

KINEMATIC DIFFERENCES OF FRAME RUNNING ATHLETES: A PILOT STUDY

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Summary

Examining the kinematics of the lower limbs in Frame Running athletes during the 100m race provides valuable insights into the running mechanics of individuals with low-functioning cerebral palsy, as well as the influence of impairment severity on these kinematic factors. In this study, we compared the kinematics of two Frame Running athletes from different sports classes and identified statistically significant differences in the flexion and extension of the hip, knee, and ankle throughout the 100 m race.

Introduction

Frame Running (FR) is an athletics discipline in which athletes use a three-wheeled frame to compete, and it is included in the events of World Para Athletic (WPA) (1). This discipline features athletes from the T71 and T72 classifications, which encompass individuals with Cerebral Palsy who rely on walking aids for their mobility. There is limited information regarding running kinematics in individuals with cerebral palsy, especially for those with lower functionality (2). Understanding whether run kinematics vary according to classification is crucial. This case study aims to examine the lower limb kinematics of two frame running athletes, one from a lower functioning class (T71) and the other from a higher functioning class (T72), and to compare their results over a distance of 100 meters.

Methods

Two adult female athletes, both with similar years of experience in FR practice and comparable weekly training frequencies, were evaluated. The assessment took place on a tartan track over a straight distance of 100 meters, during which they utilized their training frame runner.

Kinematic data were recorded at 100Hz, using inertial measurement of seven IMUs (XSENS MVN Awinda) in the lower body, and no level scenario was selected. The data collected were exported to Visual3D software (C-motion, USA) for skeletal model computation and subsequent analysis. The sagittal plane hip, knee, and ankle joint angles in three running phases (starting, middle, and final) were analyzed. In each run phase, we selected four running cycles for each side.

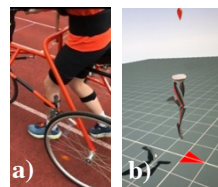


Figure 1: a) Frame running athlete with IMUs and b) Xsens kinematics

We used statistic parametric mapping (SPM) to analyze the differences between the lower limb joint kinematics of both athletes during the running cycle of each phase.

Results and Discussion

The three joints exhibit statistically significant differences on both sides across all three running phases. The left knee displays significant differences throughout the entire gait cycle in each running phase. Additionally, it was observed that the two athletes demonstrated greater similarities during the starting running phase compared to the middle and final phases.

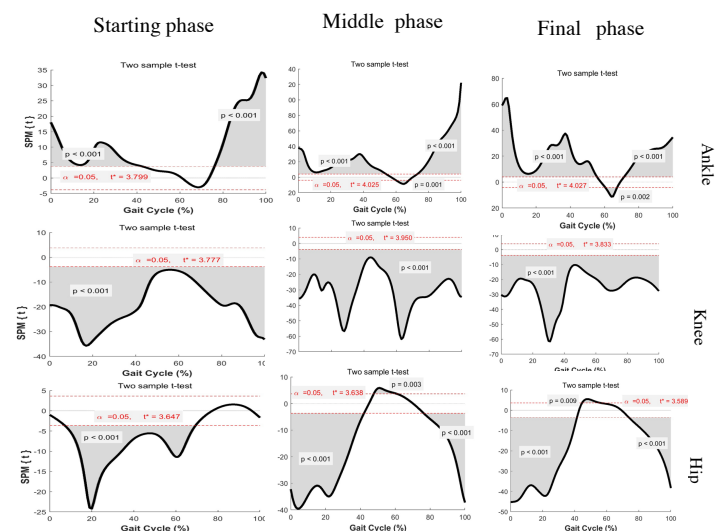


Figure 1: SPM analysis of kinematic differences between T71 and T72 athletes for left hip, knee, and ankle in the sagittal plane. Statistically significant differences ($p < 0.001$) are represented in grey.

Conclusions

Different classes of frame FR athletes' present statistically significant differences in kinematics in sagittal plane of hip, knee, and ankle during all the running phases of 100m distance.

References

- [1] van der Linden, M. et al. (2021). *J. Sports Sci.*, 39(sup1), 159–166.
- [2] Pouliot-Laforte, A., et al. (2022). *Clin Biomech (Bristol)*, 100, 105817.