HOW MUCH SHOULD YOU JUMP? REPRODUCIBILITY EVALUATION OF A 3-DIMENSIONAL FATIGABILITY COUNTERMOVEMENT JUMP TEST.

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Introduction

With the stop jump, the counter movement jump (CMJ) is probably the most used jump in sport. In the literature, a number of studies use the counter movement jump to explore (neuro-)muscular fatigability [1-4]. However, due to the continuous [1-3] (or semi-continuous [4]) character of the test, the CMJ become drop jumps from the second one. Nevertheless, the drop jump isn't the most frequent jump type in sport. These evaluations, with (semi-)continuous jumps, don't reflect the sport reality and therefore a more effective (neuro-)muscular jumping fatigability evaluation must be validated.

Methods

Nineteen volleyball players (23,5 ± 3,3 years, 187,6 ± 6,6 cm, 77,5 ± 8,5 kg), with no history of (major) lower limb injury, submitted to two jumping fatigability tests, with seven days between each session, under the direction of a single researcher.

The jumping fatigability tests consists of the repetition of 50 maximal CMJ at the rate of 33bpm. Between each CMJ, the subject were asked to make a full triple-extension and to wait the next auditory and visual signal of the metronome to start the hip-knee-ankle flexion. With these instructions, each jump remains a CMJ. Subjects were asked to leap as high as possible from the first to the last CMJ. The jumping height was recorder for each jump with three dimensional camera.

Figure 1: illustration of CMJ

The reproducibility was assessed by Standard Error of Measurement (SEM), Minimal Difference needed to be considered real (MD), Coefficient of Variation (CV), Pearson Correlation Coefficient (PCC) with 95% confidence interval, Effect Size Cohen (ES Cohen) with 90% confidence interval, paired Student's t-test, Intraclass Correlation Coefficient (ICC 2,1) with 95% confidence interval and Magnitude-Based Inferences (MBI).

Results

The results summary is available in the Table 1. In this table, only few parameters are presented and only for the partial sums of the first 10, 20, 25, 30, 40 and 50 jumps.

Our analyses were based on the partial sums per interval of one jump and all statistical tests listed in "Methods" section have been considered. The partial sum with twenty-five CMJ have an excellent reproducibility (MBI with 0/99/1; ICC with 0.961 [0.902/0.985]; ES Cohen with -0.03 [-0.17/0.10]; PCC with 0.966 [0.911/0,987] and p-value < 0.0001). Moreover, it induce a great height decrease (-23%) and its duration (45.5 s) is similar to the recommendation for the knee fatigability isokinetic protocol [5].

	MBI (+/trivial/-)	Height decrease	ICC (2,1)	Test duration
10	0/100/0	-12,7%	0.967	18 s
20	0/99/1	-19,0%	0.964	36 s
25	0/99/1	-23,0%	0.961	46 s
30	0/98/1	-25,6%	0.955	55 s
40	0/98/1	-32,1%	0.950	73 s
50	0/98/2	-38,4%	0.943	91 s

Table 1: reproducibility statistics results depending on the number of jumps considered (magnitude-based inferences (MBI) with percentage chances of better/trivial/worst retest vs test results; height jump decrease (last jump / better jump); ICC (2,1); test duration).

Discussion

Because of the (semi-)continuous character of a majority of fatigability jumping test [1-4], our test is the first, at our knowledge, to explore the reproducibility of a strict CMJ jumping fatigability task.

Considering the statistical (relative and absolute) reproducibility results, twenty-five maximal CMJ seems to be the best compromise between reliability of the data and physiological interpretability of test's results. Indeed, its (relative and absolute) reproducibility is excellent and it induces a greater height decrease than shorter test while remaining similar in total duration than other fatigability tests which explore the anaerobic lactic system.

References

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