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Importance of Biomechanics in Sports

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Abstract: When coaches understand how forces work on muscles and affect motion in sports, they have a clear advantage over those who lack this knowledge and its applications. Athletes who know the basic concepts have a rationale for learning the correct way to execute skills. Knowing the reason behind learning a challenging technique gives them more motivation to master it. The key to success is finding effective instructional cues that help the athlete achieve correct mechanical technique. Coaches with a command of mental training tools and sports training principles can help athletes make amazing things happen on the field. Anatomy and physiology lay the foundation for biomechanics and kinesiology, areas of study about human movement.

Keywords: Biomechanics, Sports.

I. INTRODUCTION

Sports biomechanics is a quantitative based study and analysis of professional athletes and sports activities in general. It can simply be described as the Physics of Sports. In this subfield of biomechanics the laws of mechanics are applied in order to gain a greater understanding of athletic performance through mathematical modeling, computer simulation and measurement. Biomechanics is the study of the structure and function of biological systems by means of the methods of "mechanics." –which is the branch of physics involving analysis of the actions of forces. Within "mechanics" there are two sub-fields of study: statics, which is the study of systems that are in a state of constant motion either at rest (with no motion) or moving with a constant velocity; and dynamics, which is the study of systems in motion in which acceleration is present, which may involve kinematics (the study of the motion of bodies with respect to time, displacement, velocity, and speed of movement either in a straight line or in a rotary direction) and kinetics.

II. HUMAN BIOMECHANICS IS A BRANCH OF SCIENCE STUDYING THE IMPACT OF INTERNAL AND EXTERNAL FORCES ON HUMAN BODY.

Sometimes biomechanics is identified with kinesiology. Kinesiology studies physiological, psychological, and mechanical rules in relation to the motions of living organisms. Therefore, kinesiology is superior to biomechanics. McGinnis (2005) defined biomechanics of sport and physical exercise in the following way:

2.1 Biomechanics of Sport

By sport it is meant an organized, competitive, fun activity, requiring skills, ability, determination, strategy, and fair play, in which the winner can be determined by objective means within a firm set of rules.

2.2 Physical Exercise

By physical exercise it is meant any intentional physical activity which enhances or maintains physical fitness, performance, health, or wellness. The secondary goal of sport biomechanics is strongly related to the main goal because a healthy athlete will perform better than an athlete plagued with frequent injuries. How can biomechanics fulfill its goals.

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III. PERFORMANCE IMPROVEMENT

3.1 Technique Improvement

Improvement of technique with the help of biomechanics can be used by teachers and coaches to correct motions of students or athletes. Moreover, research workers in the field of biomechanics may develop a new and more effective technique for better execution of a sport motion. In the former case teachers and coaches make use of the methods of qualitative biomechanics analysis in their everyday practice to produce changes in the technique used by their charges. In the latter case research workers in the field of biomechanics use quantitative biomechanics methods to develop new techniques which can then be implemented into teaching and training processes.

For instance if a gymnastics coach sees that her charge has difficulties to turn a somersault she can come up with three recommendations to help the gymnast execute this exercise correctly:

1. To jump higher,
2. To fling arms with more energy before taking off,
3. To curl up more tightly.

All these recommendations can help to execute this task correctly and are based on the principles of biomechanics. If the gymnast jumps higher, she has more time to finish the turn during the flight phase. To curl up more tightly means to increase the speed of rotation while keeping the same angular momentum. To fling arms with more energy increases the angular momentum which helps the gymnast to rotate faster.

Among sport events that saw in the past substantial changes in technique are javelin, high jump, and cross country skiing.

3.2 Equipment Improvement

Use of biomechanics can also lead to a better look and better functioning of sport equipment. For example ski boots can have a real impact on sport performance. Sophisticated sport equipment gives advantage to both elite and recreational athletes.

Researchers have recently also developed a new swimming suit which helped swimmers at the Sydney Olympics in 2000 better several world records because it has a favorable influence on the draft force and buoyancy of water that is acting against swimmers. This swimming suit had such an influence on sport performance in swimming, in fact, that its use was later banned.

3.3 Injury Prevention

The concept of injury prevention is part of public health and its goal is to improve the general health of the population and thus to increase the quality of life. Biomechanics is a tool that can be used in sport medicine to identify forces and mechanical energy that cause injuries. It helps to understand how injuries originate, how to avoid them during sport performance, and how to identify exercise suitable for injury prevention and rehabilitation. Biomechanics offers possibilities to create alternative techniques of executing specific movements, using new equipment, and carrying out more effective training methods, which also contributes to injury prevention

3.4 Injury reduction through changes to equipment function

One of the examples of using the results of biomechanics research for improving the functioning of sport equipment can be found in running. The number of people who realize the importance of healthy life style is recently growing. Running, as an elementary human locomotion, is a legitimate part of healthy lifestyle. But the growing numbers of people engaged in running also brought higher prevalence of injuries. Running shoes at the beginning of the 1970s were too stiff for in experienced runners. Among the injuries with growing prevalence were stress fractures and shin bone pain. Shoe manufacturers therefore started to market shoes with soft soles. However, soft soles did not offer good stability and motor control. Runners started to suffer from ankle, knee and hip injuries. Biomechanics research has made it possible to manufacture running shoes which reduce impact forces and, at the same time, offer good stability and motor control. With the help of biomechanics it is even possible to recommend custom made shoes for individual athletes. Prevalence of injuries in running has decreased again.

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IV. CONCLUSION

Isn't human body itself the best equipment for running? People who wear shoes from very early age mostly touch the ground first with their rear foot when they walk. Lieberman et al. (2010) studied the style of running in Kenyans who never wore shoes and assert that in barefoot running people naturally touch the ground first with their forefoot. This produces slower loading rate in foot compared to running in shoes and touching the ground first with rear foot. Grand reaction forces during running may cause chronic injuries that runners often suffer from.

REFERENCES

[1] Aboelkassem Y. Selective pumping in a network: insect-style micro scale flow transport. Bio inspiration & Bio mime tics 2013; 8(2).
[2] Bartlett R. Introduction to sports biomechanics. (1 Ed.). New York, NY: Rout ledge, 1997, 304. 3. Davis KG, Marras WS. Assessment of the relationship between box weight and trunk kinematics: Does a reduction in box weight necessarily correspond to a decrease in spinal loading? Human Factors 2000; 42:195-208.
[3] Dr. Michael Yes sis. Secrets of Russian Sports Fitness & Training, 2008.
[4] Hamill J, Knutzen KM. Biomechanical basis of human movement, 1995.
[5] Haze H. The meaning of the term biomechanics. Journal of Biomechanics 1974; 7(12):189-190. 7. Humphrey JD. Continuum biomechanics of soft biological tissues. Proceedings of the Royal Society of London A 2003; 459(2029):346.
[6] 8. Martin RB. A genealogy of biomechanics. Presidential Lecture presented at the 23rd Annual Conference of the American Society of Biomechanics University of Pittsburgh, Pittsburgh PA, 1999.
[7] 9. McGinnis PM. Biomechanics of Sport and Exercise (2nd edition) Champaign, IL: Human Kinetics, 2005.
[8] 10. Nikolas KJ. Plant Biomechanics: An Engineering Approach to Plant Form and Function (1 Ed.). New York, NY: University Of Chicago Press, 1992, 622