DEVELOPMENT OF A CRITERION METHOD TO DETERMINE PEAK MECHANICAL POWER OUTPUT IN A COUNTERMOVEMENT JUMP

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INTRODUCTION: The ability of players to repeatedly generate high levels of muscular power is a key determinant for success in many sports. Variations of the countermovement vertical jump (CMJ) have long been used as a means of measuring lower body power (LBP) (Fox and Mathews 1972). The criterion method of measuring of LBP is based on performance in a CMJ off a force platform (FP) (Hatze, 1999). Instantaneous power is determined from the product of the vertical ground reaction force (VGRF) and the velocity of the whole body centre of gravity, velocity being derived by the integration of the resultant VGRF. However, there seems to be no published standard protocol for the criterion method. The purpose of this study was to establish a standard protocol for the criterion method.

METHODS: The variables necessary to define a reliable CMJ method were:

1. Vertical force range and resolution, determined per individual corner force transducer.
2. Force sampling frequency and resultant force integration frequency.
3. Method of integration of the resultant force.
4. Determination of body weight (BW).
5. Determination of the initiation of the CMJ.

Fifteen professional male rugby players (mass = 102.5 ± 13.3 kg) performed a maximal CMJ off a FP. The five variables were then optimised, for each CMJ, to maximise the reliability and validity of the measure of peak mechanical power.

RESULTS AND DISCUSSION: The results of the investigation are summarised in table 1.

Table 1 Criterion method specification for the measurement of instantaneous power in a CMJ using a force platform

Variable	Criterion method specification
1	Six times BW (total vertical force range) at 16 bit A/D resolution.
2	1000 Hz.
3	Simpson's rule or the trapezoidal rule.
4	Mean VGRF for I second of quiet standing immediately prior to jump signal.
5	10 ms before the instant that BW ± 5 SD is exceeded after the jump signal.

Uncertainties (95% CI) for variables 2, 3, 4 & 5 were ±0.5%, ±0.4%, ±0.1% & ±0.5% respectively. Peak power output was most sensitive to variables 4 and 5.

CONCLUSION: This study has established a reliable standard protocol for the criterion method of measuring peak power in a CMJ using a FP. As all other estimates and less reliable methods of determining peak power in a CMJ rely on the FP method for calibration, it is recommended that this protocol be used for all future criterion measures using a FP.

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