# Muscle synergies during gait of functionally-dependent subacute stroke survivors before and after robotic rehabilitation

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## 1. Introduction

**Stroke affects neuromuscular control**, influencing muscle coordination and gait (1). R**obotic devices** have been used to improve walking in post-stroke patients, but **few studies have examined the effects of the robotic therapy in muscle coordination through muscle synergies** (1,2). Muscles synergies are the synergistic activation of several muscles as a single unit (2,3). Moreover, considering the technical complexity of measuring EMG activity in patients with reduced gait abilities, no studies have analyzed muscle synergies in **functionally-dependent subacute stroke patients** before and after robotic rehabilitation.

## 2. Goals and Hypotheses

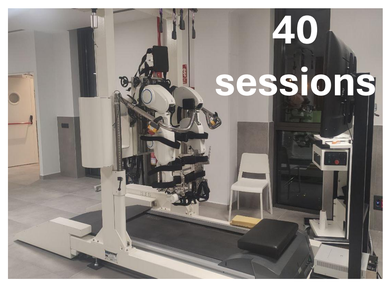
**1. Analyze motor coordination changes after a two-months robotic therapy with the P&S Mechanics Walkbot Premium.**
**2. Assess the viability of tracking motor control progress of functionally-dependent subacute stroke patients.**
**3. Relate the muscle synergies changes to kinematics and clinical scales improvements with a multi-level approach** (4).

## 3. Materials and Methods

### Recruitment

- **3 patients** (1F, 2M)
- Age: 68-76
- Stroke: **58-134 days** before recruitment
- FIM: **93-107**

### Intervention




PRE → POST

### Assessments

Clinical **Scales** | **Kinematics** with IMUs | EMG → Muscle **Synergies**

## 4. Results

**Preliminary results of a clinical study with 10 patients**
**Improvements in: walking speed, independence and RoM**

### Clinical Scales

Patient 1
Speed +70%, FAC + 2 points

Patient 2
Speed + 27%, FAC + 1 point

Patient 3
Speed + 35%, FAC + 1 point

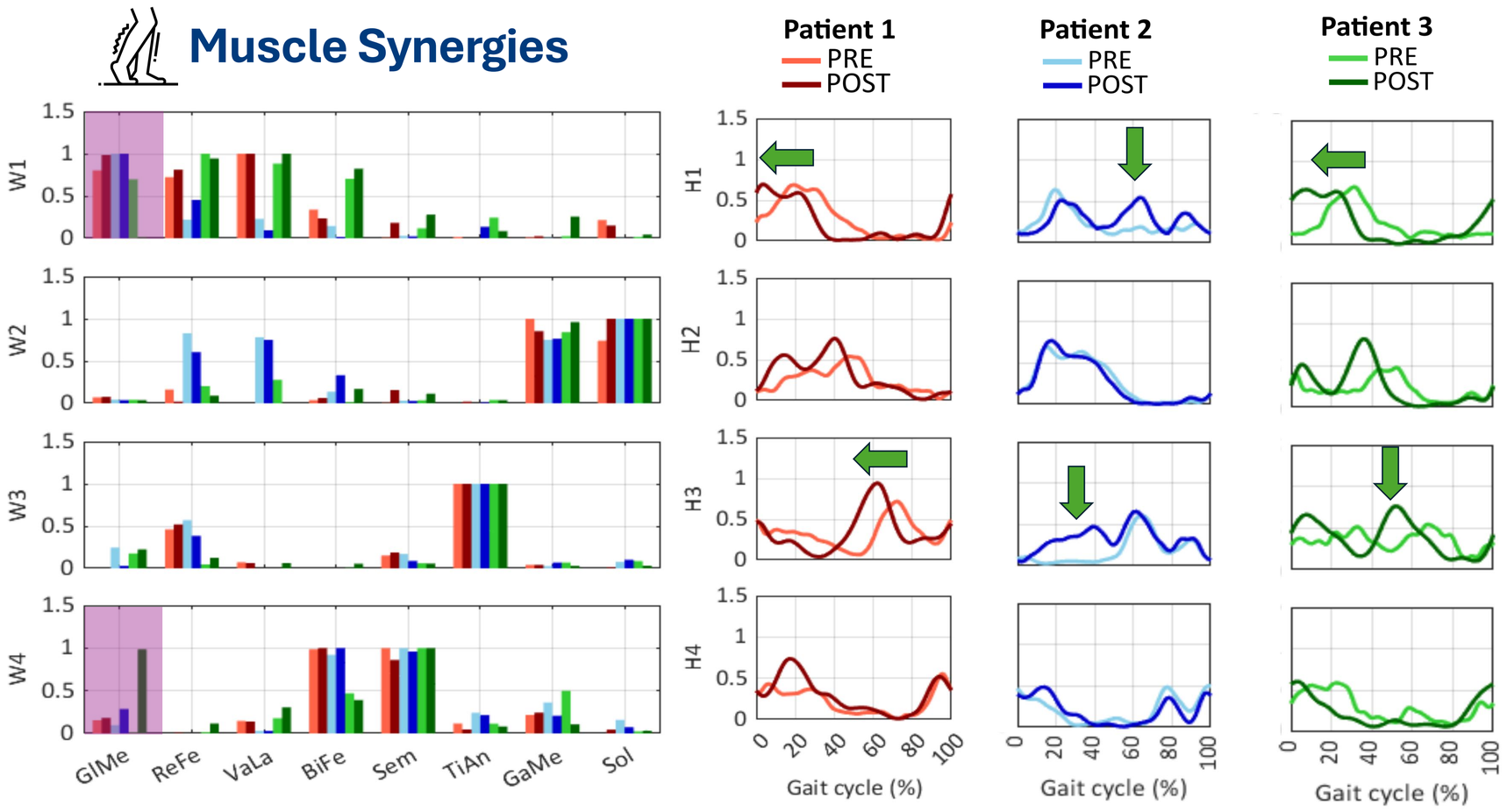
### Kinematics

Patient 1
Hip 55%, knee 30%, ankle 35%

Patient 2
Knee (38%), ankle (43%)

Patient 3
Normalized knee, hip flexion

### Muscle Synergies




## 5. Discussion and Conclusion

- ✓ Faster walking
- ✓ Increased independence
- ✓ Normalized patterns (3)
- ✓ Insights into effects of synergies
- ✓ Changes in temporal and spatial variables
- ✓ Individual response (5)

- Adequate synergy analysis for **dependent patients**
- **Positive** rehabilitation results (3,5)
- Need for **personalized rehabilitation strategies**

## 6. References

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