Test-Retest Reliability of Reactive Strength Index Variants Obtained from the Countermovement-Rebound Jump

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Introduction

The vertical jumps extensively researched include the countermovement jump (CMJ), squat jump, drop jump and repeated jumps (2, 3, 4, 5, 6). Of these jumps, the CMJ has been included in extensive research to show its reliability and repeatability as well as its sensitivity to fatigue among other factors (4,5). The countermovement rebound jump (CMJ-R) is a method of vertical jumping that will hypothetically achieve a reliable drop height in comparison to a drop jump test (1) via first performing a maximal CMJ followed by an immediate rebound allowing further assessment of reactive strength. The purpose of this study was to assess if the CMJ-R test is an appropriate test to utilise within testing batteries of athletes through assessing its test-retest reliability.

Methods

Seventeen jump-trained subjects (height = 174.4 ± 7.2 cm, body mass = 79.9 ± 11.9 kg and age = 26.5 ± 7.3 years) performed three trials each of the CMJ and CMJ-R; nine of them performed an additional three trials of each test seven days later under identical conditions. The CMJ consisted of a quick triple flexion of hips, knees and ankles with hands on hips throughout to a self-selected depth then a jump as fast and high as possible with the intention of achieving maximal jump height. The CMJ-R included an immediate rebound following the CMJ. All jumps were performed on a force platform sampling 1000 Hz. The variables analysed were reactive strength index (RSI), RSI modified (RSImod) and their respective components.

Results

The results showed acceptable intraclass correlation coefficients of between 0.515-0.972, with all but two variables (within-session time to take-off (TTO), between-session rebound ground contact time) being >0.75 and deemed good or excellent for the CMJ-R within- and between-sessions. The coefficient of variation values for all variables for within- and between-session CMJ-R were reported at <10% (see Table 1). The paired Hedges' *g* between CMJ and CMJ-R is -0.227 for RSImod and-0.207 for TTO (see Figures 2 and 3). The p value of the two-sided permutation t-test was 0.0846 and 0.179, respectively, indicating no significant differences in RSImod or TTO between the CMJ and CMJ-R. The paired Hedges' *g* between average CMJ JH and average CMJ-R JH was -0.438 (see Figure 1). The p value of the two-sided permutation t-test was 0.001, indicating significant differences between the JHs.

Table 1. Means, standard deviation, coefficient of variation and intraclass correlation coefficients of within session subject variables.

Exercise	Variable	Mean	SD	ICC	CV {range}
CMJ	JH (m)	0.34	0.07	0.974	1.9% {0.0-5.1%}
CMJ	RSImod	0.51	0.10	0.916	4.0% {1.01-10.6%}
CMJ	TTO (s)	0.68	0.10	0.819	4.0% {0.7-12.5%}
CMJ-R	CMJ JH (m)	0.31	0.05	0.972	1.6% {0.0-5.0%}
CMJ-R	CMJ RSImod	0.48	0.09	0.842	4.5% {1.1-8.9%}
CMJ-R	CMJ TTO (s)	0.66	0.14	0.657	3.7% {0.4-8.1%}
CMJ-R	Rebound GCT (ms)	263.43	55.60	0.771	5.2% {1.0-11.1%}
CMJ-R	Rebound RSI	1.07	0.28	0.760	6.0% {0.2 – 17.5%}
CMJ-R	Rebound JH (m)	0.27	0.05	0.878	3.7% {0.3-13.0%}

SD=standard deviation, ICC=intraclass correlation coefficients, CV= coefficient of variation, CMJ=countermovement jump, CMJ-R=countermovement jump rebound, JH=jump height, RSImod=reactive strength index modified, TTO=time to take-off, RSI=reactive strength index, GCT= ground contact time

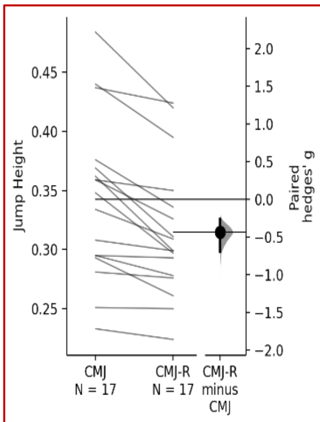

Figure 1. Left: The differences between CMJ and CMJ-R JH within session. Right: The paired mean difference (hedge' g) plotted on a floating-axes as a bootstrap sampling distribution.

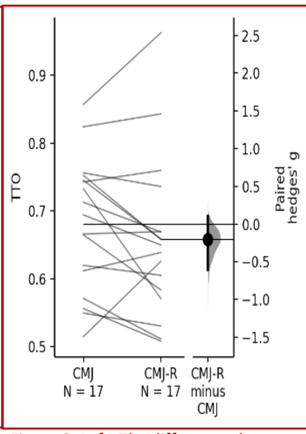

Figure 2. Left: The differences between CMJ and CMJ-R TTO within session. Right: The paired mean difference (hedge' g) plotted on a floating-axes as a bootstrap sampling distribution.

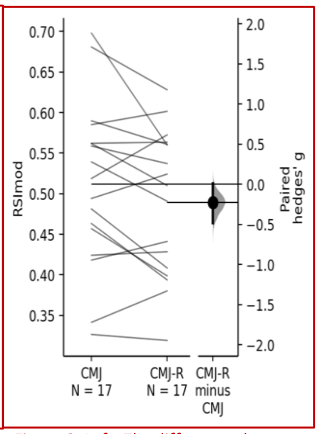

Figure 3. Left: The differences between CMJ and CMJ-R RSImod within session. Right: The paired mean difference (hedge' g) plotted on a floating-axes as a bootstrap sampling distribution.

Summary and Conclusion

The main aim of the present study was to assess the reliability of the CMJ-R within and between sessions. Having illustrated its reliability within and between sessions, the CMJ-R would be a suitable test to utilise in testing batteries. However, practitioners should be aware of potential changes of CMJ strategy, particularly if athletes are unfamiliarised with the testing procedures. Practitioners may benefit from the CMJ-Rs ability to provide data that can assess athletes' slow and fast stretch shorten cycle ability in a singular test rather than having to do separate tests.

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