THE EFFECT OF COUNTER MOVEMENT ON JUMPING HEIGHT

Tsunoda Kazuhiko, Sasaki Tsutomu, Hoshino Hiroshi, Miyake Shosuke, Koike Takayuki
(Hokusei Gakuen Univ, Japan)

INTRODUCTION: In ski jumping, this counter movement is the jumper's centrifugal force, which is determined by jumping hill's construction. At in-run, isometric muscular contraction is required for stabilization of posture. On the other hand, at take-off, concentric muscular contraction is required for explosive muscle power. Counter movement jump enhances jumping height. Thus counter movement jump training is basic for ski jumpers. The purpose of this study is to clarify the effect of counter movement to jumping height.

METHOD: Eight Japanese ski jumpers participated in this study voluntarily. Two types of vertical jumps were performed on a force plate. One jump was a static jump (SJ) beginning from a squat (i.e. with the thighs horizontal to the ground). The other type of jump was a counter movement jump (CMJ) beginning from the standing upright position. Reaction forces were measured using a force plate (AMTI co.). These data were sampled with 1kHz, and at the time, jump motions were recorded using a video camera (Photoron co.) at 120 fps.

RESULTS: The jumping height of CMJ (48.4cm) was significantly larger than SJ (45.5cm). In CMJ, when the velocity of center of mass (CM) changed negative to positive, the CM reached its lowest point. In SJ, the CM does not move downward. Power is a function of the force production and the velocity. In the phase which positive power is developed from the lowest point to release, it is possible to compare SJ and CMJ. Positive work of CMJ was 623.6J, SJ was 572.5J. Negative work was -275.5J in CMJ. The negative does not exist in SJ. The correlation between jumping height and each parameter was calculated. The correlation between positive work was strongest with jumping height in both jump types (CMJ: r=0.91, SJ r=0.94). Maximum power also is highly correlated with jumping height (CMJ: r=0.80, SJ: r=0.90). However, the correlation between maximum force of the two types was somewhat different SJ(r=0.52) and CMJ(r=0.82).

DISCUSSION: It is consider that each individual jumping action would be decided jumping height in SJ. The styles of force development were significantly different for CMJ and SJ, but the maximum force values were very similar. We predict that prolonging the positive force time will result in higher jumping heights. Our one subject with the widest spread of values for CMJ and SJ, had the unique result that for his CMJ force curve, the maximum force was generated shortly after he was in the lowest squat position.

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