

## **Ground reaction force during walking with and without counterbalance load system**

### **ABSTRACT**

The purpose of this study was to determine the ground reaction force (GRF) during walking with and without counterbalance load system. Peak GRF was recorded with force plate while walking with different conditions on the treadmill. Twenty-six students (age was  $22.41 \pm 1.75$  years) attended three test sections in three days apart. Participants after 10 min warm up walked 10 min on the treadmill without any backpack in the first day. On the second day they walked 10 min with normal backpack, and on third day they walked 10 min with counterbalance load backpack. Force peak measured during three conditions of walking. A one way analysis of variance (ANOVA) was conducted for the force peaks variable, to confirm the significant difference between walking with different conditions. If statistical significance was found a between conditions a Tukey post-hoc test was used to examine where the differences exist within the conditions, where applicable. The results of current study showed significant difference in GRF after walking in three condition with  $p < .05$ . Within group analysis showed significant difference in GRF after walking with normal backpack and without backpack. In fact the normal backpack load significantly increased GRF when walking on the treadmill. The results also showed that there is no significant difference among GRF between unloaded walking and counterbalance backpack. Findings of current study clearly show the advantage of a counterbalance system for carrying the loads. In addition to these, the reduction of forces is a considerable kinematic and ergonomic benefit of carrying load in such backpacks.

**Keyword:** Backpack; Injury; Ground reaction force