28th ECSS Anniversary Congress, Paris/France, 4-7 July 2023

SPATIOTEMPORAL DIFFERENCES ASSOCIATED WITH VERTICAL AND HORIZONTAL JUMPS IN ELITE ATHLETES.

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INTRODUCTION:
Plyometric is a training method that aims to improve muscle power. In this method, different ways of analyzing intensity in unilateral and bilateral jumping have been reported (1). However, little has been on spatiotemporal differences in the variables associated with training intensity. These exercises are characterized by an abrupt stretching of previously tight muscles after the brake of a free fall . However, it is not known if the duration times between the eccentric phase (EPT) and the concentric phase (CPT) are similar between DJ over HDJ. It has been reported that DJ does not show significant differences in GCT and flight time (FT) as height increases, but it is unknown if this behavior is the same for HDJ. In this sense, the purpose of this study was to compare the differences in the spatiotemporal variables of the horizontal Drop Jump (HDJ) with the vertical Drop Jump (DJ) in elite jumpers and sprinters.

METHODS:
Sixteen international-level athletes were recruited. All performed 2 DJ attempts with ascending order (DJ30, DJ40, and DJ50) and after 2h completed 2 HDJ attempts (HDJV30, HDJV40, HDJV50). A research-grade platform integrated with an infrared optical system allowed to analyze in real-time: GCT, FT, EPT, CPT, and time to maximum concentric peak (T-GRF-2).

RESULTS:
It was found that T-GRF-2 can take 45-55 % of the total jump time, regardless of the type of exercise. In HDJ, anteroposterior forces require more time for force production relative to DJ (T-GRF-2 DJ30 = 0.109 ± 0.003 - HDJ30= 0.158 ± 0.003; DJ40 = 0.102 ± 0.003 - HDJ40= 0.134 ± 0.003; DJ50 = 0.115 ± 0.003 - HDJ50= 0.165 ± 0.003). The other associated variables also showed significant differences ($p \leq 0.05$) benefiting DJ.

CONCLUSION:
DISCUSSION. The TGRF-2 for the DJ was better than that reported in one previous study (24). We found that the time to the concentric peak of the GRF can take 45-55% of the total time of the jump, which represents that the muscles still must continue force production 45-55% longer after reaching the concentric peak force. Also, our results show that in the HDJ the anteroposterior forces need a longer time to take the peak force production relative to the vertical forces. Other results of the EPT and CPT results show that for both exercises, EPT tends to be significantly lower than CPT. Likewise, EPT is significantly lower in DJ than in HDJ. For CPT, the behavior is not the same, where significant differences are observed only for some sets of heights.

CONCLUSIONS: The findings showed differences between DJ and DHJ. It is suggested that coaches use the DJ to enhance the fast stretch-shortening cycle exercise and the DHJ for slow-type exercises (3). Because of the characteristics of GCT, the HDJ might not favour fast stimuli during the maximal speed phase of sprinting. However, the start and acceleration phase can be favourable, where more TGRF-2 is needed, and contact times are more delayed than DJ.

Topic: Training and Testing

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