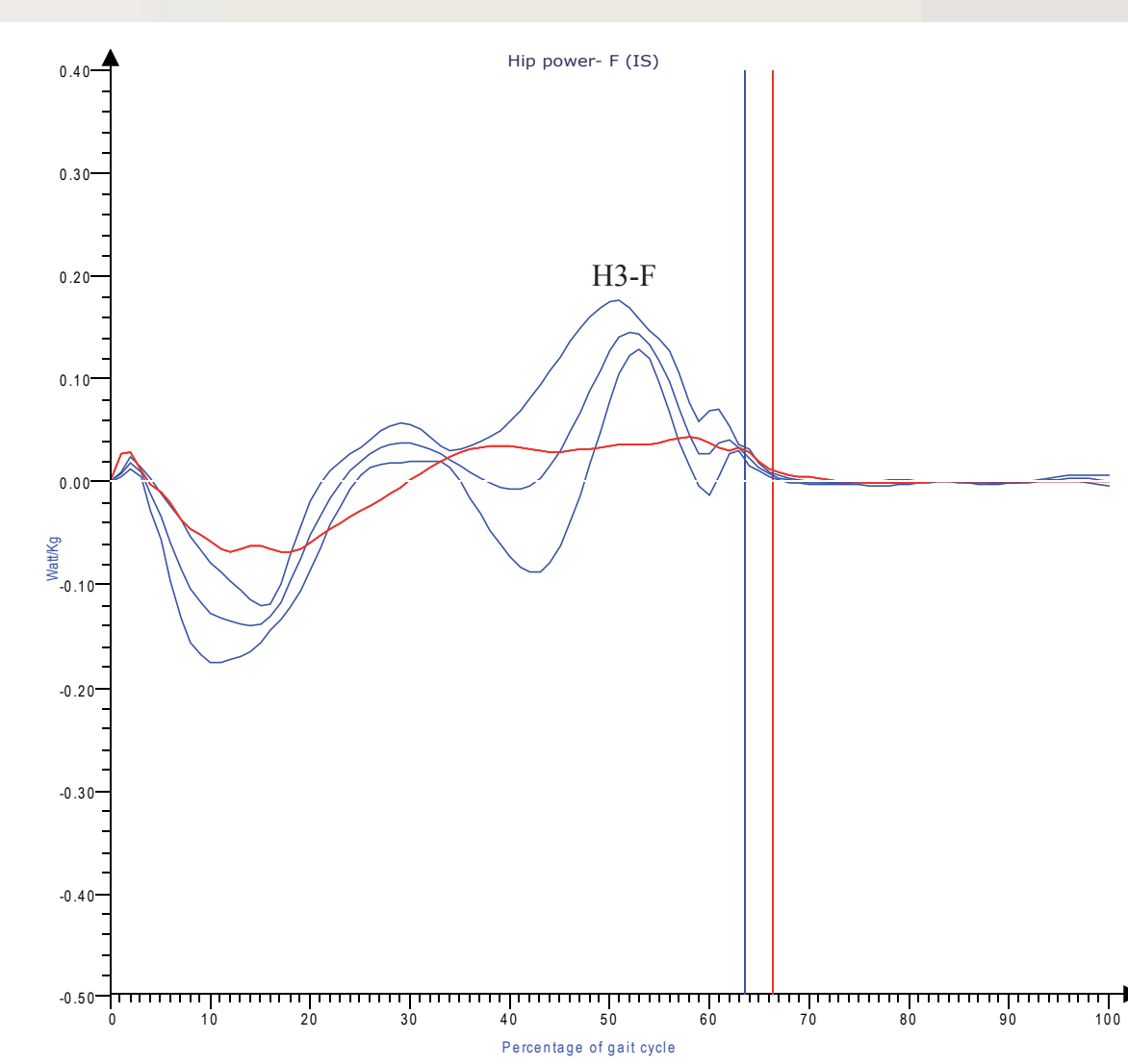


Fig. 3. Mean (SD) and single hip power on the impaired side (IS) are measured in the frontal plan and normalised to percentage gait cycle. Red curve represent baseline hip power and blue curve represent hip power after intervention. Vertical red and blue line represent end of stance face (toe-off) at baseline and follow-up, respectively.

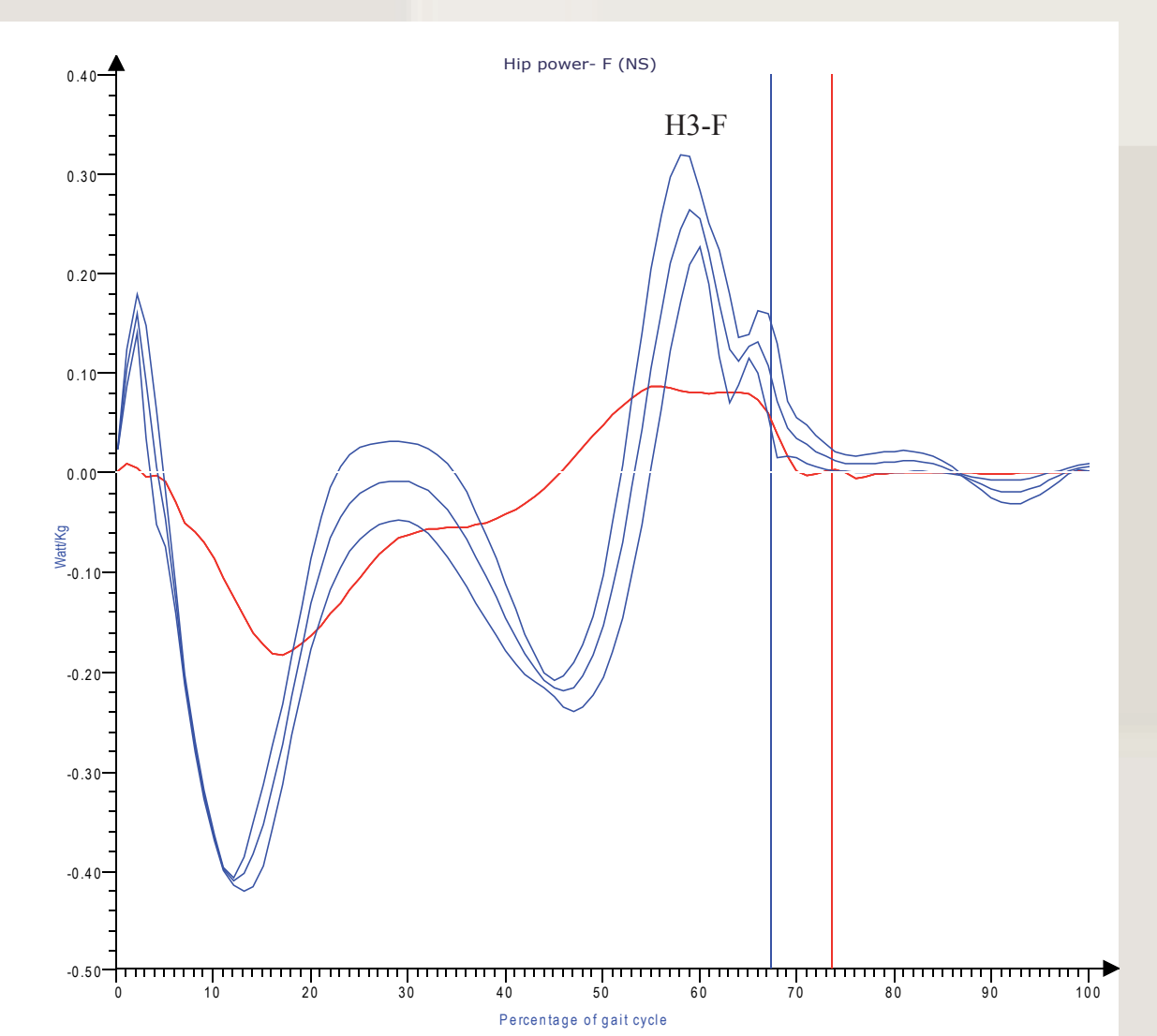


Fig. 4. Mean (SD) and single hip power on the non-impaired side (NS) are measured in the frontal plan and normalised to percentage gait cycle. Red curve represent baseline hip power and blue curve represent hip power after intervention. Vertical red and blue line represent end of stance face (toe-off) at baseline and follow-up, respectively.

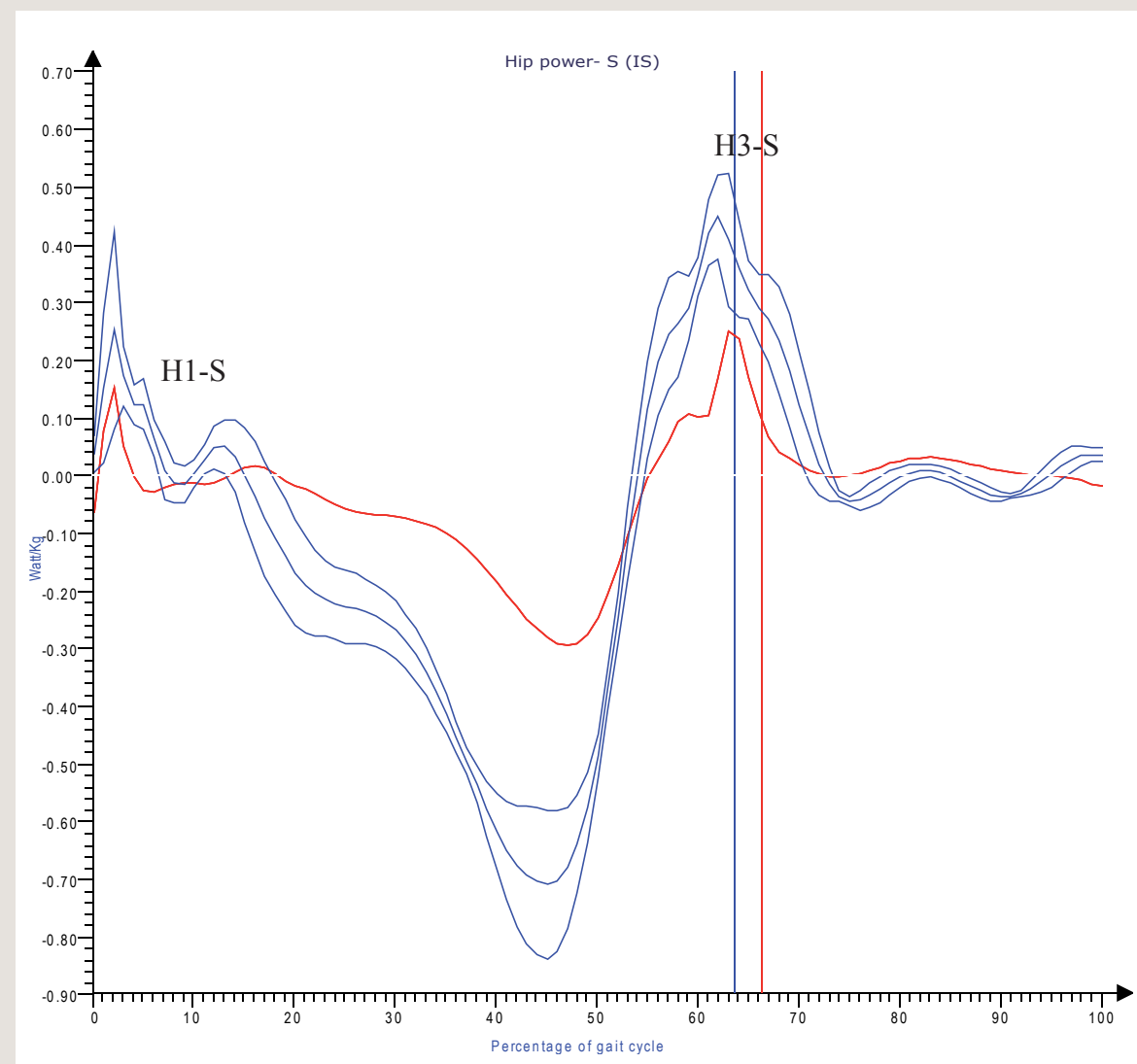


Fig. 5. Mean (SD) and single hip power on the impaired side (IS) are measured in the sagittal plan and normalised to percentage gait cycle. Red curve represent baseline hip power and blue curve represent hip power after intervention. Vertical red and blue line represent end of stance face (toe-off) at baseline and follow-up, respectively.

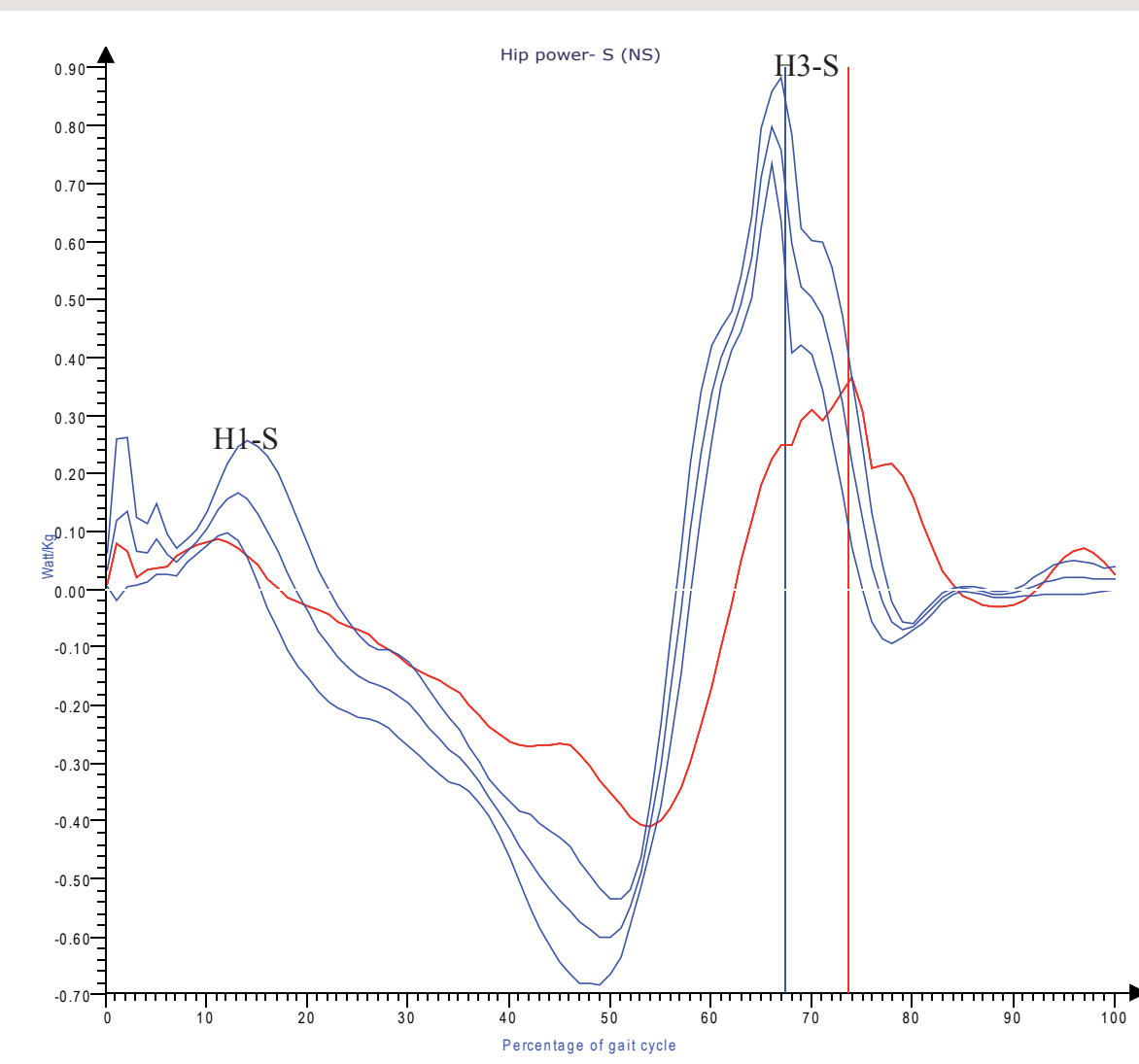


Fig. 6. Mean (SD) and single hip power on the non-impaired side (NS) are measured in the sagittal plan and normalised to percentage gait cycle. Red curve represent baseline hip power and blue curve represent hip power after intervention. Vertical red and blue line represent end of stance face (toe-off) at baseline and follow-up, respectively.

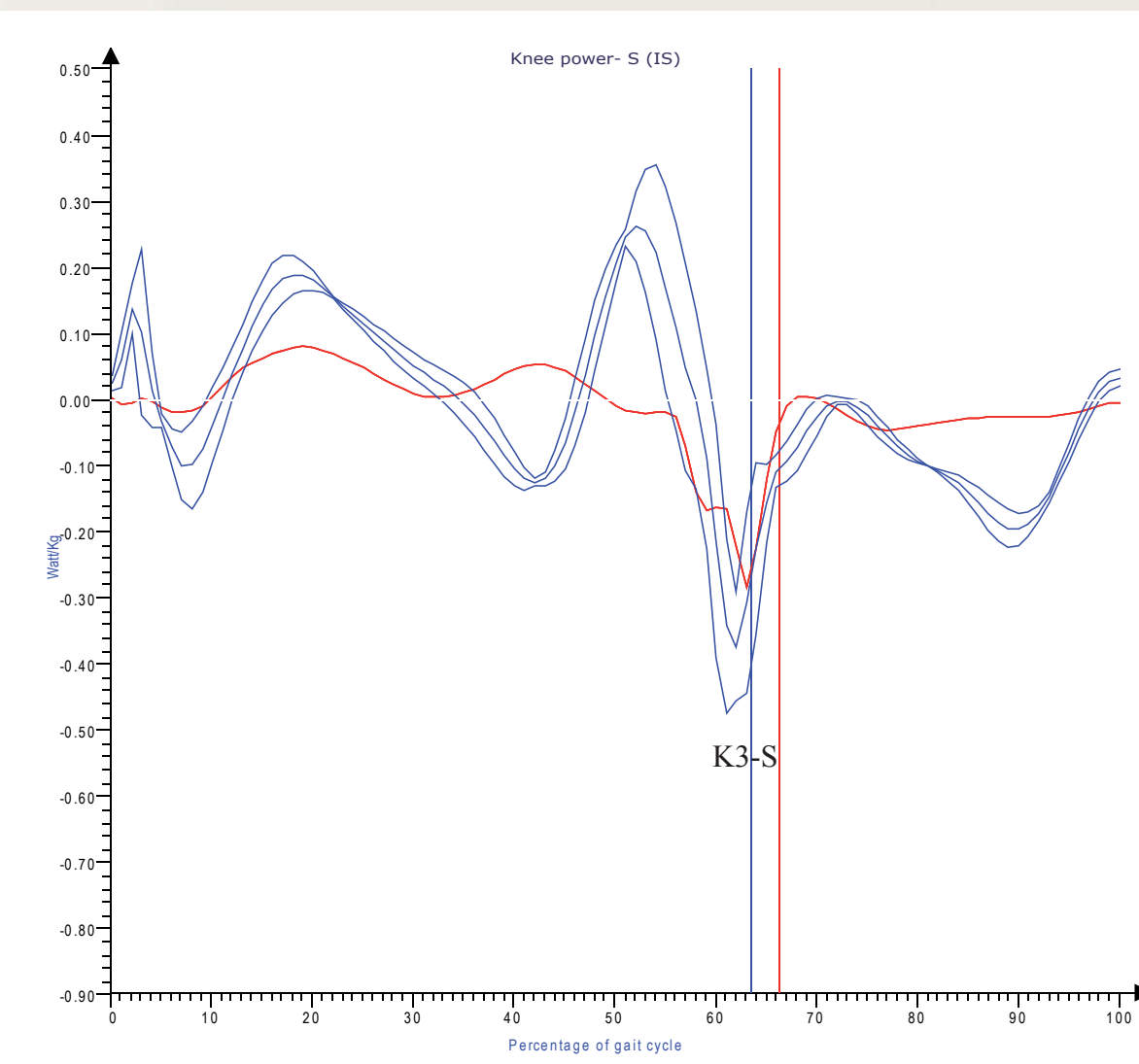


Fig. 7. Mean (SD) and single knee power on the impaired side (IS) are measured in the sagittal plan and normalised to percentage gait cycle. Red curve represent baseline knee power and blue curve represent knee power after intervention. Vertical red and blue line represent end of stance face (toe-off) at baseline and follow-up, respectively.

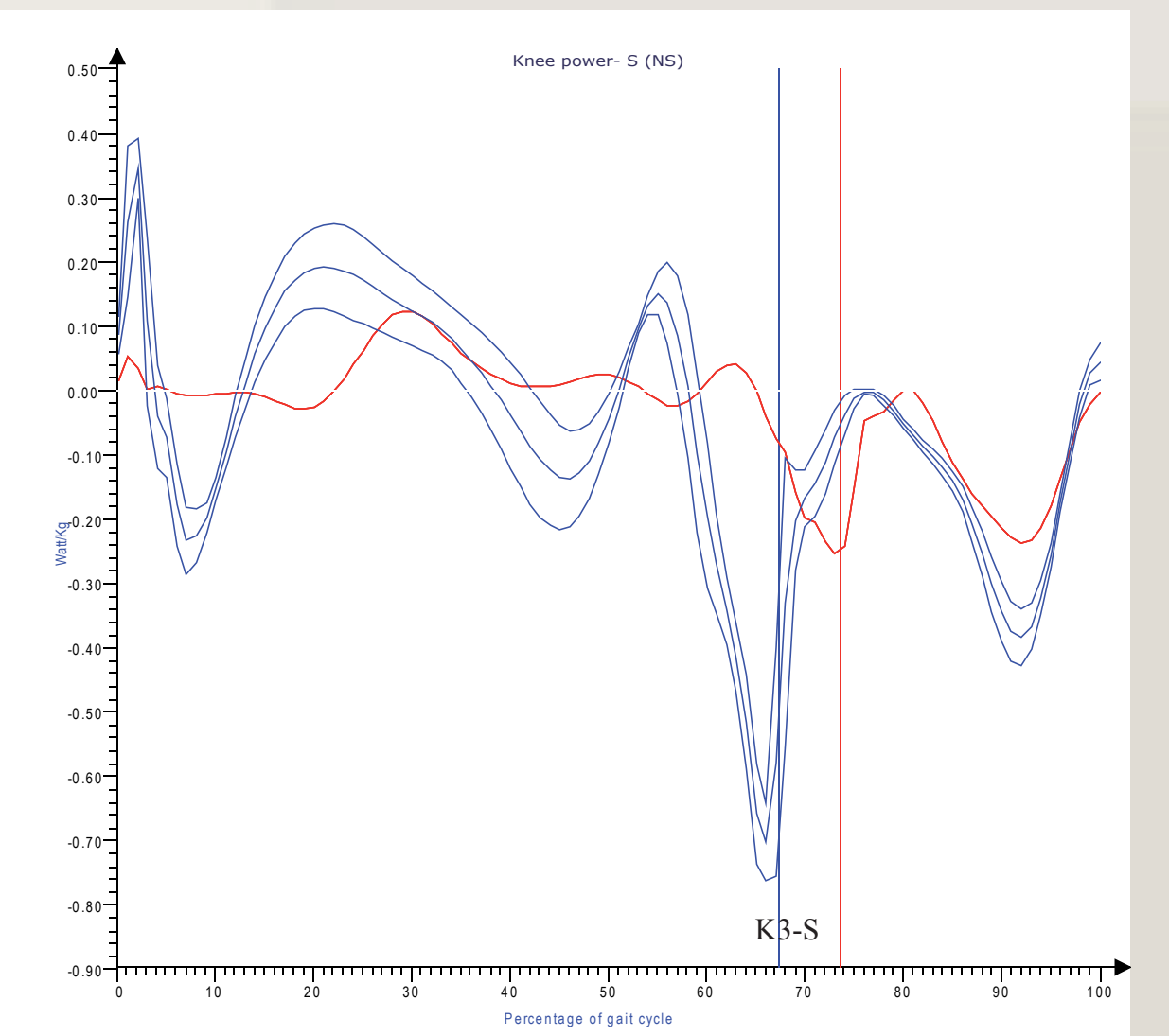


Fig. 8. Mean (SD) and single knee power on the non-impaired side (NS) are measured in the sagittal plan and normalised to percentage gait cycle. Red curve represent baseline knee power and blue curve represent knee power after intervention. Vertical red and blue line represent end of stance face (toe-off) at baseline and follow-up, respectively.

Conclusion

- Muscle power generation and absorption at specific phases of gait cycle might correspond to walking speed in stroke patients
- Results indicate a need to test this study's hypothesis in a larger study population