University of Basel
Department of
Biomedical Engineering

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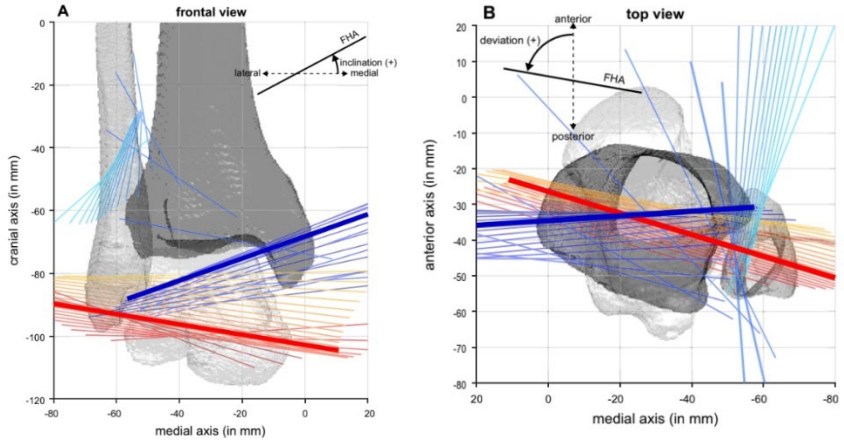
Master of Science – Biomedical Engineering

Thesis Proposal: Elucidating the relationship between the form of the talus bone and its function at the ankle during gait

In clinical gait analysis, ankle kinematics derives from the Cardan angle decomposition of the rotation between the foot (single foot models) or hindfoot (multi-segment foot models) and the tibia segments. The Cardan angle sequence expresses ankle dorsi/plantar-flexion as the rotation occurring around the medio-lateral axis of the tibia. For the conventional gait model, and most other lower limb models, the medio-lateral axis of the tibia is defined from the axis joining the two malleoli, made perpendicular to the longitudinal axis of the tibia (ankle to knee joint centres).
However, dorsi/plantar-flexion occurs at the articulating surfaces of the talocrural joint anatomically. These articulating surfaces may, or may not, be aligned with the external bony landmarks used to define the medio-lateral axis of the tibia. Furthermore, such alignment may be different between typically developing children and children with cerebral palsy.
The objectives of this project are twofold:

1. To compare the orientation of the articular surfaces of the talocrural joint with bony landmarks, and motion capture markers placed over them, used to define the medio-lateral axis of the tibia,
2. To compare the orientation of the articular surfaces of the talocrural joint with various computations of the functional axis for dorsi/plantar-flexion,

In a cohort of typically developing children and in children with cerebral palsy.



Dorsiflexion axis of the ankle
From Wolf et al. 2022

Nature of the Thesis
Experimental: 20%, Programming: 30%, Analysis: 30%, Documentation: 20%

Specific Requirements
Programming skills with Matlab

Supervisor / Contact
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