Centenary of academic sports biomechanics discipline

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Dr. Hab., Professor **G.P. Ivanova**[1]
[1]Lesgaft National State University of Physical Education, Sport and Health, St. Petersburg

Corresponding author: gpiva@mail.ru

Abstract

Objective of the study. Biomechanics in the meaning formulated by the movement theorists N.A. Bernstein, G.A. Kogan, V.K. Balsevich, L.V. Chkhaidze, V.M. Zatsiorsky and D.D. Donskoy is designed to study the mechanisms, missions and values of a healthy motor activity with its disease prevention aspects – to lay an analytical basis for progress in sports and healthy lifestyles. The sports biomechanics discipline coming to its birth centenary should undoubtedly be protected for its great service and benefits for humanity, and this is the core idea of our article.

Results and conclusion. As things now stand, it is very likely that Biomechanics PhD dissertations will not be defended anymore since 2021 – that may be interpreted as indicative of the interest in the discipline being lost by the Russian research community. It is necessary to understand the true reasons for the collapse of the academic biomechanics discipline on the verge of its birth centenary, otherwise our sports research may be stalled due to the need for a human movement theory to facilitate competitive progress in many sports disciplines, particularly the most difficult ones – including e.g. figure skating, artistic and rhythmic gymnastics with their unprecedentedly beautiful and complex elements and movement culture on the whole. This movement culture is akin to ballet in terms of the movement expression and artistic merits – that have always been of special interest for the Russian biomechanics researchers working in collaboration with the leading choreographers and athletes in the above-mentioned and other projects by the Research Institute of Physical Education.

The article analyzes the progress history of academic biomechanics discipline on the eve of its birth centenary to acknowledge, among other things, a special contribution of the Peter Lesgaft University faculty in this discipline delivered and advanced mostly by the University graduates including those who excelled in biomechanics in some other academic establishments and defended dissertations in biology or pedagogy. It could be beneficial at this juncture to empower the Biological Dissertation Councils with a responsibility to assess dissertations in sports biomechanics viewed as the human movement science or kinesiology as provided by Vadim Balsevich and commonly accepted by the relevant foreign science.

Keywords: *sports biomechanics, achievements of new biomechanical pedagogics.*

Background. The subject to analysis herein emerged when the Russian Academy of Sciences came up with its draft Regulation No. 118 dated 24.02.21 on consolidation of the scientific specialties subject to scientific degrees. If this Regulation comes into effect, it is very likely that the academic biomechanics discipline will disappear with the relevant postgraduate training and research system and the Dissertation Council responsible for the biomechanics specialist training and qualifications for the national physical education and sports sector. Modern academic sports biomechanics in our country (similar to kinesiology as it is called abroad) is geared to analyze individual physical movement systems in physical education and sports. If the academic sports biomechanics disappears one day, what science may take over this integral research domain? In the purely biological filed, the neuromuscular aspects of the movement system may be advanced by biologists much like Peter Lesgaft did in medicine; although the second

domain of the research system – that covers responses to external forces – may unlikely be advanced and delivered by biologists at universities due to the shortage of specific knowledge, sporting experiences and special backgrounds – that are now rather extensive in the physical education specialist training system.

Objective of the study. Biomechanics in the meaning formulated by the movement theorists N.A. Bernstein [2-7], G.A. Kogan [11], V.K. Balsevich [1], L.V. Chkhaidze [12], V.M. Zatsiorsky and D.D. Donskoy [9] is designed to study the mechanisms, missions and values of a healthy motor activity with its disease prevention aspects – to lay an analytical basis for progress in sports and healthy lifestyles. The sports biomechanics discipline coming to its birth centenary should undoubtedly be protected for its great service and benefits for humanity, and this is the core idea of our article.

Results and discussion. Biomechanics foundation history. The first practical problems for the newly originated biomechanics came up in the movement registration light system tests and analyses by N.A. Bernstein and T.S. Popova [5]. A cyclographic technique was advanced A.K. Gastev, leader of the labor organization science who argued that a movement research should be designed to analyze serial snapshots and profile the movement mechanics by a cyclographic toolkit for further analysis. The cyclography was then called a "time magnifying glass" [7]. By 1926 N.A. Bernstein summarized his prior study reports in the fundamental work "General Biomechanics" [4]. This is the prime reason for us to consider the 1920s a startup period for the Russian academic biomechanics that was expected to facilitate the social, artistic, athletic, educational and labor progresses in its capacity of a new research discipline.

Origins of biomechanics. It was in 1905 that P.F. Lesgaft published "Fundamentals of Theoretical Anatomy" with the associating "Bodily Movements Theory" curriculum for his students – that later on made its fast way to the national physical education universities and other sectors. This may be the reason why P.F. Lesgaft was considered an inventor of the notion of biomechanics since then. His ideas were advanced in the 1920-30s by his students at the Department of Anatomy in Leningrad including A.A. Krasuskaya and E.A. Kotikova, and many followers leaded by I.M. Koryakovsky, D.A. Semyonov, E.G. Kotelnikova et al. who contributed much to movement biomechanics and supported it by the relevant analytical systems for many sports disciplines. These productive efforts resulted in the first textbook "Biomechanics of physical exercises" (1939) of the E.A. Kotikova's edition [8] with basics of physical practicing didactics for gymnastics, athletics and some other sports disciplines. The physical education experts shared in this book with the physical education community their knowledge of the movement biomechanics, breath controls, body balancing techniques, muscle group operation mechanisms, etc.

Biomechanics persecution period in the USSR. It was in 1947 that N.A. Bernstein's monograph "On Movement System" was published [7] and immediately awarded by an innovation prize. However, it is traditional for any innovation to face opposition, and the life biomechanics was no exclusion as well as cybernetics in our country. Supporters of the N.A. Bernstein's multilevel movement design theory were called "mechanists" at that time and fiercely opposed by a scientific group leaded by I.P. Pavlov's school of physiology. It was not unusual for the public scientific debates in1949 to 1956 that even some supporters of the great scientist had to betray the "mechanists' theory" for fears of repressions, whilst the great experimenter had to quietly resign from many research offices and biomechanics laboratories all the more that most of them were closed under pressure, and his colleagues and followers developed an instinctive fear of the very word "biomechanics". The persecution faded not sooner than by the late 1958 when the national physical education universities were again allowed offering elective biomechanics curricula, although N.A. Bernstein was first seen at a physiology conference only in 1966.

Biomechanics renaissance period. The lifestyles in the country were slowly changing at the time when a man's flight into space was underway with contributions from biomechanics experts including, among others, L.V. Chkhaidze [12], a Bernstein's follower; the research community was proudly celebrating the first breakthroughs in robotics and labor automation [9, 13]; and the nation on the whole was proud of the great competitive accomplishments in global sports. These successes would have been impossible without progress in biomechanics – that was recognized and resumed in the physical education and sports specialist training curricula and research at this time. However, the biomechanics persecution period had stalled its contribution into the global progress of the discipline. The GDR researchers published a sports biomechan-

ics monograph; R. Alexander in the USA published "Biomechanics"; Italy and Finland also launched their biomechanics research initiatives. In the Soviet republics, Professor L.V. Chkhaidze resumed biomechanics research activity in Georgia [12], associate Professor the E.G. Kotelnikova [10] in Leningrad resumed her biomechanics consulting service at the SCOLIPE Physiology Department headed by Professor N.V. Zimkin – after E.K. Zhukov, renowned movement physiologist, moved to the Institute of Evolutionary Physiology. E.G. Kotelnikova at that time combined her consulting service at the Institute with lecturing biomechanics at the Vaganova Choreographic School – following the footsteps of G.A. Kogan [11] and N.A. Bernstein who lectured at musical schools in 1930s [7].

First Biomechanics Department in the academic education system of the USSR.

The biomechanics recovery process was marked in 1961 by the first Symposium on Biomechanics hosted by the P.F. Lesgaft Institute on the initiative of its Research Vice-Rector D.A. Semenov, where the ways to establish the first biomechanics department in the USSR were discussed. However, the Biomechanics Department at the Peter Lesgaft Institute was established not sooner than in 1963; followed by the similar departments at Moscow Institute of Physical Education in 1965, and then in Tbilisi, Minsk, Lvov, Kiev and other research centers. In a decade, the academic biomechanics made progress from a prohibited to obligatory – and rather popular – discipline, with the biomechanics specialists being in high demand all over the country.

In 1968, a Biomechanics Department with the cutting-edge laboratory equipment was established at Omsk Institute of Physical Education by Biology Doctor and Pedagogical Science PhD V.K. Balsevich, the globally renowned specialist in age biomechanics who offered a new kinesiological approach for elite sports based on his own concept of physical resource [1]. V.K. Balsevich severed the human movement research science from the general biomechanics to establish kinesiology as an independent discipline, thereby taking a global lead in this process. The Biomechanics Laboratory at the SCOLIPE was particularly strong and successful under leadership of Professor V.M. Zatsiorsky [9].

As things now stand, it is very likely that Biomechanics PhD dissertations will not be defended anymore since 2021 – that may be interpreted as indicative of the interest in the discipline being lost by the Russian research community. It is necessary to understand the true reasons for the collapse of the academic biomechanics discipline on the verge of its birth centenary, otherwise our sports research may be stalled due to the need for a human movement theory to facilitate competitive progresses in many sports disciplines, particularly the most difficult ones – including e.g. figure skating, artistic and rhythmic gymnastics with their unprecedentedly beautiful and complex elements and movement culture on the whole. This movement culture is akin to ballet in terms of the movement expression and artistic merits – that have always been of special interest for the Russian biomechanics researchers working in collaboration with the leading choreographers and athletes in the above-mentioned and other projects by the Research Institute of Physical Education.

Conclusion. The article analyzes the progress history of academic biomechanics discipline on the eve of its birth centenary to acknowledge, among other things, a special contribution of the Peter Lesgaft University faculty in this discipline delivered and advanced mostly by the University graduates including those who excelled in biomechanics in some other academic establishments and defended dissertations in biology or pedagogy. It could be beneficial at this juncture to empower the Biological Dissertation Councils with a responsibility to assess dissertations in sports biomechanics viewed as the human movement science or kinesiology as provided by Vadim Balsevich and commonly accepted by the relevant foreign science.

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