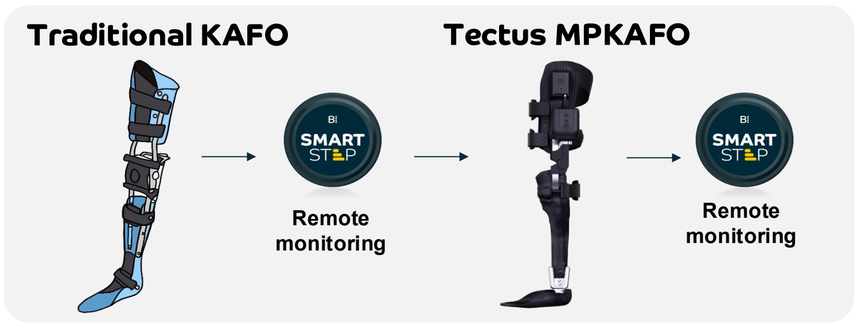
Clinical Efficacy of a Microprocessor Controlled KAFO – A Secondary Study

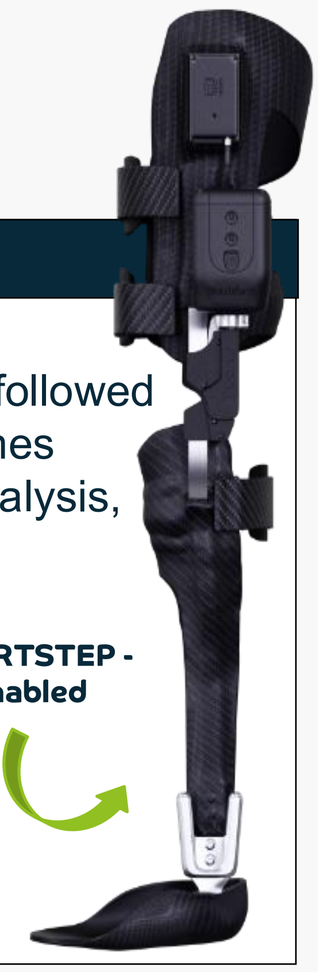
Introduction

Traditional Knee-Ankle-Foot Orthosis (KAFO) often result in locked knee gait patterns, compensatory movements and higher metabolic cost[1,2]. The Tectus Micro-Processor KAFO (MPKAFO) incorporates real-time microprocessor control to adapt knee resistance dynamically throughout the gait cycle, facilitating a more natural gait, reducing effort, improving safety and addressing biomechanical limitations of a traditional KAFO. We aim to evaluate the clinical impact of transitioning from a traditional KAFO to the Tectus MPKAFO through remote monitoring via our SMARTSTEP platform.

Method

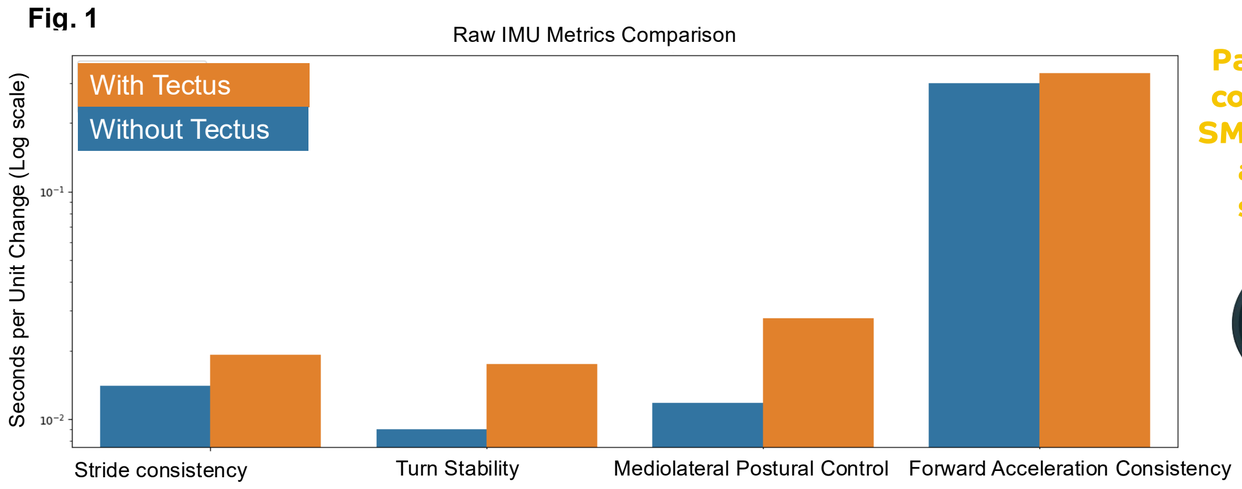
Six-month study, 7 scheduled visits. Baseline assessments with participants' existing orthosis, followed by a comparison to the Tectus MPKAFO. Outcomes are tracked through clinical assessments, gait analysis, SMARTSTEP sessions and questionnaires.





Results

Fig. 1



Participant completing SMARTSTEP activity session

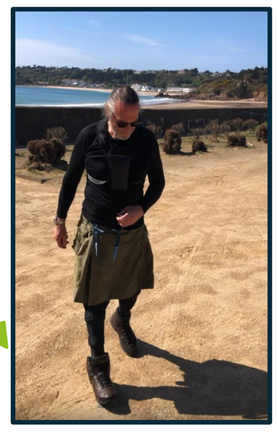
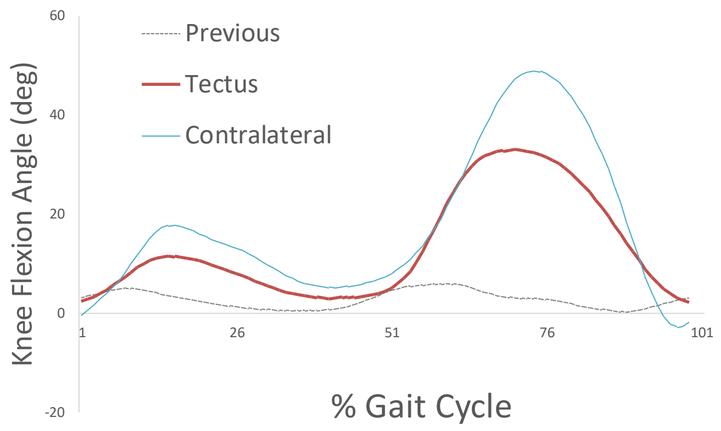


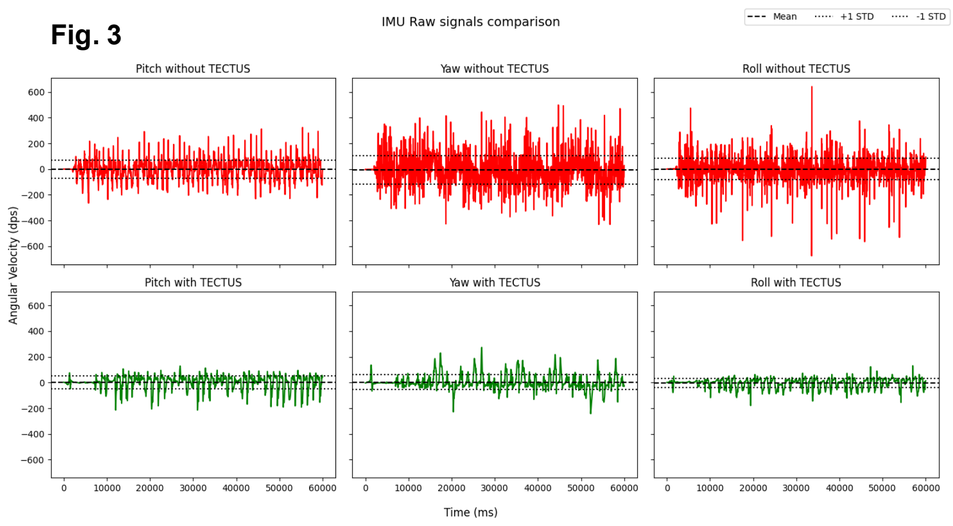
Fig. 2



Results indicate enhanced gait consistency and postural control when using the Tectus MPKAFO.

- **Stride Consistency**: More repeatable and stable gait patterns.
- **Turn Stability**: Improved dynamic balance during directional changes.
- **Mediolateral Postural Control** was enhanced, supporting better stability in the frontal plane.
- **Forward Acceleration Consistency** remained high in both conditions, with a slight improvement observed with Tectus. (Fig. 1)
- **Improved Gait:** Knee flexion angle closer to contralateral side (Fig. 2)
- **Reduced motion variability:** across all planes when using Tectus (Fig. 3)

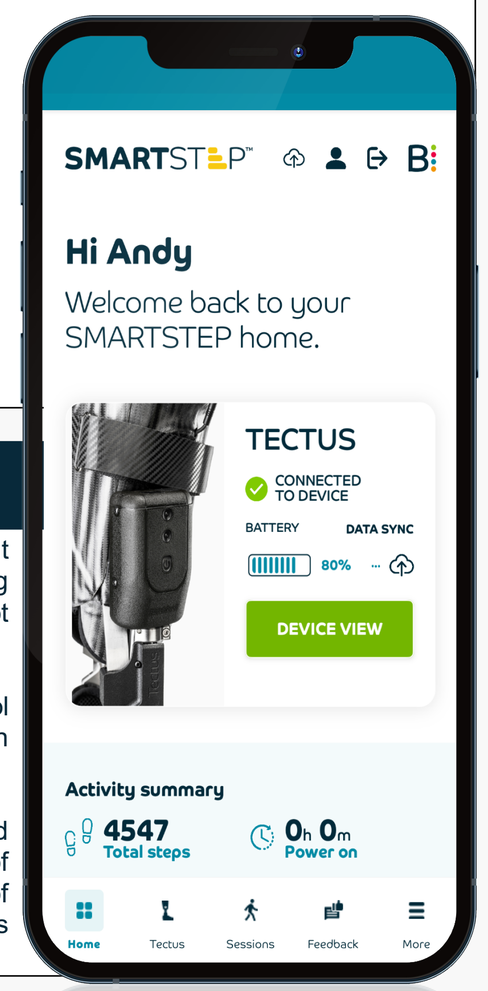
Fig. 3



Discussion

The Tectus MPKAFO showed improvements in key aspects of dynamic stability and gait control. Improved stride and turn stability as well as increased knee flexion during gait may reduce the risk of trips and falls[3]. Enhanced postural control and reduced motion variability reduced energy expenditure and aligns with increased confidence in ambulation, as also reflected in the subjective feedback gathered throughout the study.

The integration of the SMARTSTEP app and activity tracker into this study enabled continuous, remote collection of mobility data in real-world settings. The system allowed for daily activity tracking - capturing nuanced changes in movement patterns, gait symmetry, and wearer satisfaction over time. This digital approach offered a more holistic view of patient outcomes, improving ecological validity and reducing reliance on clinic-only snapshots.



Conclusion

- Findings support the Tectus MPKAFO as a clinically effective device for enhancing safety, efficiency and confidence in everyday walking.

I'm doing flipping fab! I've done laps of my son's garden and practiced my stair skills.

I can descend a set of stairs, leg over leg, looking like anyone else, and just as fast as anyone else. It's a great feeling.

References

1. Yilmaz et al., 200.4 Energy expenditure and gait characteristics of spinal cord injured patients using reciprocating gait orthosis and knee–ankle–foot orthosis

2. Fatone et al., 2009. Evaluation of a stance-control knee–ankle–foot orthosis with swing-phase lock in persons with spinal cord injury.

3. Ruetz et al., 2024. A microprocessor stance and swing control orthosis improves balance, risk of falling, mobility, function, and quality of life of individuals dependent on a knee-ankle-foot orthosis for ambulation

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