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# Applied Biomechanics In Gymnastics

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## ABSTRACT

The gymnast's persistent search for more advanced skills and the effect this has on his originality, burgeoning artistry and virtuosity, greatly accounts for the increasing popularity of this discipline which had stuck to traditional structures for so long. Probably the greater taking of risks which is involved, can also be regarded as a factor of public interest. Certainly, the growing number of serious accidents and injuries associated with sport reflect its hazardous nature.

Biomechanics has much to contribute to the continued progress of gymnastics. Its use may sharpen the understanding of techniques that exist, suggest new skills that might be tried, and lead to the achievement of more advanced performance. It may also help in identifying and controlling circumstances which lead to accidents.

These considerations gain in significance in regard to the not so expendable volume of gymnastic training and to the decreasing age of male and especially of female gymnasts. On the other hand coaches all over the world hardly use available benefits from science for their practical work. The reason for this tendency may be the standard of scientific education of the coaches; however, the main reason seems to be that in most cases, especially biomechanical, research was lagging behind the development in high level sports. This reproach to biomechanics is also maintained by gymnastics coaches.

The purpose of this paper is (a) to present a biomechanically based structure of the numerous techniques in gymnastics from a very practical point of view, and (b) to present data and biomechanical analysis which are useful for practical training. The first important step is to arrange and order the techniques from a biomechanical perspective and to identify the most important factors of these techniques. These factors will be projected on the methodological techniques. These factors will be projected on the methodological proceedings in gymnastics. The second part of the paper presents biomechanical data examined on top class athletes under competition and training conditions. Special techniques and the accompanying mechanical load will be worked out. The chapter also includes the dis-

cussion of the possibilities of computer-simulation to study and to improve gymnastics techniques. All results are finally applied to practice in gymnastics and checked in regard to their usefulness for training. The analysis presented will include techniques on the floor, of the vault, the rings and the high bar. All the studies are focused on high level gymnastics and therefore they include selected difficult techniques but also important basic ones.

The paper tries to give a critical overview of the biomechanics of gymnastics and their application in practice.