

Abstract

Title: Effect of height and load carried on post-jump dynamic forces in military personnel

Objective: To investigate the effect of added load carried and different jump heights on dynamic forces, specifically pvGRF and tpvGRF values, acting on the lower limbs during impact in military personnel.

Methods: This thesis was designed as a theoretical-empirical randomized trial. The research population consisted of 22 military students (21.8 ± 1.8 years; 182.1 ± 9.4 cm; 82.3 ± 7.2 kg) of the Faculty of Physical Education and Sport, Charles University, who performed drop landing tasks from elevated platform (50 and 75 cm) without a load and with an added load (21.45 kg). Hawk Dynamics force plates (ME, USA) were used to obtain kinetic data. For this work, the values of peak vertical ground reaction force (pvGRF) and time to peak vertical ground reaction force (tpvGRF) were selected. The data obtained were descriptively and statistically analyzed in Jasp (0.16.2) using repeated measures analysis of variance. The level of statistical significance was set at $\alpha = 0.05$. Eta-squared ($\eta^2 = 0.066$) and Cohen's d ($d = 0.626$) values were calculated using G*Power.

Results: The added load carried (PNZ) and the change in jump height from 50 to 75 cm (ZVS) had an effect on both pvGRF ($p_{PNZ} < 0,001$; $\eta^2_{PNZ} = 0,166$; $p_{ZVS} < 0,001$; $\eta^2_{ZVS} = 0,596$) and tpvGRF ($p_{PNZ} = 0,045$; $\eta^2_{PNZ} = 0,050$; $p_{ZVS} = 0,022$; $\eta^2_{ZVS} = 0,140$). PNZ increased pvGRF (18,1%; $p < 0,001$; $d = -0,859$) and prolonged tpvGRF (5%; $p = 0,045$; $d = -0,219$), and ZVS increased pvGRF (39,1%; $p < 0,001$; $d = -1,628$) and shortened tpvGRF (7,9%; $p = 0,022$; $d = 0,367$). Specifically, PNZ from both 50 and 75 cm increased pvGRF (10,6%; $p_{50} = 0,030$; $d_{50} = -0,413$; 25,6%; $p_{75} < 0,001$; $d_{75} = -1,304$) and prolonged tpvGRF (8%; $p_{50} = 0,031$; $d_{50} = -0,356$; 2%; $p_{75} = 1$; $d_{75} = -0,082$), and ZVS without and with PNZ increased pvGRF (30,2%; $p_{non-PNZ} < 0,001$; $d_{non-PNZ} = -1,182$; 48%; $p_{PNZ} < 0,001$; $d_{PNZ} = -2,074$) and shortened tpvGRF (5,2%; $p_{non-PNZ} = 0,964$; $d_{non-PNZ} = 0,231$; 10,5%; $p_{PNZ} = 0,023$; $d_{PNZ} = 0,504$).

Keywords: drop landing, kinetics, ground reaction force, musculoskeletal injuries, military