

## THE RESEARCH ACTUALITY AND DEVELOPING TREND OF SPORTS BIOMECHANICS IN CHINA

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From the 20th century to 21st century, the human all knowledge of the class got fast development. And sports biomechanics is one of the disciplines with the fastest developing speed. The elite of the numerous researchers of the set participates in studying in short 30 years, with rigorous scientific attitude initiative application many kinds of theory of discipline they, and the most advanced instrument studied the method, thought deeply and carefully about this discipline at that time, promote the development of sports biomechanics actively. This research course itself whether one method study, it is one that makes development history that people revere.

**KEY WORDS:** sports biomechanics, actuality, developing trend

**INTRODUCTION:** Sports biomechanics takes studying the mechanics law of the human motion in the sports activity as the main task, as one of the discipline with the highest scientific and technological content in the system of the physical education. On the one hand, its multi-disciplinary application research results can instruct sports activity directly; On the other hand, the fast development of sports activity, especially athletics demands sports biomechanics to create constantly new research method and measuring technology. So the considerable progress of sports biomechanics mainly benefits from the talent advantage that discipline cross and constantly increasing sports activity practice and needs.

**THE RESEARCH ACTUALITY:** The study of Sports biomechanics is based on measurement of the mechanics parameters, which should be able to signify the mechanics essence of the human movement. Physics measuring technology, basing on biomechanics method, can divide into mechanics, electricity, optics and thermodynamics measuring technology according to measuring principle; can be divided into kinematics, dynamics, human-body parameters and parameters of skin measuring technology according to measuring attribute. With the rapid development of electronic technology, especially computer technology, they have put forward and will put forward the new request to the measuring technology of movement biomechanics constantly. Taking measuring the human kinematics parameters by the image analytical method as example, from high-speed photography which our country generally adopted in the early of 1980s to video analyzing instead of film analyzing in the late of 1980s, image conversion board has integrated with computer display, and the data smooth, mass centers determining, and forming of speed parameters was discussed ardently in the past had already completed by standardized software. At present, image analytical methods have already obtained new progress abroad, and its main technological sign is automatic discernment function of human arthrosis and synchronous test of video analyzing system and dynamometry platform test.

About the biomechanics measuring system of the human motion, the sign of its technological progress is the progress of measuring the method and analytical method. The former is mainly represented as the development of the sport-measuring instrument, and the latter mainly depends on the development of the biological theory, and then both of them submit to the need of practice in sports activity at the same time. The more representative one is the three-dimensional video measuring system developed in recent years, and its measuring instrument and analytical method are set up in order to satisfy and study the human body's complicated space sport in the sports activity. It needs to pay much attention to that from 1982, a kind of information treatment technology simulating the human brain works --The neural network- has been paid much attention by global scientist. It has the advantage that cannot be

compared with other method in parameters analyzing, especially comprehensive decision, that use neural network technical to investigate human motion mechanics behavior.

**DISCIPLINE 'S DEVELOPING AND CHANGING:** The level of development in biomechanics of the organization of human body has improved by a large range: With the birth of people's new thinking and the need of testing, the instrument is being updated continuously, and the performance is close to the demand of the researchers; the study on organization of human body is gradually having the transition from skin trauma to no wound; the test of the human-body parameters and muscular strength grows from tangency test to distant testing. Research approach and testing method of sports biomechanics are improved: Along with technology's development and the application in the sports practice, a large number of advanced way to test the speed is coming out one after another, for example, radar, laser, and optic fiber. And researchers can measure the speed of the human body or sport instrument conveniently and rapidly. For example, measure the speed of teeing off of the tennis ball, and using in the tennis tournament, the result is very ideal.

The progress of testing method of dynamics is mainly shown as the improvement of the capability of the organ that is used for making the force transducer, and the material changes like that: Stress changing - Piezoelectric crystal - Semiconductor  
- Light-transmitting fiber, and the installation of the force transducer is more scientific, and the measure data result is steadier, and more accurate.

The speed and accuracy of testing data processing are improved: At present, data gathering and disposal is done by the computer to do timely gathering, scene disposal, and the result can be obtained on the spot, and this is a greater help undoubtedly to feed back the sport training quickly. Adopt advanced mathematics tool, the calculating way of datum testing has obtained a great improvement, and at the same time we've made a break-through in theory of data disposal, for example, DLT theory, three-dimension pay theory, three-dimension figure varying theory, and etc. The formulation and application of these new theories play facilitation to the improvement of the research approach conversely. Thanks to adopt smooth data, dispel noise, make curve to be smooth, the data to be more accurate, it's easier to find the law of technological sport.

The performance of the sports apparatus is improved: Another representation of sports biomechanics in sports practice is to design the sport equipment according to the principle of sports biomechanics, so as to improve the sport achievement. The sport equipment that made up with new material and new technology, for example, running shoes, vaulting pole, swimming suit, help athlete set the new world record.

Comprehensive research between multi disciplinary is closer and closer: Sports biomechanics itself is an edge disciplinary that synthesized by multi-disciplinary. So, in the mean time of strengthening other biologist to use in this discipline, we are also required to use the advanced research approach and the testing method of other discipline to analyze the sport technology, set up the optimized sport technological mode, so as to serve for improving sport train method, raising sport training effect, raising sport achievement. Such as material mechanics, electrical engineering, computer science, etc. The infiltration and combining of these subjects with biomechanics is an important reason of the rapid development and with advantage of biomechanics.

Technological analysis and multifactor analysis is combined together: There are a lot of factors that influence sport achievements, such as the physical stamina, technology, psychology and external environmental factor such as the humidity, temperature, and etc. So, when discuss the element that influence athlete's sport achievements, we can't simply analyze it from the technology, and also we need analyze it combining with other factors synthetically. Some scholar puts forward " the expert system ", in fact it is a synthetically testing analyzing system, which combined with diagnosing the physiological index, diagnosing sports technology, analysis psychological characteristics, and measure sports selecting index.

**DEVELOPING TRENDS OF SPORTS BIOMECHANICS:** At present, the research of international sports biomechanics has already made considerable progress, and the depth, scope, the precision, and others have been improved by a greater degree. New material and application of computer drive testing method of biomechanics to develop automatically, exactly, and rapidly, in the direction of automation, met accurately and directions that take fast develop rapidly. Regarding to strengthen the infiltration and cooperation among the disciplines, the knowledge system of biomechanics becomes more perfect. In the prospect of the developing prospect of the international sports biomechanics, the developing direction of sports biomechanics in our country is as follows:

**Analysis of classical mechanics and research of mechanics model:** Basing on the principle of classical mechanics, combining with the human inertia parameters, setting up the mathematics model to describe the human body's simple movement in conventional condition, using the theories of mechanics, such as Lagrange's equation, theorem of moment of momentum, etc., so as to describe or explain the reason and mechanism of the human movement, even analyze the rule of human nervous system control sport and state of bearing force of the human main body position in sport. This kind of analysis can provide the theoretical foundation of deeply study of human body's complicated movement, and it is a quite creative research field.

**Optimization of sport technology:** It's the way to improve sports ability that study and realize the optimization of movement technology. The first is measuring sport technology, and setting up the best mode of sports technology. The second is setting up the approaching scheme of realizing the best sports technology, including the training scheme. So, the study of optimization of sports technology, should not be staying the measurement, analysis and appraisal of sports technology, and the more important thing is to set up optimized sports technology adopting proper method of mathematics, and mechanics, and to design the training method and training apparatus in order to realize the optimization scheme, and we still comparatively lag behind in the research work of this field.

**Computer technologies and the emulation of human movement:** This kind of research is the advanced way of studying the human movement at present, and is still a difficulty of sports biomechanics that is being explored. The emulation of human movement can carry on an overall emulation to various kinds of complicated movements of the human body with the computer shown out by the way of three-dimensional, as well as can make forecast and simulating display of various possibility in human movement. So, it's a cuspidate research task that is full of challenge, theory and practice.

**The research of sports biomechanics facing nationwide fitness programs:** It's a mainstream that the research of sports biomechanics is been applied in human health, body exercise. The contents in this research are mainly as follows: the impact on human motion function of various kinds of mechanics load, such as place, apparatus, shoes, clothing, and etc.; the examining equipment for human movement making and the training equipment for developing sports ability. In the recent years, the research of sports biomechanics about the sports apparatus, such as shoes, clothes, and other living articles, has caused extensive attention, and this will be a field, which is very attractive and has extremely rich commercial value.

**Research of the system of the experts of technological analyzing:** In the recent ten years, a lot of experts of sport technological analyzing are devoted to developing the expert system of final decision, but successful sample is little. The reason is the shortcoming in the two indispensable content in the expert system, i.e. knowledge base (database which store the special knowledge with a certain method), and deduction machine (the machine which do the scientific deduction by use of the data in the knowledge base). With the appearance of the neural network technology, the expert system of sports technology analyzing, which set up by adopting the artificial has a wide prospect. And this kind of technology is realizing the simulation of the function of the human brain essentially, and will become the developing direction of the research of the sport technology analyzing.

**The research of healing of sports damages will be deeper, and combines with the sports special more close:** Muscle biomechanics has already become the hot subject, and will be also a hot subject to the research of preventing movement damages, but few research results

of molecule biomechanics. In the future, it should extensively combine with the research method in such disciplines as sports biomechanics, biology, movement physiology, sports medical science, and etc. to solve the relevant problems in the human motion.

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