RUNNING BEFORE JUMPING:
HOW MUCH MORE HEIGHT FOR RUN-IN vs. STANDING VERTICAL JUMPS?

Emily L. McClelland and Peter G. Weyand
Locomotor Performance Laboratory, Southern Methodist University, Dallas, TX, USA
email: emcclelland@mail.smu.edu, web: https://www.smu.edu/Simmons/Research/LPL

INTRODUCTION

Vertical jumps for maximum height rarely occur without a preceding run-in in athletic and other circumstances. Yet nearly all standardized vertical jump testing occurs from a stationary position. Thus, stationary jump testing's applicability to functionally relevant vertical jumps has not been widely considered. Evaluating performance differences between standard, stationary, countermovement jumps (CMJ) vs. run-in jumps (RIJ) should reveal how well standard CMJ tests quantify dynamic jumping ability.

Here, we compared the differences in performance between stationary countermovement jumps vs. run-in jumps (RIJ). Our objective was to determine if, and how much height a preceding run-in may add across different individuals. Based on general observation, we hypothesized that all healthy jumpers would jump appreciably higher with vs. without a run-in.

METHODS

Fourteen physically active participants (age 24 ± 2.9 years, mass 72.2 ± 10.9 kg, n=6 male, 7 female) of varying athletic ability, performed three maximum effort trials under the two different jumping conditions: (1) countermovement jump and (2) self-selected run-in jump with a two legged take-off. For the run-in jump, the participants were instructed to run in a self-selected pattern. The participant's highest jump of each type was subsequently analyzed.

Jump heights were calculated using equation (1) using vertical velocity at take-off (V_{to}^2) measured from an Optitrack motion capture system (Natural Point). This calculation of jump height was validated over other types of jump height calculations when motion capture is in use with similar systems [1].

$$Ht = (V_{to}^2) / (2g) \qquad \text{(equation 1)}$$

RESULTS AND DISCUSSION

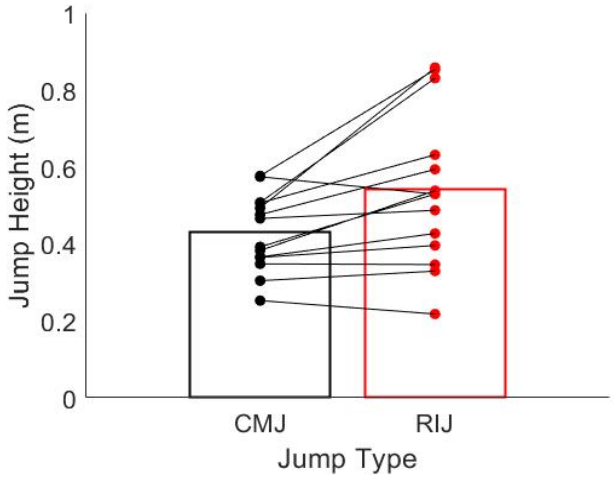

Figure 1: Countermovement (CMJ, black) and run-in jump (RIJ, red) performances linked across jump type for each the 14 subjects. Vertical bars provide group CMJ and RIJ means.

Mean jump heights for CMJ and RIJ trials was 0.43 m (± 0.1) and 0.54 m (± 0.2) respectively. Heights ranged from 0.25 to 0.58 m for the CMJ and 0.22 to 0.86 m for the RIJ. The paired performances of all CMJ and RIJs from all participants as well as means for both types of jumps appear in Figure 1. Additionally linear regression of the RIJ height versus CMJ jump height provided the following best fit equation, $y = 1.6553x - 0.1702$, $R^2 = 0.68$.

Eleven of the 14 subjects had greater jump heights with a run-in vs. CMJ, while three subjects achieved lower maximum heights for their RIJ vs. CMJ. Thus, the height differential between the two jump types ranged from -4.5 to +36 cm. Thus, our initial hypothesis that the jump performances of all subjects would benefit from a preceding run-in was not supported.

This rather large individual variability in performance across jump types suggests that the RIJ has a significant mechanical skill component. Clearly, a preceding run-in enables some, but not other jumpers, to increase take-off impulses and velocities.

We conclude that stationary jumps are only limitedly representative of dynamic jumping performance.

REFERENCES

[1] Moir, G. L. (2008). Three different methods of calculating vertical jump height from force platform data in men and women. *Measurement in Physical Education and Exercise Science*, *12*(4), 207-218