PEAK GROUND AND JOINT REACTION FORCES IN THE LOWER LIMB IN STEP EXERCISE DEPENDING ON STEP PATTERN AND STEPPING RATE

Santos-Rocha Rita¹, Veloso António², Machado Maria², Ferreira Carlos², Valamatos Maria João²
(Sport Sciences School of Rio Maior / Faculty of Human Kinetics¹, Faculty Human Kinetics², Portugal)

The assessment of biomechanical loading is quite important for exercise prescription and injury prevention in the scope of Exercise Biomechanics. The analysis of the ground reaction forces (GRF) and of the joint reaction forces (JRF) allows the understanding of the magnitude of external and internal loading experienced by the lower extremity joints and the pattern of force-absorbing adjustments while performing a dynamic and cyclic activity. The main purposes of this study were to determine the GRF and to calculate the JRF at ankle, knee and hip joints, using inverse dynamics, during the ascending and the descending phases of four Step Exercise patterns (basic step, knee lift, run step and knee hop), and to compare the peak values of these parameters at varying stepping rate conditions (125, 130, 135 and 140 beats per minute), in a group of 18 skilled females. The results indicated that lower extremity internal loading can be effectively controlled by varying stepping rate during Step classes. The findings of the present study indicate the relative contributions of stepping rate and different choreographic movements and how experienced subjects deal with the increase of movement cadence in terms of external load. Assuming that walking or running are safe activities to be included in Exercise and Rehabilitation programs, controlled stepping exercise appear relatively safe with respect to the magnitude of loading.

Keywords: Sports Biomechanics, Health and Fitness, Cadence