Opponent's Report on PhD thesis final defense

Gongju LIU: The performance enhancement of professional weightlifters and treatment of patella tendinopathy in competitive sports athletes

Reviewer: Dr. Gábor Katona

I. Structural aspects

The dissertation was written in English language. The structure follows the regulations of the Doctoral School of the University of Pannonia. The full length of the work is 142 pages. The dissertation starts with acknowledgments, table of content, abstract, list of abbreviations, list of figures, tables, and equations, the dissertation has 5 main parts and no annex added. The style of the dissertation is logical and understandable. The chapters are divided clearly as they address the three main questions, mentioned in the beginning of the dissertation. The design of the figures, and tables are good. The number of figures is 23, table 14. I had no problem with the figures, tables, and context. The references in the text are precise and correct.

At the end of the dissertation, we can find the publications of the candidate, the author mentions 29 own publications, from which 23 in peer-reviewed journals, 6 conference proceedings. He has 10 independent citations according to the Scopus system.

The candidate has 8 main achievements with athletes in international competitions and he participated in 7 scientific research projects.

II. Contextual aspects

The dissertation presents an original work on the biomechanical analysis of professional weightlifters and the treatment of patella tendinopathy in competitive sports athletes. The topic is up-to-date. The key techniques of weightlifting, the factors that affect success rate, and the rehabilitation evaluation of patella tendinopathy are very complicated and rarely investigated.

The candidate raises three main questions, where he first wishes 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.

His second objective is 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. His last objective is connected to the rehabilitation of professional athletes, since a very common problem, the patella tendinopathy, highly affects the career of these sportsmen.

With regard to data collection regarding the stability of snatch technique raises questions regarding the appropriateness of using the specific assistant exercises for improving the success of the snatch lift. The use of the 3D video digitization method can definitely help to improve the snatch performance of the sub-elite athletes. This dissertation has valuable results in this field and it combines the applied techniques in a creditable way to yield results about how to achieve better sports performance, sports technique, and success rate.

III. Scientific thesis points

1. I accept the first thesis point, this dissertation combined experimental and computational workflows to record the kinematics data of the lower limbs between the top-elite and sub-elite male weightlifters performing the snatch style in the 69-kg category. The candidate identified that M1-M3 phases will enhance the snatch technique and will make a significant difference between top-elite and sub-elite weightlifters. With regard to lower limb movement pattern, he deduced that that the knee joint angle (KA) has the most significant effect on the snatch technique. Based on this result he concluded that sub-elite lifters must develop their knee extension capability, similarly to top-elite lifters, to reach higher efficiency.
2. I accept the second thesis point, the candidate concluded, based on the “combination barycenter” theory of combined objects, that the key factor of failed snatch is the insufficient increase of human & bar combination barycenter along the X-axis during the M4 and M5 phases. Therefore it is predicted that if weightlifters can ensure the sufficient increase range of human & bar combination barycenter on the X-axis during M4-M5, then the success rate of snatch can be improved.

3. I accept the third thesis point, in this dissertation, the candidate experimentally proved on professional, active athletes that Extracorporeal Shockwave Therapy (ESWT), combined with rest, can effectively improve the morphology of patellar tendon, since the decrease of the five main properties (proximal-, distal thickness, longitudinal length, hypo-echogenic, and calcifications zones) were significantly reduced. This is valuable information provided by this dissertation.

Specific questions

1. In terms of the subjects involved in this dissertation, my first question is: what is the conceptual difference between top- and sub-elite weightlifters? In addition, why did the author choose 6 top- and sub-elite weightlifters as the subjects? Is it because of the limited number of athletes in these two levels?
2. This dissertation used sports biomechanics methods to evaluate the changes in the snatch process. Thus, my second question is, “to perform a 3D kinematic analysis, each point should be visible from at least two cameras.” How was the right ankle visible by the left camera? How did the author calculate the center of gravity of the body and the barbell?

Statement

I suggest submitting this dissertation to the final defense.

2022/03/09,

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