

Applying Symmetry to Motor Control in Sports and Rehabilitation

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Symmetry is a core yet controversial concept in the health sciences, spanning multiple disciplines from anatomy and biomechanics to pathophysiology, with important clinical implications for both diagnostic and therapeutic practices [1]. In human movement science, symmetry has traditionally been regarded as an indicator of optimal function [2]; however, growing evidence suggests that asymmetry may represent not only impairment, but also adaptation, compensation, or task-specific specialization.

In recent years, there has been renewed interest in investigating symmetry and asymmetry in biomechanical and functional aspects of individuals with neurological and musculoskeletal conditions, as well as in athletic and physically active populations. Although body (as)symmetry is often easily recognized using subjective observation, its objective quantification (whether structural or functional) remains methodologically challenging. Moreover, the effects of symmetry-related factors—such as posture alignment [3], sidedness, bodyweight distribution [4], muscle activation on postural control [5], activities of daily living [5], injury risk [6], and sports performance [7]—are not yet fully understood. Clarifying these issues is essential for improving both performance assessment and clinical and preventive intervention design.

In this Special Issue, the contributions encompass studies on upper- and lower-limb asymmetry and their functional consequences, such as the relationship between morphological asymmetry and grip strength [8] and the association between temporal–spatial gait asymmetry and dynamic balance in children with hemiplegic cerebral palsy [9]. Several papers explore symmetry in sports and physical activities, including bilateral landing mechanics under different flooring conditions [10], laterality and spatial asymmetry in elite football penalty kicks [11], and the relationship between handedness and scoring success in handball [12]. Additional contributions address applied and methodological aspects, such as asymmetries in school furniture alignment and anthropometry [13], the influence of core muscle endurance on frontal-plane movement symmetry during indoor walking or cycling [14], and the dependence of asymmetry outcomes on the test used and player category in male volleyball players [15].

Taken together, these studies provide new information regarding (i) how symmetry and asymmetry manifest in human movement, (ii) how they can be reliably assessed, and (iii) how they may inform training strategies, injury prevention, and rehabilitation programs. We hope that this Special Issue will serve as a useful reference for researchers, clinicians, and practitioners interested in advancing the understanding and application of symmetry-related concepts in motor control, sports, and rehabilitation.

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