The Effect of Barbell Load on Vertical Jump Landing Force-Time Characteristics

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INTRODUCTION

Countermovement jumps (CMJ) with additional loads are used to assess neuromuscular function and to identify training loads. However, little is known about their landing force-time characteristics. This could have implica tions for performance enhancement and injury prevention. The aim of this study was to quantify the effect of barbell load on CMJ landing force-time characteristics.

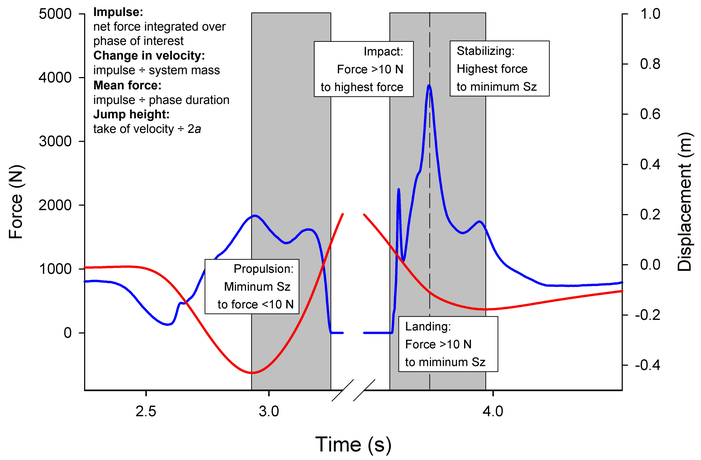

Figure 1. How phases (grey) were identified and dependent variables were calculated.

METHODS

Fifteen trained men (age: 23±2 years, mass: 84.9±8.1 kg, height: 1.80±0.05 m) performed 2 CMJ with no additional load (body mass: BM) and with barbell loads of 25, 50, 75 and 100% of BM on two force plates. The way in which the different phases were identified and the dependent variables were calculated is shown in Fig 1. Jump height and landing data were compared across the 5 loads using 1-way ANOVA and effect sizes (ES).

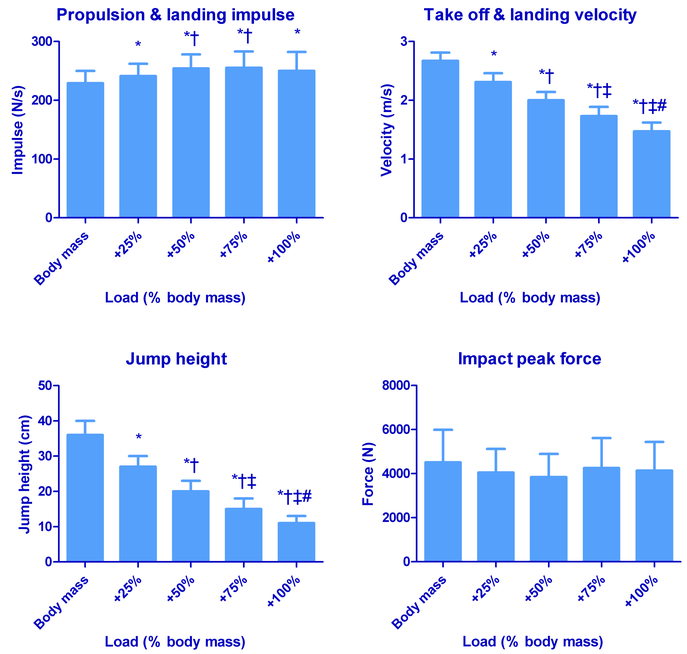

Figure 2. Mean (SD) propulsion and landing impulse and velocity, jump height and impact peak force. * = † = different to +25% condition; ‡ = different to +50% condition; # = different to +75% condition.

RESULTS

Results are presented in Figure 2 & 3. Load reduced jump height, but did not effect impact peak force. Load increased landing time, but relative impact and stabilising time did not change. Impact and stabilising phase change in velocity decreased with load, but relative change in velocity did not.

DISCUSSION

Adding barbell load to vertical jumping does not increase peak impact force or change force absorption during the impact and stabilizing landing sub-phases. Loaded vertical jumping is a relatively simple way to assess neuromuscular function and identify training loads.

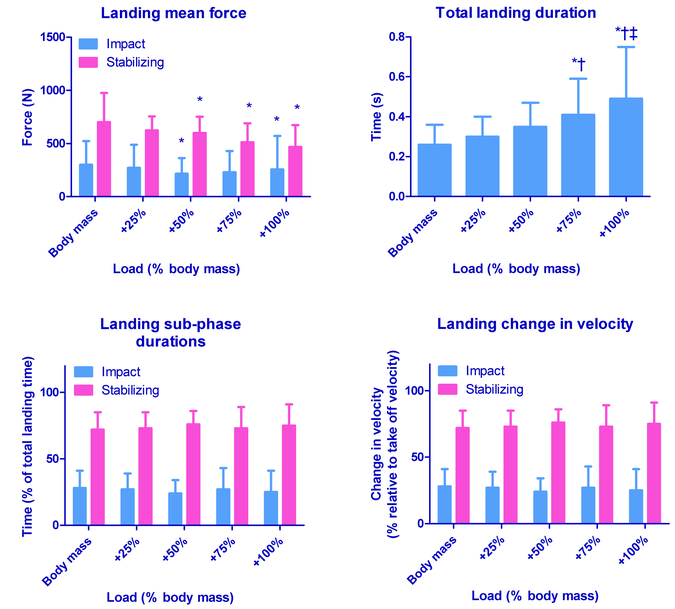

Figure 3. Mean (SD) landing duration, and impact and stabilization mean force, change in velocity, and duration. * = † = different to +25% condition; ‡ = different to +50% condition; # = different to +75% condition.

PRACTICAL APPLICATIONS

The results show that additional load does not change force absorption. However, future research should examine whether lower-body joint kinetics and kinematics change during loaded CMJ landing.

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