

Editorial

Special Issue on Musculoskeletal Research: Biomechanics and Biomaterials for the Treatment of Orthopedic Diseases

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Musculoskeletal research deals with the effects of the orthopedic treatment of pathologies on the biomechanics of the affected areas and on the musculoskeletal system. Biomechanical measurement methods enable the quantitative determination of these influences and the assessment of their extent and size in the patient (in vivo).

The range of examination methods is particularly wide in this field of musculoskeletal research. On one hand, in vitro examinations under laboratory conditions on simplified models, such as artificial bones or specimens from donors, are implemented. With the help of these models, for example, new biomaterials or implants for the treatment of fractures are often examined for their primary stability or to determine the influence of a joint replacement on their kinematics. In contrast to experimental in vitro studies, numerical methods are increasingly applied to analyze a large number of implant configurations and loading scenarios. Using the method of clinical motion analysis, a comprehensive in vivo investigation of the musculoskeletal system is performed directly on the patient. An example of its advantages is that it allows the monitoring and control of therapeutic interventions.

However, it is of great importance to know the limits and possibilities of the applied methodology in its preclinical and clinical applications. In order to reliably answer clinical questions on orthopedic interventions, established and extensively validated methods and measurement protocols are the only choice.

This Special Issue intends to provide the reader with an exciting overview of current research in the field of biomechanical investigations for the treatment of musculoskeletal diseases according to topics such as tissue biomechanics [1], in vivo diagnostics [2], numerical simulation [3,4], tribology [4,5], experimental biomechanics [6–12], joint kinematics [3], motion/gait analysis [3,13–17], and implant fixation [18,19]. These accepted manuscripts are just a few examples from the field of musculoskeletal research and its methods. They all have the common goal of increasing patient safety.

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