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» **Journal Abstract**

Mechanical loading of the gymnast's motor system during swings on rings  
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The aim of this work was to identify the mechanical loading of the gymnast's motor system during forward and backward swings on gymnastic rings. A junior gymnast of the First Class, aged 14, with body mass 53.1 kg and body length 1.61 m, participated in the study. He executed a series of ten cyclic swing movements on rings with his maximum amplitude. Kinematic variables of the gymnast's centre of mass (COM) as well as reaction forces in the cables were measured and synchronized using the SIMI MOTION movement analysis system. Two separate phases of mechanical loading of the motor system have been identified: resistance phase and non resistance phase. In the non resistance phase the gymnast attains similar values of the COM's momentum but different angular displacements. In the resistance phase the forces acting on the motor system have their maximum. They amount to 5.5 BW for the forward swing and 6.5 BW for the backward swing movement. The maximum rate of change of the force for forward and backward swing is 42.6 BWS<sup>-1</sup> and 67.4 BWS<sup>-1</sup>, respectively. These two variables differentiate the mechanical loading of the gymnast's motor system between forward and backward swings. The reaction force produced by the gymnast is significantly greater during the execution of forward swings. It seems probable that horizontal displacements of COM may be the factor responsible for reduction of the mechanical loading experienced by the gymnast.

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