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NUMERICAL SIMULATIONS OF THE MUSCULOSKELETAL SYSTEM DURING NATURAL GAIT AND WALKING WITH POLES

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Walking with poles is a form of physical activity involving fast walking, during which the upper limbs are also used to push off. The correct technique is based on alternating and opposite movements of the limbs, involving up to 90% of the muscles of the whole body. Walking with poles is most often practised to stimulate the body's muscles, improve physical fitness, or as a type of fitness exercise.

The purpose of this study was to conduct numerical simulations to analyse the functioning of the musculoskeletal system during natural walking and walking with poles.

Computational simulations were conducted using the FullBodyHumanModel available in AnyBody Modeling System. The model of natural gait and walking with poles was developed on the basis of experimental research. The analyzed movement was recorded using the BTS Smart three-plane motion analysis system equipped with dynamometer platforms. Numerical simulations allowed us to determine the resultant reaction forces in the lumbar region and the value of energy expenditure during natural walking and walking with poles.

Walking with poles affects the increase in loads occurring in the lumbar spine, the greatest increase in the resultant reaction force values at the L5-S1 joint was registered from 5% to 10% and from 45% to 60% of the gait cycle. Walking with poles also increases energy expenditure.

Walking with poles, using the proper technique, can positively affect the functioning of the human musculoskeletal system. It has been shown that adding poles to walking activates more muscles than during natural walking, which can also affect the burning of more calories.

Figure 1 An example of gait simulation performed in the AnyBody Modeling System.

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