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REVIEW and EVALUATION

of the PhD Thesis

Biomechanical exploration on lower extremity injury mechanism during table tennis stroke play and implication for topspin forehand skill optimization

(by Yuqi He)

1. Structural aspects, formal, quantitative requirements, style

The PhD thesis was written in English language. the composition, the style is logical and understandable. The thesis is well written in English, with minor grammatical errors. The construction, the design of the figures, and tables are good with several exceptions, which will be detailed in the comments of the different parts.
The structure follows the regulations of the Doctoral School of the University of Pannonia.
The full length of the thesis is 122 pages (without references). The dissertation starts with an introduction, and literature review. The literature review contains 14 pages (12 % of the work). The thesis has 6 main parts (with limitations and conclusion), list of tables and figures are added. The number of figures is 38, tables 15.

2. References and publications

The references are edited to the end of the thesis, which are cited from the international literature involving the most relevant research studies, the reference format conforms to regulations of the Doctoral School of the University of Pannonia.

The list of bibliography contains 107 items, the references in the text are precise and correct.
The candidate lists 26 own publications in english (13 publications in Scopus, h-index 5). The publications are in peer-reviewed international journals with impact factor (Q1, Q2), 8 publications and 5 International conference abstracts are related to this thesis and thesis points. In case of 6 publications the candidate is first author.

3. Contextual aspects, topic of the dissertation

The topic of the dissertation are novel and the outcomes are applicable in the future.

The thesis work begins with the literature review related to the topspin forehand (biomechanical, performance and injury considerations), the realysed study could probably provide some support for clinical applications.

This dissertation was performed in compliance with the declaration of Helsinki and was approved by the Ethics Committee of the Research Academy of Grand Health at Ningbo University (RAGH20191121).

4. Comments

***Motivation and goals**:* The topic are up to date, the goals are clear, and logically connected to each other.

Literature review: is an overview of the literature, with critical evaluation. The biomechanical performance evaluation methods related to topspin forehand are presented as an owerview, refering at figures or tables in order to help the readers.

Research methods and validation: Statistical analysis and calculation were used by SPSS software (SPSS Inc., Chicago, IL, USA). The normal distribution of variables was verified using the Shapiro-Wilks normality test. As the driven leg, the right leg kinematic differences in the topspin forehand loop between the two levels of players were examined by independent T-tests. The Analysis included joint angles, motion time, angular changing rate, and ROM of the ankle, knee, and hip joint. The significance level was set at $P < 0.05$.

5. Concerning the specific questions and remarks made at the workshop defense, the final Thesis contains the following corrections:

5.1 **List of Abbreviations** was added.

5.2 **Figure 2** (page 36) – the signed informed consent form is included.

5.3 The experiment setup and **target area**, page 40, (A: L1 = 45 cm, L2 = 38 cm) is specified in reference [13].

5.4 **Segmental Coordinate Systems** (page 40) – the created coordinate system (x, y and z axis) is specified in the reference [13].

5.5 For a better overview of the **research methods and elemets** the referred Figure positions (Figure 8 , Figure 9) were reorganised immediatly after the indications in the text.

5.5 The given **relationships, formulas** were numbered for beter reference.

5.6 „The kinematics and kinetics information was captured at 200 and 1000 Hz" (page 52) – the reference is specified [13 - 19].

5.7 „The **Gait2392 model** was selected to complete the musculoskeletal modeling in the OpenSim" (page 52) – the selection criterias for this model are specified in the references [53].

5.8 **Procedure** (page 53 - 54) „subjects completed 10 min of running and 5 min of static stretching" the given time values are based on own considerations.

5.9. **Data Analysis Process and Statistical Analysis** (§ 2.3.2 – page 58) the significance level was set at $P < 0.05$, the used software version for the statistical analysis was specified as SPSS 19.0.

5.10 **Plantar Force** (**Table 5** - page 72) significance value P = 0, explanation was given.

5.11 Pressure unit KPa (**Table 6** - page 73), significance value P = 0, explanation was given.

6. Research objectives and Thesis points:

Initially the candidate established **two research objectives,** wich were achieved in the **1st and 3rd thesis points** as follows:

- reveal the intrinsec biomechanical mechanism of table tennis forehand topspin stroke skill, and provide guidance and suggestions for skill optimization - related to the **1st Thesis point**,
- reveal the potential injury risks of lower limb joints and lower limb trunk when performing forehand hitting skills under different conditions, provide coaches with effective information, help formulate scientific training programs, prevent and reduce the occurrence of sports injuries, and extend the sports life of outstanding athletes - elated to the **3rd Thesis point.**

Due to the fact that the candidate **developed a portable cryotherapy equipment** and realysed a study of the impact of cryotherapy on the subjects the recomandation to **complete the initial research objectives** with studies of cryotherapy effect on dynamic balance recovery and static balance ability of the subjects was implemented and highlighted in the **2nd Thesis point**.

Final remarks on the Thesis points:

In case of the proposed Thesis points, the text was **reorganised** in order to **higlight the obtained general applicable results** from the obtained experimental results.

In the final version of the Thesis we have three main research objectives and three Thesis points.

The realised corrections and the proposed reorganised Thesis points can be accepted.

7. Conclusions:

Based on the research study it is recommended building strength and explosiveness of the lower limb muscles, as excellent proficiency optimizes the transmission efficiency of the kinetic chain. In addition, long hours of practice in forehand topspin skills are also necessary.

The thesis results and the developed and produced portable cryotherapy equipment could provide some support for clinical applications.

Significant new scientific results are proven in the evaluated PhD dissertation, these new findings are sustained by the proposed Thesis points and supported by journal papers with impact factor (Q1, Q2).

I recommend the acceptance of this PhD Thesis for final defense.

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Szombathely,

2024.06.19

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