MECHANICAL LOAD IN STEP EXERCISE

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Physical activities such as Step Exercise may have an osteogenic potential since it involves a large weight bearing impact on the feet. Therefore, it is important to determine the related biomechanical characteristics of these types of exercise. The study of ground reaction forces (GRF) helps to understand the magnitude and pattern of loading experienced by the body while in contact with the ground. This research aimed to characterize GRF related to Step Exercise and to investigate differences (in both ascending and descending phases) between four stepping rate conditions (125, 130, 135 and 140 bpm) and between four Step patterns (basic step, knee lift, run step and knee hop), performed with right and left leading legs. We selected 3D GRF's, recorded at 1000 Hz, of 18 skilled females to highlight the biomechanical characteristics of these types of exercise in order to assess the safety and efficiency of Step programs. All data, normalised to body weight, was processed using the Acknowledge software (BIOPAC, CA, USA). Descriptive statistics and ANOVA for repeated measures were conducted using SPSS (SPSS Inc. IL, USA).

The results are relevant to determine which patterns and cadences can be recommended to be included in exercise programs. Depending on the inclusion of non-propulsion or propulsion patterns, the results for peak vertical forces suggest that Step Exercise is a low to moderate activity. Concerning the mean values for the 1st peak VGRF, they range from 1.16 BW to 2.27 BW in ascending phase (A) and from 1.57 BW to 1.79 BW in descending phase (D). The anterior-posterior GRF exhibit a similar characteristic shape between propulsive and non-propulsive patterns, with higher stepping rate in propulsive patterns. The values range from 0.32 BW to 0.60 BW (A) and from -0.39 BW to -0.31 BW (D). The medio-lateral GRF ranged from -0.02 BW to 0.02 BW (A) and from -0.03 BW to 0.01 BW (D). The results are also relevant to determine which patterns and cadences can be recommended to be included in programs. This study also showed that lower extremity external loading during step classes, can be effectively controlled by varying stepping rate during Step classes and appears relatively safe with respect to the magnitude of loading.

Keywords: Physical Activity, Health and Fitness, Ground Reaction Forces

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