Opponent's Report on PhD thesis public defense

Siqin Shen: "Research on musculoskeletal injuries in badminton: Based on a cross-sectional survey and biomechanical analysis"

Opponent: Dr. Singh Tej

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 124 pages. The thesis has a clear structure, with distinct sections such as introduction, methods, results and discussion followed by conclusions. Each section is appropriately titled, aiding the reader in understanding the organization of the thesis. The thesis follows a logical flow of information, progressing from the introduction of the research problem to the presentation of the methodology, results, and discussions. The use of subsections within major sections enhances the logical organization of content. Ideas and concepts are presented coherently, with smooth transitions between sections and paragraphs. The use of clear and concise language contributes to the overall coherence of the thesis. The introduction effectively sets the stage for the research, introducing the problem and the motivation for the study. The background information provides context for the reader, creating a foundation for the subsequent sections. The incorporation of citations and references enhances the credibility of the literature review. The methodology section is detailed and well-explained, providing clarity on the research design, data collection, and analysis procedures. The inclusion of equations and tables adds to the transparency of the research methodology. The presentation of results is clear, with tables and figures effectively illustrating the data. The analysis is thorough, with appropriate statistical methods contributing to the robustness of the findings. The discussion section logically interprets the results and relates them back to the research questions. Conclusions are drawn based on the evidence presented, providing a succinct summary of the key findings.

Overall, Theses structured into four main sections (introduction, methods, results, discussion) and no annex added. The number of figures is 29, table 15.

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 six publications from this thesis, from which three at Q1 level.

II. Contextual aspects

The topic of the dissertation is up-to-date. Badminton is much more than a recreational activity; it offers a wide array of benefits that contribute to physical health, mental well-being, social interaction, and personal development. Its global popularity and accessibility further underscore its importance as a sport that can be enjoyed by people of all ages and backgrounds. Badminton, while beneficial for health and fitness, can also lead to various musculoskeletal injuries due to its high-intensity and repetitive movements. Understanding the common musculoskeletal injuries in badminton, their causes, and effective prevention strategies can help players minimize risks and maintain optimal performance. In this work author used experimental and analytical approaches to analyze gender properties of badminton shoes, torsional stiffness of badminton footwear, torsional stiffness and arch support variations in badminton footwear ensuring not only better performance but also longevity in the sport.

III. Scientific thesis points

1. **I accept the 1st thesis point.** Experimentally author indicates clear gender-based disparities in shoe requirements, with noticeable differences in shoe problems/complaints and foot discomfort between genders. Such insights underline the necessity for gender-specific shoe designs in badminton, tailored to address the unique anatomical and biomechanical aspects of male and female players.
2. **I accept the 2nd thesis point.** Experimentally author conclude that an intermediate level of torsional stiffness in badminton shoes offer the best balance for sports performance and injury prevention, suggesting the need for further research on the long-term effects of varying shoe stiffness and its

relation to different athletic levels and foot morphologies.

3. **I accept the 3rd thesis point.** Author numerically demonstrated that increased arch support significantly reduces hip internal rotation peak angles during specific badminton tasks, potentially lowering hip injury risks. In contrast, during other tasks such as forehand clear stroke executed with the right foot, increased arch support may adversely affect performance indicating variable injury risks with different movements. Furthermore, enhanced arch support improves ankle dorsiflexion peak angles which are beneficial for foot clearance and impact force distribution.

Statement

This PhD work proves a lot of new scientific results; all the required changes advised by the reviewers are now included in the dissertation; peer-reviewed journal publications support the findings/results thus I suggest presenting this dissertation to the public defense.

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