

**Opponent's Report** on PhD thesis for workshop defense

**Gongju LIU:** Performance enhancement of professional weightlifters and treatment of patella tendinopathy in competitive sports athletes

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**The topic of the dissertation:**

The submitted dissertation presents an original work on the biomechanical analysis of professional weightlifters and the treatment of patella tendinopathy in competitive sports athletes.

In this dissertation, the Candidate raises three major questions while he succeeds to provide proper answers to them throughout his research work.

First, he proposes to highlight the differences of technical characteristics between top-elite and sub-elite male weightlifters in order to identify the key phases that will enhance the snatch technique and will make a significant difference between top-elite and sub-elite weightlifters.

Second, he proposes to present an alternative and novel method, the barycenter combination theory, to provide a more in-depth judgement approach for predicting successful and failed snatches in weightlifting.

Thirde, he proposes a validated rehabilitation treatment for professional weightlifters, since a very common problem, the patella tendinopathy, highly affects the career of these sportsmen. The candidate aims to use and evaluate the effect of extracorporeal shockwave therapy (ESWT), which is a non-invasive method to heal and restore the function of the patellar tendon. The method is investigated on five major parameters, namely: proximal and distal thickness of the patellar tendon, the longitudinal length of the patellar tendon and the hypo-echogenic, and calcifications zones.

**Formal, quantitative requirements, literature review:**

The dissertation consists of 4 main parts, in 113 pages, 18 figures and 14 tables to help the understanding of the research work. The candidate made an exhaustive literature review about 214 journal and conference papers in 41 pages. Therefore, I can conclude that the literature has been well studied, and the candidate analytically and critically reviewed the topic of his research. Based on his review the major objectives have been appointed in his dissertation.

The chapters are divided clearly as they address the three main questions, mentioned in the beginning of the dissertation. They follow a pattern of introduction, materials and methods, results and their explanation.

On this account, the formal requirements meet the standards of the Doctoral School.

**Style:**

The style of the dissertation is logical and understandable. The construction, the design of the figures, and tables are good. In my first review, I mentioned several typos, which have been already eliminated, and the Candidate made the table of content shorter, by erasing some non-important subchapters, which made the thesis easier to follow and comprehend.

**Methods:**

In the view of the applied experimental methods, the Candidate approached the objectives with rigorous and well-based techniques, e.g. the use of motion-capture cameras, statistical analysis or the application of extracorporeal shockwave therapy. The obtained data was processed in a scientific way, where all the important steps were documented in a comprehensive way.

**Results:**

The deducted results from his experiments are correct, and it has been extensively discussed and compared to results, published in prestigious journal papers. The discussion part of the thesis is well-formulated.

**Publications:**

The references are edited to the end of the thesis and they meet the general requirements of a PhD dissertations in Hungary.

At the end of the dissertation we can find the publications of the candidate. He authored or co-authored 29, mostly peer-reviewed publications. He has one Q1 paper, two Q3 papers and two Q4 papers. His total Impact factor is 3.5 which meets the minimum requirements. It must be mentioned that the candidate has 10 independent citations in the Scopus system.

**Thesis points**

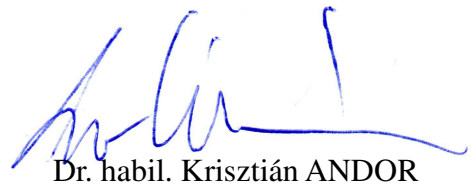
- 1<sup>st</sup> thesis point: The candidate experimentally deduced that M1 and M3 phases enhance the snatch technique the most, with regard to top-elite and sub-elite weightlifters. He also resolved, based on his experiments, that the knee joint angle influences the most the snatch technique. In addition, he indicates that if a new sport strategy could be formed to increase the knee extension capability, then sub-elite lifters could reach faster the efficiency of top-elite lifters. This is an acceptable new scientific result.
- 2<sup>nd</sup> thesis point: By introducing a new method, the candidate experimentally deduced that the key factor of failed snatches can be originated to the insufficient increase of the human & bar combination barycenter along the X-axis during the M4 and M5 phases. This is an acceptable new scientific result.
- 3<sup>rd</sup> thesis point: The candidate effectively applied and scientifically demonstrated that the application of extracorporeal shockwave therapy (ESWT), in case of patella tendinopathy, can substantially increase the healing rate and the function restoration of several patellar tendon related physical parameters, such as the proximal or distal thickness of the patellar tendon, longitudinal length of the patellar tendon and the hypo-echogenic or calcifications zones. This is also an acceptable new scientific result.

**Specific Questions:**

1. What other application do you see where the combined barycenter theory can be used?

Three significant new scientific thesis points and results are proven in this PhD dissertation. These new findings are supported by journal papers with impact factor. Therefore I suggest that this dissertation should proceed to the final defense!

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