Opponent's Report on PhD thesis public defense

Sun Dong: Gait analysis and musculoskeletal modeling used in athletes recovery from Achilles tendon rupture

Opponent: Dr. Gábor Katona

I. Structural aspects

The dissertation was written in the English language. The structure follows the regulations of the Doctoral School of the University of Pannonia. The full length of the work is 113 pages. The dissertation starts with acknowledgments, table of content, abstract, list of abbreviations, list of figures, tables and equations. It has 5 main parts and no annex added. The number of figures is 34, table 5. The whole text and figures are clear and understandable. I had no problem with the figures, tables, and context. The references in the text are precise and correct.

The author mentions 30 own publications, from which 12 in peer-reviewed journals (SCI), 3 conference proceedings. 19 independent citations in total from Scopus Database.

II. Contextual aspects

The topic of the dissertation is up-to-date. The mechanism of human Achilles tendon rupture is very complicated and rarely investigated. The description of the in-vivo muscular contribution and joint loading of human lower limbs is quite challenging. In order to better design optimal rehabilitation movements, it is important to develop and validate an experimental and computational workflow, which can investigate the inter-limb gait asymmetry, muscular contribution, and joint loading in recovery from an Achilles tendon rupture during daily activities. The development of a subject-specific musculoskeletal model can help to improve the research work. This dissertation has valuable results in this field and combines in a creditable way the validated subject-specific musculoskeletal models.

III. Scientific thesis points

1. I accept the 1st thesis point, and I find it surely a new scientific result. This thesis shows the differences of the subject-specific musculoskeletal model estimation from the earlier results in the literature. The candidate found the overestimated Achilles tendon related muscle forces were around 10% without considering the Achilles tendon elongation and muscle fiber shorten on the injured side.
2. I accept the 2nd thesis point. The 2nd thesis shows that increased knee joint adduction moment and increased knee contact forces on the injured side will elevate the risk of further knee injuries, especially in the medial part of the condyles. I agree with the findings, which may result in a mild type of genu varum in the injured leg.
3. I accept the 3rd thesis point. The candidate revealed in his dissertation that the Achilles tendon rupture highly modifies the center of pressure trajectory, which has primer effect on the ankle. The candidate stated that this effect can higher the risk of ankle joint lateral sprain injury.

Specific questions

1. My first question is how does the author select the three points in the plantar?
2. My second question is what is the implications of the distance differences between the injured and uninjured side?

Statement

A significant number of new scientific results are proven in this PhD work. These results are supported by peer-reviewed journal publications, therefore I suggest to submit this dissertation to the public defense.

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