

The Concurrent Validity of Portable Bilateral Jump Mat to Estimate Countermovement and Squat Jump Performance



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Introduction

Countermovement (CMJ) and squat jumps (SJ) are often used to assess not only changes in physical capacities as a result of training but also neuromuscular fatigue and limb-to-limb asymmetries.

Typically this has required the use of bilateral force plates, however this approach can be difficult for strength and conditioning professionals due to the costs associated with force plate technologies and the lack of portability.

Purpose

The purpose of this study was to assess the concurrent validity of a portable jump mat that measures flight-time for individual legs, as well as overall flight-time against those calculated using bilateral, in-ground force plates during countermovement and squat jumps.

Methods

- Sixteen healthy subjects (age: 27.67 ± 4.32 years, height: 170.71 ± 10.59 cm, body mass: 75.65 ± 13.30 kg) performed a general dynamic warm-up of body weight squats and lunges, followed by three submaximal CMJs and SJs.
- Six maximal CMJs and SJs
 - 1 minute between trials. 2 minutes between jump types.
 - Instructed to jump "as high and as fast as possible".
- All trials were performed while standing on a portable jump mat (Ezelump, Swift Performance, Australia) that was placed over the top of two in-ground triaxial force plates sampling at 1000 Hz (Type 9287CA/9287BA, Kistler Instruments, Switzerland).
- The jump mat was interfaced via Bluetooth with a tablet (iPad 6, Apple Inc, USA). Overall flight-time as well as left and right leg flight time were calculated via a proprietary application (Ezelump; Swift Performance).
- Overall flight-time and left and right leg flight time were calculated from the force plate data via Excel spreadsheet (1).
- Jump height was calculated from flight-time for both devices.
- Agreement between the two devices was assessed using ordinary least products regression (2).
 - Fixed bias = Intercept 95% confidence intervals do not include zero
 - Proportional bias = Slope 95% confidence intervals do not include one
- Statistical analyses were performed in SPSS 26.0 (IBM Corp, Armonk, NY, USA).

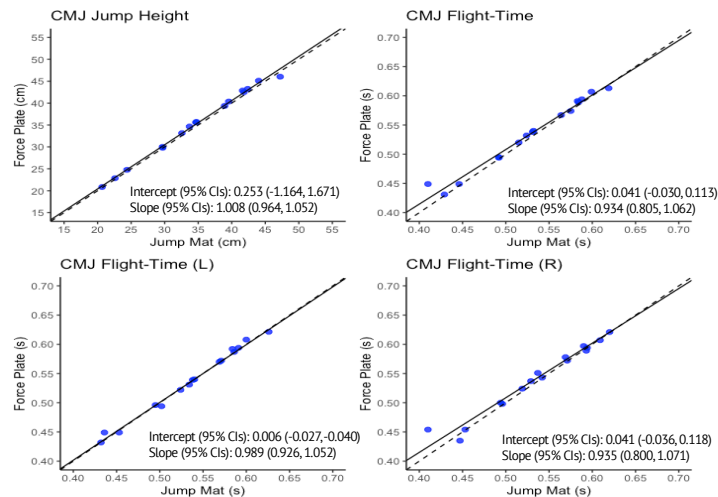


Figure 1. Countermovement jump ordinary least products regression comparisons

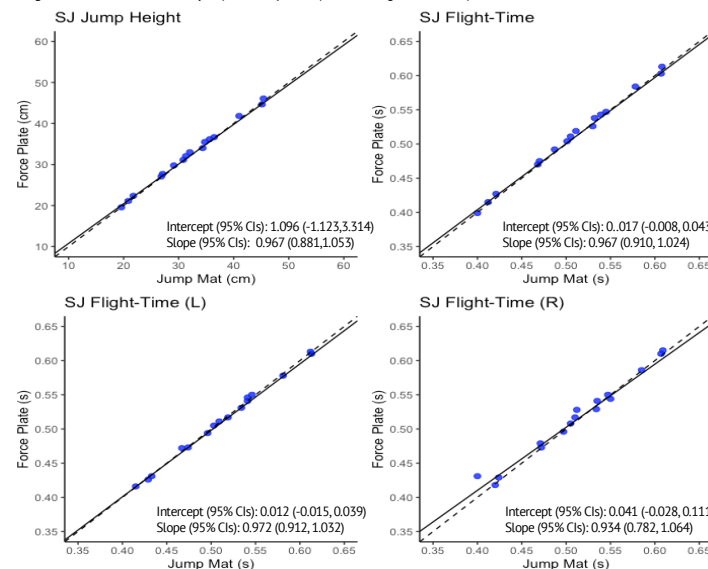


Figure 2. Squat jump ordinary least products regression comparisons

Results

No fixed or proportional bias was present for characteristics recorded during the SJs (Figure 2). No fixed or proportional bias was present for CMJ jump height, overall flight-time or right-leg flight time (Figure 1). Fixed but not proportional bias was present for left-leg flight-time during CMJs.

Conclusions

The bilateral jump mat assessed in the study agrees with the calculation of flight-time and jump height using bilateral force-plates during both CMJs and SJs.

Individual limb flight-time calculated using the portable jump mat agree with those calculated using bilateral force-plates during SJs

Practical Applications

The Ezelump may be used by strength and conditioning professionals who do not have access to force plates, but still wish to assess jump height and inter-limb performance differences during jumping tasks.

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References

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